VESUVIUS PLC

Company number 08217766

WE ARE VESUVIUS

Annual Report and Financial Statements

2018

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Contents

Financial performance

Revenue
£1,798.0m
2017: £1,683.9m
+6.8% on a reported basis
+10.7% on an underlying basis[1]

Return on sales[2]
11.0%
2017: 9.8%
+120 basis points
+120 basis points on an underlying basis[1]

Recommended final dividend
13.8p
per share
2017: 12.5p per share

Trading profit[2]
£197.2m
2017: £165.5m
+19.1% on a reported basis
+24.1% on an underlying basis[1]

Profit before tax
£156.2m
2017: £97.1m
60.9% increase

Group full-year dividend
19.8p
per share
2017: 18.0p per share

Headline earnings per share[3]
49.6p
2017: 40.7p
21.9% increase

Year-end net debt[2]
£248.0m
1.0x net debt to EBITDA ratio
2017: £274.3m – 1.3x

1. Underlying basis is at constant currency and excludes separately reported items and the impact of acquisitions and disposals.
2. For definitions of alternative performance measures, refer to Note 4 of the Group Financial Statements.
3. Headline results refer to continuing operations and exclude separately reported items.

Forward-looking statements
This Annual Report contains certain forward-looking statements with respect to the operations, strategy, performance, financial condition, and growth opportunities of the Vesuvius Group. By their nature, these statements involve uncertainty and are based on assumptions and involve risks, uncertainties and other factors that could cause actual results and developments to differ materially from those anticipated. The forward-looking statements reflect knowledge and information available at the date of preparation of this Annual Report and, other than in accordance with its legal and regulatory obligations, the Company undertakes no obligation to update these forward-looking statements. Nothing in this Annual Report should be construed as a profit forecast.

Cover image
Claire Ratajski
Operational Marketing Assistant,
Glass & Industrial Technology, Feignies, France

WE ARE VESUVIUS

Vesuvius is a global leader in molten metal flow engineering and technology, serving process industries operating in challenging high-temperature conditions.

We develop innovative solutions that enable our customers to improve their manufacturing costs, quality and safety performance, and help them to become more efficient in their processes.

We aim to deliver sustainable, profitable growth to provide our shareholders with a superior return on their investment, whilst providing each of our employees with a safe workplace where he or she is recognised, developed and properly rewarded.

Find out more about Vesuvius.
Visit **report2018.vesuvius.com**

Shantaram Dhamale
Cell Assistant,
Pune, India

Vesuvius at a glance
Where we operate

See p4

Business model
What we do

See p14

Our strategy
Our aims and execution priorities

See p16

Innovation
Our R&D focus

See p24

SECTION ONE
OUR BUSINESS

In this section:

I HAVE ALWAYS BEEN ENCOURAGED TO DEVELOP MY CAREER.

Séverine Romero-Baivier
Global Fundamental
Research Manager Flow Control, Ghlin

I started my career with Vesuvius in 2007 as an engineer. My first role consisted of performing Finite Element simulations. While developing my engineering skills, I was promoted to Material Modelling and Characterisation Manager in the Enabling Technology group. In this position, I had the opportunity to develop my leadership skills and build a team to develop a new methodology to analyse and predict the thermomechanical behaviour of molten metal.

In 2018, I was promoted to the position of Global Fundamental Research Manager in the Flow Control business unit, leading an international team of scientists, most of whom are based in Belgium and the USA. This new role is focused on reproducing, simulating and modelling phenomena which occur during the continuous casting of steel. These scientific assessments enable us to better determine material selection, and to design processes to optimise the performance of our refractory pieces.

Thanks to the inclusive and focused working environment at Vesuvius, I have always been encouraged to progress in my career. I have been supported in my work and inspired to pursue my interest in material characterisation. I am especially grateful for the continuous management support I have received throughout my journey.

Find out more about Séverine's career journey at Vesuvius.
Visit **report2018.vesuvius.com**

Vesuvius at a glance

Overview

We are a global group with a business model based on offering customised products, solutions and services from production facilities in close proximity to our customers. Our two divisions – Steel and Foundry, mainly serve the global steel and foundry industries.

See our **Business model** on p14

See more about our **Steel** and **Foundry Divisions** on p42-49

Our global presence

41
Countries

10,809
Employees

6
Continents

89
Sales offices

59
Production sites

7
R&D centres of excellence

Vesuvius gives me great opportunities to learn and progress. The company invests in its people and I take pride in our professionalism and dedication.

Tomohiro Hirano
Sales Representative
Kobe, Japan

Americas

£527.0m
Revenue
(2017: £492.4m)

77% Steel
23% Foundry

16
Production sites

1
R&D centre of excellence

3,086
Employees

22
Sales offices

EMEA

£786.4m
Revenue
(2017: £729.8m)

68% Steel
32% Foundry

24
Production sites

4
R&D centres of excellence

4,360
Employees

33
Sales offices

Asia-Pacific

£484.6m
Revenue
(2017: £461.7m)

61% Steel
39% Foundry

19
Production sites

2
R&D centres of excellence

3,363
Employees

34
Sales offices

The map shows our production, R&D and commercial sites worldwide

Steel Digital Services
Operating review

See p47

Steel Flow Control
Operating review

See p42

Foundry
Operating review

See p48

Steel Advanced Refractories
Operating review

See p45

Divisional overview

Steel Division

Revenue
£1,236.7m
2017: £1,148.7m

Return on sales
10.4%
2017: 8.7%

Trading profit
£128.3m
2017: £100.4m

Business units

Steel Flow Control

What we do
Vesuvius' Steel Flow Control business unit supplies the global steel industry with consumable ceramic products, systems, robotics, digital services and technical services. These products are used to contain, control and monitor the flow of molten steel in the continuous casting process.

How the process works
The continuous casting process enables steel manufactured from a blast furnace or electric arc furnace to be cast without interruption, whilst protecting it from the atmosphere. Avoiding atmospheric contact is crucial as it significantly reduces contamination and oxidation of the steel.

Our products
The consumable products that Vesuvius supplies have a short service life (often a matter of a few hours) due to the significant wear caused by the extremely demanding environment in which they are used. These products must withstand extreme temperature changes, whilst resisting liquid steel and slag corrosion. In addition, the ceramic parts in contact with the liquid steel must not contaminate it. The quality, reliability and consistency of these products and the associated solutions and services we provide are therefore critical to the quality of the finished metal being produced and the productivity, profitability and safety of our customers' processes.

Steel Digital Services

We offer digitalised solutions to our customers to enable them to make their underlying processes more efficient and reliable. Digital Services focuses on providing products that enhance the control and monitoring of our customers' production processes. The products provided by Digital Services include temperature sensors, oxygen, hydrogen and sublance probes, iron oxide and metal sampling for the steel, aluminium and foundry industries.

See **Steel Digital Services** Operating review on p47

Overview

Our customers are steel producers and other high-temperature industries. Vesuvius is a world leader in the supply of refractory products, systems and solutions. These help our customers increase their efficiency and productivity, enhance quality, improve safety and reduce their costs and their environmental impact.

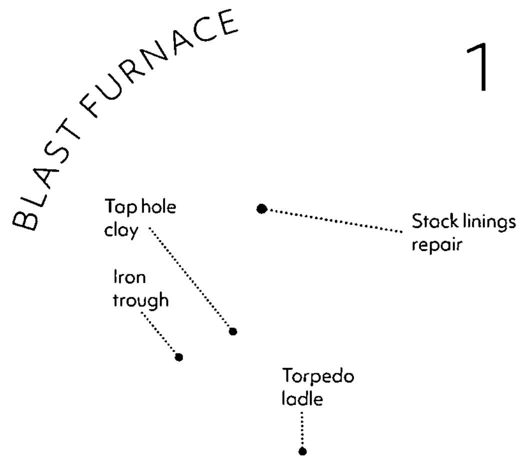
See **Steel Flow Control** Operating review on p42-44

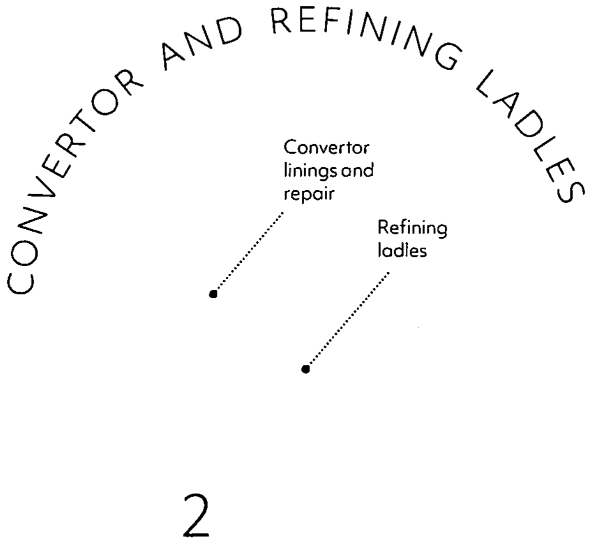
Blast furnace
1

Convertor and refining ladles
2

Continuous caster
3

Steel slab, billet or bloom
4





Steel Advanced Refractories

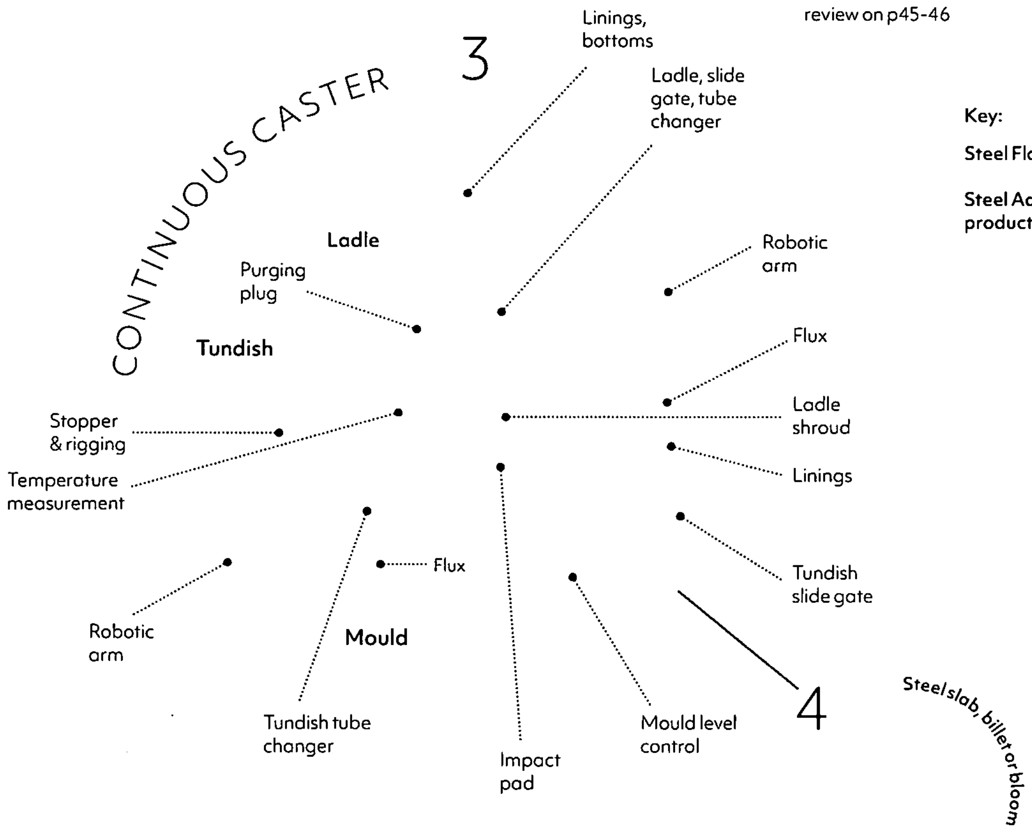
What we do
Vesuvius' Advanced Refractories business unit supplies specialist refractory materials for lining steel-making vessels such as blast furnaces, ladles and tundishes, which are subject to extreme temperatures, corrosion and abrasion. Along with these materials, we provide advanced installation technologies (including robots), computational fluid dynamics capabilities and laser systems for measuring refractory wear.

Our main customers are steel producers and manufacturers of steel production equipment, where our products accompany the steel-making process from its early steps all the way to the end of production in the rolling mill. Our array of heat-intensive production solutions accompany the physical transformation of iron ore and scrap into semi-finished products, and account for c.80% of the revenue of the business unit.

Our customers and the process
The service life of the products that Advanced Refractories supplies into the steel-making process can vary (some a matter of hours and others for a period of years) based upon the type of refractory and the level of wear caused by the demanding environment in which they are used.

Broader offer
In addition, Vesuvius' Advanced Refractories business unit supplies other high-temperature industries such as primary and secondary aluminium, copper, cement, petrochemicals and energy from waste.

See **Steel Advanced Refractories** Operating review on p45-46



Key:

Steel Flow Control products

Steel Advanced Refractories products

Divisional overview continued

Foundry Division

Revenue
£561.3m
2017: £535.2m

Return on sales
12.3%
2017: 12.2%

Trading profit
£68.9m
2017: £65.1m

Overview

We are a world leader in the supply of consumable products, technical advice and application support to the global foundry industry, improving casting quality and foundry efficiency. Our primary customers are ferrous and non-ferrous foundries serving various end-markets, from large bespoke castings to high-volume automotive pieces. We operate in the foundry sector under the FOSECO brand.

Foundry

What we do

The foundry process is highly sequential and is critically dependent on consistency of product quality and productivity optimisation. Working alongside customers at their sites, our engineers provide on-site technical expertise in addition to advanced computational fluid dynamics capabilities to develop the best customised production solutions.

Our products

The conditioning of molten metal, the nature of the mould used and, especially, the design of the way metal flows into the mould are key parameters in a foundry, determining both the quality of the finished castings and the labour, energy and metal usage efficiency of the foundry. Vesuvius' products and associated services to foundries improve all of these parameters. Each of our products typically represents a small element of the overall cost of the foundry process but contributes significantly to product quality and yield.

In Foundry, customers are evolving towards more sophisticated and increasingly complex castings with increased requirements for cleaner and lighter metal, resulting in a greater need for Vesuvius' products.

Our customers

We are also focused on expanding the cross-selling opportunities between the Foundry and Advanced Refractories business units. Foundries utilise some of the refractory products manufactured by Advanced Refractories, which allows us to offer a complete product offering to our customers.

See **Foundry** Operating review on p48-49

Induction furnace

1

Mould production and pouring

Final casting

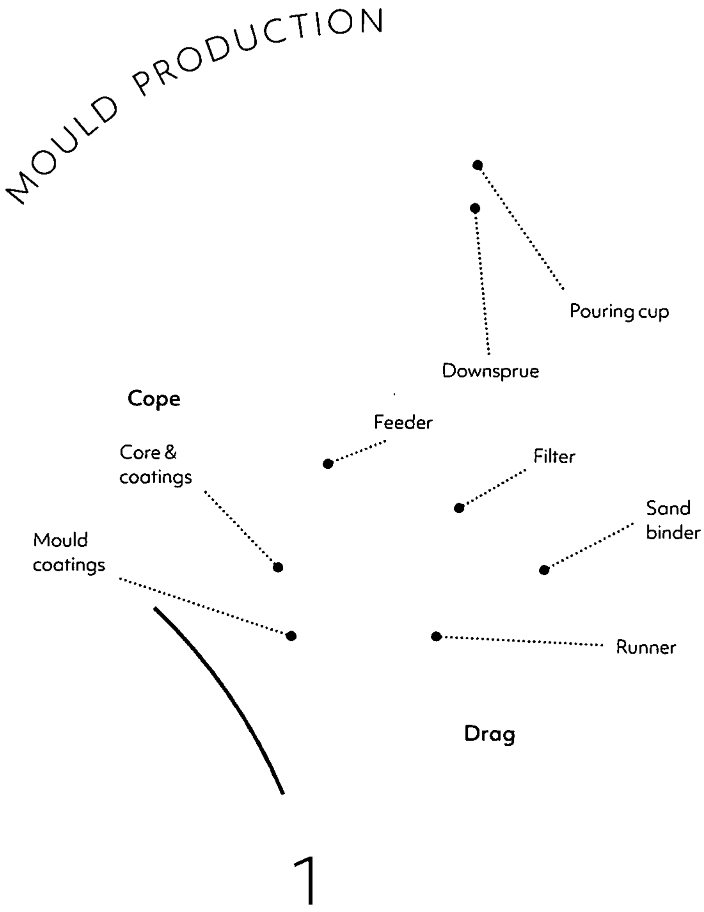
3

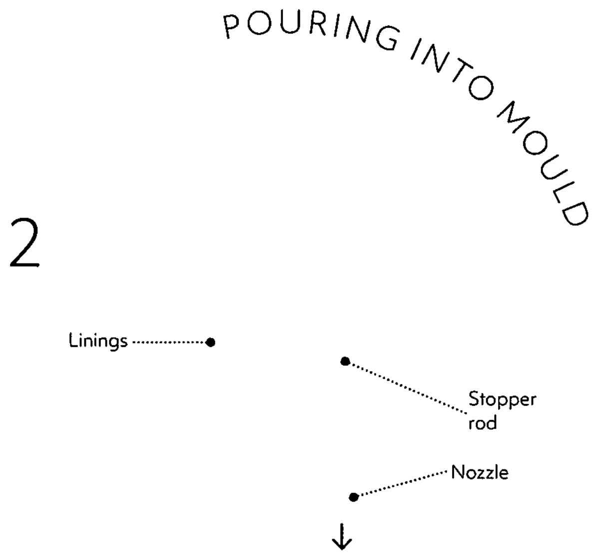
2

Treatment/ pouring ladle

CAST ITEM (before fettling)

3


MOULD PRODUCTION
Pouring cup
Downsprue
Cope
Feeder
Core & coatings
Filter
Sand binder
Mould coatings
Runner
Drag
1


POURING INTO MOULD
2
Linings
Stopper rod
Nozzle

Our external environment

The world is changing, and we are responding

Sustainability improvements

Environmental pollution and emissions (e.g. CO_2) continue to be a major challenge across industries and in particular along the steel and foundry value chain

Technical upgrade of steel and foundry

Steel and foundry producers globally, are upgrading their production capabilities to deliver better quality, higher technology steel and castings

Automation – delivering safety and efficiency

Safety across their operations is of utmost concern to our customers

What's happening

Steel and foundry production are highly energy intensive processes, with steel manufacture alone accounting for a significant amount of global direct CO_2 emissions. These industries are facing increased scrutiny about their sustainability footprint.

Steel plays an integral part in the modern world, and will remain crucial for many end products. Whilst it is infinitely recyclable, solutions that improve the environmental footprint of its manufacture are needed to ensure that the impact of its production is reduced, and makes the best use of available resources.

7-9%

of global direct CO_2 emissions are created by the steel industry (as estimated by the World Steel Association)

How we are responding

> Vesuvius' products and services improve the sustainability footprint of our customers' production processes. Vesuvius' consumables enable our customers to increase their throughput while lowering energy consumption, increasing yields and improving the quality of their end products

> At the same time, Vesuvius continues to optimise its own operations, focusing on maximising the utilisation of raw materials and recycling

Case studies

Making ongoing robotic repairs saves energy

Laser technology and robotics are used to assess refractory wear and repair requirements throughout production, reducing energy and refractory consumption in the steel mill

Steel producers are increasingly focusing on higher quality steel grades where the consistency of the finished steel is fundamental. As a result there is above-market growth forecast for high technology steel in all regions.

Foundries are experiencing a similar development where metal quality is paramount and higher strength is demanded from thinner castings.

+9%

Our internal annual growth forecast for high technology steel in India

> Vesuvius is strongly positioned to facilitate this upgrade and benefit from its development. We have a wide product and service offering designed to support the production of high technology steel across our broad, global customer base

> In Foundry, Vesuvius' innovative portfolio of products and services and global footprint, enable us to provide high technology solutions to our worldwide customers

Improving quality with our new products

Our new technology solution– ladle shrouding for steel foundries – lowers oxidation and inclusions in the end products, significantly improving the quality of the final castings and thus their performance

Companies face ever-increasing scrutiny to ensure that their operations and products are safe and that they are not causing harm to the environment.

New technologies, such as advancements in automation, help transform production, bringing greater flexibility and lower costs, whilst also delivering the potential to significantly improve safety performance in a plant.

Robotics help support or even substitute operators in hazardous production areas, thus lowering the safety risk and ensuring consistency of the process.

42%

of total task hours are expected to be performed by machines by 2022 (as estimated by the World Economic Forum)

> Vesuvius has the global capability to combine know-how in steel mills and foundries with robotic capabilities: a winning combination for superior safety performance

> Vesuvius' in-depth understanding of production processes enables us to provide robotics and laser technology that work reliably and consistently in hazardous areas of production, reducing operator exposure to risk

Leaving the most dangerous work to robots

Vesuvius installed fully automated robots for a large steel customer in South America to execute safety-critical activities, removing operators from a *hazardous production* area

See **Strategy section** on p16-17

Our markets

Steel

Flow Control

Crude steel production and the above average market growth of 'high technology steel' are drivers of Flow Control business unit product demand

Advanced Refractories

Crude steel production and level of activity in other high-temperature industries, such as aluminium, copper, cement, petrochemical and energy from waste, are the drivers for the Advanced Refractories business unit product demand

Above average market growth for 'high technology steel'

'High technology steel' is our internal marketing segmentation that describes steel which is either high performing (e.g. high strength steel for wind turbines) and/or where the production process to produce the steel is complex (e.g. the near net shape production process, which is a continuous casting process that produces steel in very thin slabs i.e. near to its final thickness).

Complex production processes and the need for higher quality steel grades where the consistency of the finished steel is paramount, are gaining momentum worldwide because they provide steel producers with differentiated products and significant benefits in terms of cost savings and a reduced environmental footprint.

Advanced steel cans are produced from "high technology steel" because of the need to achieve a challenging combination of thin gauge and high rigidity/strength

Vesuvius' internal segmentation of global crude steel production

World crude steel production 2018: 1,808.6mt (World Steel Association)

Flow Control business unit end-markets

Key

'High technology steel'
Selected examples:
- Near Net Shape production process
- Stainless steel
- Engineering steel (bearing, shafts, tools etc.)
- Automotive

'Medium technology steel'
Selected examples:
- Construction sheets (roofing, cladding etc.)
- Heavy plates for ship building, pipe

'Commodity steel'
Selected example:
- Basic rebar for concrete reinforcement

Foundry

Higher sophistication and increasingly complex castings are the drivers for Foundry Division product demand

Above average market growth for highly sophisticated and complex castings

The Foundry Division benefits from its capabilities to improve highly sophisticated and complex castings, which are the segments of the foundry market growing the fastest. Foundry customers are evolving towards these more sophisticated and increasingly complex castings because of increased requirements for cleaner metal to deliver complex shapes with thinner sections, resulting in a greater need for Vesuvius' foundry expertise.

Whilst Foundry Division products typically represent less than 5% of a foundry's production costs, they contribute significantly to the improvement of product quality and manufacturing efficiency, whilst reducing the environmental impact of the casting process and improving the ratio of finished castings to the amount of metal poured which is a key parameter for foundry efficiency.

Foundry market end-markets

The most important end-markets for the foundry industry are general engineering, followed by light vehicles (including passenger cars and light commercial vehicles), medium and heavy commercial vehicles, construction agriculture and mining equipment, power generation equipment and railroad.

Crude steel production is a structurally growing market

According to the World Steel Association, global crude steel production in 2018 increased by 4.6% compared with 2017. Production in the majority of major steel-producing countries was up year-on-year.

In the past 20 years the growth in crude steel production came mostly from China. We do not forecast China to continue to grow at the same rate as it has done historically. In our internal projections we forecast China to grow at a rate of 0.5% per annum.

We believe that the majority of the growth in crude steel production going forward will come from India and other emerging markets, mostly Middle East, Africa, South East Asia and Latin America.

Globally we expect crude steel production to grow at a rate of 1.3% per annum and the world excluding China at a rate of 2.0%.

World crude steel production (mt)

(bnt)

CAGR '18–'30

+2.9%	+5.6%	+0.5%	+0.2%
Other emerging markets[1]	India	China	Developed markets[2]

Sources: Historical data from World Steel Association. Forecasts are management estimates.

Notes:

1. Eastern Europe, Middle East (incl. Turkey), Africa, Latin America and South East Asia.
2. EU28, USA, Canada and North Asia.

Growth in crude steel production (2018 vs. 2017) vs. 2018 steel production volume (Vesuvius key regions)

Technology changes and environmental drivers

New technologies, such as 3D printing, are expected to continue to influence the metal casting industry, allowing for faster prototyping and production of smaller volume parts. Environmental regulations, driven by the desire to reduce volatile organic compound emissions and the use of silica within the industry, are also expected to continue to tighten. This will drive the trend to find processes and consumable products which support production efficiency and reduce a foundry's impact on the environment.

Iron casting

Iron casting is split between grey and ductile iron with grey iron representing the majority of metal being cast. This is a cost-efficient and robust process producing components that do not need to tolerate extreme mechanical stress. All iron castings require filters and coatings but grey iron is not as reliant on feeding system utilisation due to its lower shrinkage on solidification. Conversely, ductile iron production requires more sophisticated consumable products to cope with the high shrinkages of metal whilst solidifying.

Steel casting

Steel is used in casting for manufacturing components with very high mechanical performance. Steel casting is the most demanding casting process due to higher melting temperatures and greater tendency for shrinkage. This drives greater demand for products and technical expertise in this segment.

Aluminium/Non-ferrous casting

Aluminium casting is the segment of the foundry market growing the fastest. It has captured a significant share of the light vehicle market. Being molten below 700°C, aluminium can be cast in iron moulds which can then be reused. Vesuvius concentrates on supplying fluxes, filters and machines that refine the composition and cleanliness of the metal.

Business model

A profitable, flexible, cash-generative model focused on sustainable growth

What we do

We develop and manufacture high-technology products and solutions predominantly for supply to the steel and foundry casting industries, operating a profitable, flexible, cash-generative and growth-building business model. Over many years we have built the brand equity of our Vesuvius and FOSECO products through technology leadership, reliability and service.

Our key resources

Financial capital

We use the cash generated by our business to invest in innovation, people, operating assets, technology and sales to generate further growth.

Manufacturing capital

We have a global footprint, with 59 production sites on six continents, giving us proximity to our customers.

Intellectual capital

We have seven R&D centres of excellence and over 300 R&D staff worldwide, generating innovative products and solutions for our customers.

Human capital

We invest in developing our skilled and motivated workforce of approximately 11,000 people and provide them with a safe environment in which to work.

Social capital

We champion our values and our ethical conduct. We maintain strong relationships with customers and our wider stakeholder groups.

Natural capital

We utilise high-quality raw materials, secured through reliable and well-developed supply chains.

7
R&D centres of excellence

10,809
employees

59
production sites

300
R&D staff

Our sustainable competitive advantages

Global presence

Using our global expertise to identify and create market opportunities

Vesuvius is present on six continents, supporting the development of global steel and foundry manufacturing processes with new technologies. We have manufacturing capability in all the main steel and foundry markets and hire and train local engineers. Our local manufacturing, local expertise and global knowledge of customers' processes give us a special relationship with our customers.

See more about **Our global presence** on p4-5

Optimised manufacturing

Low-cost lean manufacturing provides reliable 'just-in-time' products

Our successfully tested products can be produced at high volumes across all of our manufacturing footprint, guaranteeing cost-competitive and time-efficient delivery. We optimise our cost-competitiveness by investing in low-cost production sites and increasing production automation – and have established manufacturing facilities to support our expansion in emerging markets.

See more about **Our operations** on p42-49

How we deliver

- Our industry experts are embedded at many customer locations and are therefore ideally placed to collaborate with customers to identify their needs, and potential service and process improvements. This also enables us to grow our solutions and service portfolio.
- We develop high technology products that deliver quality enhancement, efficiency gains and energy savings to our customers. We focus on sustainability in our own business through the efficient use of energy and natural resources.
- Our model is profitable by allowing value pricing for bespoke products and services. It generates growth as we enlarge our market with additional innovative products and solutions.
- Our model is resilient to end-market volatility due to the flexibility of our diversified manufacturing footprint and adjustable cost base.
- Our commitment to ethical business delivers strong, long-term, sustainable commercial relationships.

The value we create

Our Investors

Our efficient use of capital generates annual profits, giving returns to our shareholders and underpinning sustainable growth.

Our Customers

Our investment in innovation creates cutting-edge products and solutions, delivering enhanced value for our customers and differentiating us from our competitors. We embed technical experts within our customers, giving us a fundamental understanding of their needs and delivering them access to our global network of highly skilled individuals.

Our People

We focus on the health and safety of all our staff. We engage with our people, encouraging and rewarding high performance to create an environment where all can realise their individual potential.

Our Suppliers

Maintaining cost-effective access to high-quality raw materials is vital to our success. Our suppliers are critical to our business.

Our Communities

We are committed to maintaining positive relationships with the communities in which we operate. Our social responsibility activities complement our values and we encourage our employees to engage with communities and groups local to our operations.

Students and Graduates

Attracting new talent to Vesuvius is vital for the Group's continuing success. Recruiting new students and graduates feeds the talent pipeline and allows us to tap in to new sources of up-to-date business ideas and R&D capability.

Advanced technology

Our technology centres develop value-adding solutions involving engineered systems and high-value consumables

Our continuing investment in Vesuvius' R&D centres of excellence is reflected in all areas of our offering. We have knowledge of the most advanced ceramic and metallurgical techniques using state-of-the-art equipment and the most advanced technologies of flow simulation and finite element analysis. We are therefore able to provide our customers with sophisticated, innovative, custom-designed solutions.

Read more about **Innovation** on p24-27

Service and consistency

Serving our customers reliably, competitively and consistently with consumables critical for their manufacturing processes

Alongside our global presence, we ensure a local service to our customers, from inventory management to high-quality technical support at their sites and the ability to swiftly modify production and supply to reflect changes in customer requirements. Our knowledge of end-market processes, specifications and techniques around the world gives our experts an unparalleled ability to support our customers.

Read more about **quality and reliability** on p42-49

Our strategy

Strategic Objectives

We are dedicated to accelerating the delivery of our Strategic Objectives. In particular, speeding up growth by focusing our efforts on the high-quality, high-end segments of the Steel and Foundry markets; increasing our efforts to optimise our manufacturing base; and driving this change with a team of skilful, motivated and talented people.

Deliver growth

Generate sustainable profitability and create shareholder value

Maintain strong cash generation and an efficient capital structure

Provide a safe working environment for our people

Be at the forefront of innovation

Run top-quality, cost-efficient and sustainable operations

Foster talent, skill and motivation in our people

Vesuvius measures and monitors its performance against these Strategic Objectives through its Key Performance Indicators (KPIs)

See our **Key performance indicators** on p18-19

Execution priorities

Reinforce our technology leadership

See **Innovation** p24-27

Increase penetration of value-creating solutions

See our **Operating reviews** p42-49

Capture growth in developing markets

See our **Operating reviews** p42-49

Improve cost leadership and margins

See our **Operating reviews** p42-49

Develop our Technical Service offering

See **Innovation** p24-27

Vesuvius has articulated five key execution priorities. These enable us to achieve our core strategic objectives of delivering long-term sustainable profitability and creating shareholder value.

Description	Progress in 2018
Vesuvius was built and grew on technology breakthroughs. These enabled the steel continuous casting and foundry industries to improve their efficiency and quality substantially. Focusing on technology leadership continues to drive our unique value proposition and underpins our ability to deliver ongoing value enhancement to our customers.	In line with our focus on a non-matrix, decentralised organisation, we integrated R&D into the business units to ensure the closest possible link between R&D and our operations. In 2018, the percentage of revenue accounted for by 'New Products', being products launched within the last five years, grew to 15.4% (from 14.5% in 2017). Our objective is for this to reach 20%. We continued the process of focusing our global efforts in R&D on centres of excellence in the US, Europe, India and China. We also increased our focus on combining developments in robotics, automation and data analytics capabilities with our well-established material science research. Our spend on R&D increased year-on-year to £33.6m in 2018, being c.2% of our total revenue. We continued to increase our R&D efficiency by focusing our efforts on a reduced number of potentially high-impact R&D projects.
Our technology has been widely adopted by the most sophisticated producers in the most developed markets. However, marked differences remain in the penetration of our solutions within the industry. Consequently, there is a wider audience of customers whom we believe can benefit from them. As steel and foundry markets in developing markets become more quality focused, we have the opportunity to significantly increase our penetration of these markets through offering our value-creating solutions.	In 2018, we outperformed underlying growth in the majority of end-markets. We achieved market share gains in Flow Control and Foundry through customer proximity and the combination of our products with robotics and automation at our customers' plants. For Flow Control, this outperformance is reflected in our underlying 2018 revenue growth of 11.5% versus 4.6% growth in global steel production volumes. For our Foundry Division, underlying 2018 revenue growth of 8.2% is further evidence of this outperformance.
Building on our long-standing presence in all markets, we can leverage the high growth enjoyed by our customers' industries in emerging markets which are large consumers of steel goods and foundry castings.	In 2018, we continued to deliver attractive top line growth in both our Steel and Foundry Divisions, outperforming crude steel production increases and underlying foundry end-markets in our key developing markets of China, India, Latin America, EEMEA (Eastern Europe, Middle East (including Turkey) and Africa) and South East Asia. Steel Division revenue in these markets grew by 17.6% in 2018 versus steel production growth of 5.7% and Foundry Division revenue grew by 10.8% in these key developing markets.
We continue to pursue our restructuring programmes throughout the Group to adapt our business and our cost base to the changing trading environment. This is central to our efforts to improve profitability. Furthermore, we have embedded the principles of lean manufacturing across all our sites, continuously focusing on quality and productivity to enable us to maintain our margins. Our global presence allows us to benefit from economies of scale and deliver excellent service from local sites.	We remain on track with the implementation of our restructuring programmes and delivered an incremental £14.0m recurring cash saving during the year, in part related to the three European plant closures announced in July 2018. This was ahead of our expectations. Our original restructuring programme launched in 2015 is almost complete, with £8.4m savings still to be delivered by 2020. Our new restructuring programme launched in March 2018 is well underway, and we expect to deliver cash savings of £22.0m for a one-off cash charge of £19.3m and £15.0m of capital expenditure to support the implementation of the programme. £17.3m of cash charge and £2.1m of capital expenditure had been accounted for at the end of 2018. We have £16.4m savings left which will be delivered by 2021. In 2019 we are targeting the delivery of a further £14.0m of recurring cash savings, leaving £8.5m to be delivered in 2020 and £2.3m in 2021.
Our customers' processes require increasing levels of engineering services to reach the demanding levels of safety, accuracy and consistency required by their end-customers' quality specifications. The key elements of Vesuvius' Technical Services strategy are, firstly, the Digital Services business unit, which is focused on incubating our data capture technologies, and secondly, the business units which play a critical role in integrating these products into our broader consumables offering as well as ensuring customer access. In this way, our Technical Services strategy is progressively penetrating all activities of both our Steel and Foundry Divisions.	We continued to see good progress in our global Technical Services offering during 2018. The partial integration of our technical service capabilities into the business units in 2018 is yielding strong results and the global revenue from our Technical Services offering reached £96.5m in 2018, up 16.1% from 2017 on a constant currency basis. The performance of our Digital Services business unit was also strong, with underlying revenue growth of 10.8%, reflecting accelerated product penetration and a focus on optimising the structure of this business.

Key performance indicators

We have performed well against our strategic metrics

The Board and management regularly monitor both financial and non-financial performance indicators to measure performance against objectives. The Board reviews these KPIs as part of its governance and risk management processes.

Strategic Alignment	KPI	Purpose
Deliver growth	**Underlying revenue growth**	Provides an important indicator of organic (like-for-like) growth of Group businesses between reporting periods. This measure eliminates the impact of exchange rates, acquisitions, disposals and significant business closures
Generate sustainable profitability and create shareholder value	**Trading profit and return on sales**	Used to assess the trading performance of Group businesses
	Headline profit before tax	Used to assess the financial performance of the Group as a whole
	Headline earnings per share	Used to assess the underlying earnings performance of the Group as a whole
	Return on net assets	Used to assess the financial performance and asset management of the Group
Maintain strong cash generation and an efficient capital structure	**Free cash flow** **Average working capital to sales ratio**	Used to assess the underlying cash generation of the Group. One of the factors driving the generation of free cash flow is the average working capital to sales ratio, which indicates the level of working capital used in the business
	Interest cover ratio **Ratio of net debt to EBITDA**	Both ratios are used to assess the financial position of the Group and its ability to fund future growth

Non-financial KPIs

Strategic Alignment	KPI	Performance
Provide a safe working environment for our people	**Lost time injury frequency rate**	
Be at the forefront of innovation	**R&D spend**	

Read more about Innovation on p24-27

Performance

Link to remuneration

Delivery of value to shareholders is linked to remuneration through the Vesuvius Share Plan ('VSP'), which measures the vesting of awards against total shareholder return

VSP – Read more about this on p111-113

EPS is linked to remuneration as a measure used in the Annual Incentive Plan ('AIP') and the VSP

AIP and VSP – Read more about them in the **Directors' Remuneration Report** on p105-115

In 2018, working capital performance was linked to remuneration through the use of the Group's working capital to sales ratio as one of the measures used in the AIP

AIP – Read more about this on p109-110

Read more about **Safety** on p56-61

Strategic Alignment	KPI	Performance
Run top-quality, cost-efficient and sustainable operations	**Total energy consumption**	

Read more about **Sustainability** on p62-65

* Work-related illness or injuries which resulted in an employee being absent for at least one day – measured per million hours worked.

** At constant 2018 currency.

*** Sales of products launched within the last five years as a % of total revenue.

Chairman's statement

In 2018 we delivered record results for the Group

We continue to focus on succession planning, recognising the importance of nurturing talent and bringing highly capable people through the business.

John McDonough CBE
Chairman

See our **Financial review** on p36-40

See more about our Governance in the **Governance section** on p72-126

See more about our Values in **Our principles section** on p53-55

Performance

In 2018, our reported revenue increased 6.8% to £1,798.0m and margins improved to 11.0%, delivering reported trading profit of £197.2m. These are record results for the Group as we continued our outperformance of underlying markets.

Our restructuring programmes continue to be successful, delivering £14.0m of incremental recurring cost savings during the year.

Strategy

Following a full strategic review in 2018, we remain confident that our strategy continues to deliver sustainable shareholder value. Now that Patrick André is fully embedded as Chief Executive we were thrilled to welcome investors and analysts to our Capital Markets Day in November to discuss our strategy and showcase progress towards our target of a 12.5% Return on Sales by 2020.

The Board remains very vigilant of the potential risks to the Group–including Brexit, and wider geopolitical and economic conditions – and we continue to monitor, assess and mitigate these risks closely to protect shareholder value.

Vesuvius remains an intrinsically cash-generative business and we continue to focus on investment in our R&D capability and organic investment in innovation to drive customer demand.

Our dividend policy aims to deliver long-term dividend growth, provided this is supported by cash flow and underlying earnings, and is justified in the context of our capital expenditure requirements and the prevailing market outlook. The Board has recommended a final dividend of 13.8 pence per share (2017: 12.5 pence per share). If approved at the Annual General Meeting, this final dividend will be paid on 24 May 2019 to shareholders on the register as at 23 April 2019.

Board and governance

The Board places great importance on the constant development of its understanding of the Vesuvius business by visiting key operations and meeting as many of our people as possible. In 2018, the Board visited sites in India and Poland, reviewing our operations there and meeting our people. We will continue to visit other sites in 2019, increasing our knowledge and remaining well connected with our teams around the world.

The 2018 independent Board evaluation confirmed that the Board continues to function effectively. It remains well balanced and diverse, with a strong mix of relevant skills and experience.

Following the Financial Reporting Council's launch of the new Corporate Governance Code in July 2018, the Board is reviewing the Group's governance activities to ensure that we will continue to remain fully Code compliant in 2019.

People and culture

We continue to focus on succession planning, recognising the importance of nurturing talent and bringing highly capable people through the business. The Board also fully supported the management team's roll-out of our new company values – Courage, Ownership, Respect and Energy – which will underpin organisational culture and the continued success of our strategy.

I remain impressed by how our leadership teams and people go the 'extra mile' to exceed our own and our customers' expectations, and on behalf of the Board, I thank them all.

Annual General Meeting

The Annual General Meeting will be held on 15 May 2019. The Notice of Meeting and explanatory notes containing details of the resolutions to be put to the meeting accompany this Annual Report and are available on our website (www.vesuvius.com). I and all my Board colleagues plan to attend the AGM and we look forward to the opportunity to meet with as many shareholders as possible on the day.

John McDonough CBE
Chairman
27 February 2019

NO JOB IS SO URGENT, NO TASK SO IMPORTANT, THAT WE DON'T TAKE THE TIME TO DO OUR JOBS SAFELY.

Clara Williams,
Maintenance Supervisor,
Chicago Heights, USA

Chief Executive's strategic review

We continue to implement our strategy to grow our top line and optimise our costs

In 2018, we achieved our best results since becoming an independent company in 2012.

Patrick André
Chief Executive

Strong operational and financial performance in 2018

In 2018, we achieved our best performance since becoming an independent company in 2012.

In a globally favourable market environment for both our steel and foundry markets, our Flow Control, Digital Services and Foundry business units registered strong commercial performances and continued to outperform the general market growth in terms of volume. In parallel, the pricing of our products was successfully adjusted to compensate for the sharp increase in raw material prices which had negatively impacted our performance in 2017.

On the operational side, the production bottlenecks in our Flow Control European manufacturing network, which had also negatively impacted our 2017 performance, were completely eliminated, resulting in a strong improvement in our global manufacturing efficiency.

In 2018 we launched a new restructuring programme, aiming to deliver £22.0m recurring cash savings per year by 2021, in addition to the £16.8m recurring cash savings per year which remained to be delivered under our previous programme at the start of 2018. We remain fully on track in the implementation of these programmes and delivered an incremental £14.0m recurring cash saving during the year, which exceeded our expectations.

We continue to study further opportunities for restructuring. These restructuring programmes, due to their financial attractiveness, will remain our first priority in terms of capital allocation.

Thanks to this strong commercial and operational performance, our global sales in 2018 reached £1,798.0m, an increase of 6.8% over 2017 on a reported basis. On an underlying basis, our revenue was up 10.7% as compared with 2017.

Our trading profit in 2018 reached £197.2m, an increase of 19.1% as compared with 2017 on a reported basis and 24.1% on an underlying basis.

Our return on sales improved to 11.0% in 2018 as compared with 9.8% in 2017.

Good cash generation and solid financial position

Despite the important growth in our turnover and increased capital investment of £41.2m in 2018 versus £39.0m in 2017, we maintained a cash conversion ratio of 91% in 2018. This was made possible thanks to our continued focus on working capital management, with our working capital to sales ratio decreasing to 23.9% in 2018 versus 24.9% in 2017 and 26.6% in 2016. We are however still not satisfied with this level of performance and intend to focus on continued progression in 2019.

Our cash flow generation enabled us to reduce net debt to £248.0m at 31 December 2018 versus £274.3m at 31 December 2017. Our net debt to EBITDA ratio decreased to 1.0x at the end of 2018.

See our **Financial review** on p36-40

See **Our strategy** on p16 and 17

See more our **Health and safety section** on p56-61

Acceleration of the delivery of our profitable growth strategy

We conducted a global strategic review of our activities in 2018.

This strategic review led to the confirmation of our 5 key execution priorities:

> Reinforce our technology leadership

> Increase the penetration of our value-creating solutions

> Capture the growth in developing markets

> Improve our cost leadership and margins

> Develop our Technical Service offering

The review however also highlighted the possibility of accelerating the delivery of our strategic objective by:

> Reinforcing our presence in the high-end, high-quality segments of the steel and foundry markets, which are growing faster than the average markets and where our Flow Control and Foundry solutions can play a decisive role in supporting our customers' efforts to improve the quality and performance of their finished products. Our R&D and commercial organisations are being reinforced and focused to support this.

> Accelerating and intensifying our efforts to optimise our manufacturing cost base. Beyond the already announced restructuring programmes, several other potential optimisation opportunities are currently being studied, with the results of these studies expected in the course of 2019.

> Adopting an entrepreneurial, decentralised, non-matrix organisation, to increase the speed of execution and the level of energy across the Group. This new organisation is now fully operational and supported by the introduction of our new Group CORE values of Courage, Ownership, Respect and Energy, and by the promotion of a new generation of talented managers to several key positions.

Thanks to these measures taken to accelerate the delivery of our strategy, we have set ourselves the target to reach a sustainable Return on Sales level of 12.5% by 2020.

Improved safety performance in 2018

Our safety performance improved markedly in 2018 with a lost time injury frequency rate of 1.3 versus 1.6 in 2017 and 1.7 in 2016. This is the best result we have ever achieved and highlights the Group's efforts to evolve rapidly towards a global best-in-class organisation in terms of safety. However, we also suffered the fatality of one of our contractors at a site in South America. For this reason, and because the only acceptable objective is zero accidents, we remain unsatisfied with our safety performance and will strive to continue making progress in 2019 and beyond.

Sustainability

As a Group we already have a low environmental footprint, due to the low energy intensity of our manufacturing and our strategy of not being integrated upstream in mining. We do however continuously strive to operate even more sustainably, and in 2018 we continued our efforts to reduce waste generation and energy consumption in our manufacturing processes. In parallel , we maintained our focus on developing new solutions to enable our steel and foundry customers to reduce their own energy consumption and carbon footprint.

Outlook

Despite a moderate slowdown in growth since the fourth quarter of 2018, we still expect our main Steel and Foundry markets to register a positive growth rate in 2019, albeit at a lower level as compared with the growth rates recorded in 2017 and 2018. In this environment, we plan to continue growing our revenue and accelerate and intensify efforts to optimise our costs, to support our drive towards further profitable growth. For these reasons, the Board is confident that, in comparison to 2018, further progress will be made in 2019.

Patrick André
Chief Executive

27 February 2019

Innovation

We build an environment across the organisation in which creativity is encouraged and can flourish

Artificial intelligence, mechatronics, automation and digitalisation all now play an important role in our research activities, production processes and the products and services we provide to our customers.

£33.6m
Total R&D spend*
2017: £32.6m

* At constant 2018 currency.

1.9%
% of Revenue
2017: 2.0%

15.4%
% of new product sales[1]
2017: 14.5%

1. Sales of products launched within the last 5 years as a % of total revenue.

Alan Charnock
Chief Technology Officer

Innovation culture and change

Without refractory materials most of the technological inventions and developments we know today would not have been possible. Virtually everything we use in everyday life, is in some way dependent on the existence of refractories, which are an essential part of the successful operation of any industrial process in which high temperatures are used. The extensive application of refractory today, across so many different industrial processes, has and continues to be a story of continuous innovation.

To meet the challenges of today and the opportunities of tomorrow, Vesuvius has integrated many new technologies into our Innovation portfolio: Artificial Intelligence, Mechatronics, Automation and Digitalisation. These all now play an important role in our research activities, production processes and the products and services we provide to our customers. Our leading robotics technologies help improve safety, reliability and consistency in the application of our refractory and sensors technologies at our customer sites, generating refractory and process data which, combined with predictive algorithms, allows for the optimisation of our refractory performance and real time enhanced control of our customers' processes to maximise the yield and quality of their end products. Artificial Intelligence is also now used to accelerate our research and material development process.

To maintain creativity and more importantly to turn creativity into innovation through the successful commercialisation of new ideas, we strive to build an environment across the organisation in which creativity is encouraged and can flourish. This implies that individuals as well as the organisation itself needs to be continuously challenged, re-energised, recognised, rewarded and provided with the best tools to achieve its maximum potential.

The Group's focus on adopting a new entrepreneurial, decentralised, non-matrix organisation, detailed elsewhere in the report, also had implications for the R&D organisation in 2018. Likewise, the formulation of a new strategic plan for each business unit, required a complete review of our Innovation roadmaps. This process dovetailed with the end of the 5-year R&D plan, with most of the existing initiatives completed or in advanced stages of implementation. Whilst much of what we have developed and implemented in the last few years has been maintained and reinforced in the new innovation roadmaps, we have also made the adjustments necessary to reflect new aspects of each business unit's strategic plan.

Training remains a critical element, ensuring that the innovation pillar of the Vesuvius group strategy – reinforcing our technology leadership – remains solid and that the career development of our staff is supported to ensure that we can deliver the necessary progress. As we continue with our Excellence programme in innovation we also identify new areas where training is required, both for newly hired and existing staff to allow progress on this excellence journey.

VESUVIUS IS BRINGING THE NEXT GENERATION OF PRODUCTS TO OUR CUSTOMERS.

We're doing this by focusing R&D activities on Centres of Excellence.

Devdutt Shukla
Global R&D Director, Advanced Refractories
Barlborough, UK

Vesuvius' Advanced Refractories business unit assists our customers with advancements in vessel performance management

- **Ergonomics and safety**
  Customised installations of Vesuvius Portable Smart Robotic Systems help our customers to provide a safe, ergonomic working environment for their maintenance operators
- **Consistent application & predictable material consumption**
  Custom pre-programmed installation parameters virtually eliminate operator induced variability in the tundish refurbishment process
- **Vesuvius' commitment to service**
  Our team of automation experts conduct training, modifications and preventive maintenance for customers using remote access features
- **Laser guided maintenance**
  Complementing the consistent, automated installation method with Vesuvius Process Metrix Lasers allows for targeted surface refurbishment to extend the service life of vessels

Innovation continued

Structure, collaboration and resources

At the beginning of 2018, we elected to redistribute and embed the Group R&D organisation directly within each business unit, maintaining cross-fertilisation and technical exchange between the business unit R&D groups using 'TechConnect', our communication and collaboration tool developed over the last few years. We also expanded our Technology Bridge concept, where teams of experts across all business units collaborate on our core technologies. This approach now also covers Front-End Innovation – where technologies, materials and applications that are completely new to the refractory world, are shared between technologists from across the entire organisation. This collaboration stimulates ideas for the application of these technologies in as many areas of our business as possible. Being new to the refractory world, Front-End Innovations are naturally breakthrough technologies and usually market disruptive in nature. Thus, they involve significantly more risk and longer-term research effort. The more ideas for their application that we can generate in advance, the easier it is to justify the investment risk involved in this type of research.

We also launched 'Ideation Challenges' in 2018, designed to increase networking and creativity using our TechConnect collaborative platform. This promotes a collaborative brainstorming process where technical challenges are posted on the platform and members of the technology community are invited to contribute their ideas to accelerate the resolution of the challenge.

2018 also saw our first Technology and Innovation Meeting (TIME) where we brought together a large portion of the global Vesuvius R&D community for extensive technology exchange, targeted brainstorming exercises on specific topics and networking. TIME was a great success and will become a regular feature on the R&D calendar as we foster a professional, collaborative and interactive global R&D community.

In addition to embedding Group R&D into the business units, we have also made some significant changes to the business units' R&D structures aimed at further globalisation of our R&D.

In Advanced Refractories we closed the Bettsville Facility in Ohio and moved the staff and analytical facilities to Pittsburgh which now houses teams from all three of the business units. Advanced Refractories R&D is now focused on three sites: Pittsburgh, USA, Barlborough, UK and Visakhapatnam, India. The research groups in each of these facilities are the Global Centres of Excellence (CoE) for a specific area of our technology: Pittsburgh focusing on basic monolithic; Barlborough on bricks and tap hole clay; and Visakhapatnam on alumina silicate monolithic. Each facility also continues to house a development group responsible for regional support across all Advanced Refractories technologies.

Flow Control is expanding the capabilities of our research centre in Suzhou, China to increase support for the Viso product development, the largest product line in the Group. Also in Ghlin, Belgium where we have traditionally housed our systems research facility, we are investing in a new mechatronics and automation centre for both Flow Control and Advanced Refractories, consolidating the market-leading robotic technologies of both business units.

Vesuvius' Foundry business unit facilitates advances in the pouring of steel castings with a shrouded metal stream

During the casting process, oxide films form readily on the surfaces of the metal streams coming from a bottom-pour ladle. Through metal turbulence these films can become entrained in the metal, initiating defects in the casting and degrading its physical properties. For many years continuous casters of metals have been using a shrouding process to protect the metal streams during casting. Using technology developed by Vesuvius, foundries are now able to enhance their casting quality by using a similar shrouding concept. The Foseco Hollotex Shroud is a new product that creates a seal between the nozzle and the shroud, allowing the metal to flow from the ladle into the shroud. The liquid metal passes through the shroud and an integrated filter block, and then into the casting cavity. The liquid metal remains protected from exposure to air; eliminating the potential for air aspiration and the associated formation of oxide films.

The Czech foundry UNEX now applies this shrouding principal to a range of high-integrity and quality-demanding castings. Dramatic quality and productivity improvements have been achieved due to the elimination of oxide and bifilm formation within the casting process. In addition to the improved surface quality of the castings, there has also been a significant reduction of X-ray and ultrasonic detected defects experienced. Improved physical and mechanical properties are achieved, with notch toughness – that is the casting's ability to withstand an impact with a flaw present – increased by up to twofold.

Pouring a steel casting using the Hollotex Shroud

Vesuvius Steel Flow Control 'Ladle to Mould' Solution

A European steel plant producing high quality steel grades for use in automobiles and packaging, was striving to improve the quality, productivity and yield of its production. Working in partnership, with the customer, the Vesuvius Solutions Group conducted a full 'Ladle to Mould' evaluation and simulation of the various products and processes in use.

Measuring and recording the existing mould flow characteristics using our XMAT technology and thermal cameras to monitor the filling of the tundish, the Global Solutions Group then utilised their computational fluid dynamic modelling capabilities to propose changes to the combination of products and the casting process to improve the flow of molten metal from ladle to mould.

Validation tests were conducted in situ utilising the proposed new components to assess their performance, and Vesuvius' technology. The combination of new products was shown to considerably improve the steel quality level (both in terms of cleanliness and defect rate), achieving the standard for 'food packaging' steel required by the customer. The Vesuvius 'Ladle to Mould' solution has now been permanently implemented by the site.

'Ladle to Mould' configuration

Old process New process

Mould level plots

Foundry R&D continues to operate from three sites: the main site in Enschede, Netherlands, which acts as the Centre of Excellence for filters, feeding systems, binders, coatings, metal treatment and non-ferrous applications; Pittsburgh, USA, the Centre of Excellence for non-ferrous and foundry and crucible research; and Feignies, France, the Centre of Excellence for fused silica research.

All of these changes and the emphasis on fundamental research and front-end innovation require the ongoing recruitment of additional research staff. These increased internal resources combined with expanded funding for the external cooperation projects with our partners, mean that we will continue to increase our research spending to maintain total R&D spend at c.2% of turnover as our revenue grows. The increased investment is expected to maintain the growth of our NPS % KPI, towards our target of a sustainable 20% level. At the same time, we expect to increase R&D productivity by a further £2m of NPS revenue/year for each £1m of R&D spend, ensuring that this increased R&D investment delivers a higher level of return to the business.

We expect to continue with a stable level of IP filings. In 2018 we maintained our portfolio at 155 families, 1,530 granted patents and 590 applications pending.

Technology roadmap and KPIs

Our technology roadmap details both the requirements for the successful delivery of the existing project portfolio and the areas where fundamental research is required to make long-term new product developments possible and practical, therefore boosting NPS performance. NPS%, our key R&D KPI, has continued to steadily grow, with the NPS% reaching 15.4% in 2018 up from 14.5% in 2017. There was a reduction from the original targeted number of product launches in 2018 due to a deliberate shift of focus and resources onto a smaller number of important long-term new product developments, which are now entering industrialisation and are planned to launch in H1 2019. The launch of these major projects in 2019 will in turn release R&D resources to move onto new projects entering the pipeline.

Whilst we seek to avoid too many changes in project prioritisation, new ideas continue to arrive, with our New Product/Process Ideation portal delivering over 100 new ideas per year and we would absolutely expect some of these to take priority over those currently in the roadmap. It is this process that will ensure the continuation of refractories as an essential element in so many industrial processes.

Whilst NPS% remains our key innovation KPI, we track additional targets to ensure the Innovation strategic plan delivers as expected. In particular, we monitor the level of effort/resources specifically targeted for Breakthrough, key strategic and front-end innovation projects, and the results of these projects, which are those expected to deliver increased sales revenue at higher margins. Oversight of the R&D activity has been increased with bi-annual reviews by the full Group Executive Committee in addition to post-launch reviews of the new product introduction projects. This ensures adherence to the best project practices and allows the organisation to learn from past experiences.

Alan Charnock
Chief Technology Officer
27 February 2019

Risk, viability and going concern

The Board continually monitors the internal and external risks that could significantly impact the Group's long-term performance

There is a clear understanding at Board level of the individuals and groups in the business formally responsible for the management of specific risks and the mitigation in place to address them.

Risk management in 2018

The Board's oversight of principal risks involves a specific review of the processes by which the Group manages those risks. This establishes a clear understanding at Board level of the individuals and groups in the business formally responsible for the management of specific risks and the mitigation in place to address them. The Board also establishes the Group's risk appetite, considering the nature and extent of the principal risks that the Group should take.

The Board has overall responsibility for establishing and maintaining a system of risk management and internal control, and for reviewing its effectiveness. The Group undertakes a continuous process of risk identification and review, which includes a formal process, conducted annually for mapping risks from the bottom-up, with each major business unit, and key operational, senior functional and senior management staff identifying their principal risks. This assessment undergoes a formal review at half year. The results are compiled centrally to deliver a coordinated picture of the key operational risks identified by the business. In conjunction with this, each Director contributes their individual views of top-down strategic risks facing the Group –drawing on the broad commercial and financial experience gained both inside and outside the Group. This review process extends to cover both financial and non-financial risks, and considers the risks associated with the impact of the Group's activities on employees, customers, suppliers, the environment, local communities and society more generally. As in previous years, in 2018 the Group's assessment of principal risks was also reviewed and considered against this group of emerging risks and uncertainties identified through our Board review process.

Changes to risk in 2018

The Board believes that there has been no material change to the Group's principal risks and uncertainties during the year.

However, the risk identified in our 2017 Annual Report as Quality, Health and Safety, was further analysed during the year and is now presented as two separate risks in the table of Principal risks and uncertainties – Product quality failure and Health, safety and environment – which each focus on separate issues with different mitigation. The assessment of both risks is that they were stable year-on-year. In addition, the Financial Uncertainty risk has been removed from the table of Principal risks and uncertainties. This does not indicate that the challenges of the global economic situation have receded – we still identify end-market risks,

Yaaresi Flores
Accounts Payable Analyst,
Monterrey, Mexico

protectionism and globalisation, and the changing regulatory environment as key areas for attention and mitigation. However, the Board does not consider that Vesuvius is exposed to the issues of currency, interest rates, inflation or capital availability in a way that is substantially differentiated from other multinational companies operating in our markets.

The Board continues to monitor the implications of certain emerging 'macro' trends such as automation in manufacturing, the increased focus on sustainability and increasing digitalisation, each of which could act as disruptors to industry. Some commentary on these areas is contained in the Our external environment section on pages 10 and 11 of this Report. This Report also sets out, on page 53, the work done in 2018 to reinvigorate the Values of the Group. These underpin our performance culture, reflecting the Board's understanding of the challenges that could arise from a failure by the Group to foster the correct culture for success.

In addition to these wider trends, the Board continued to focus on specific, identifiable risks where those arose during the year – the supply of quality raw materials and the potentially disruptive effects on global trade from increasing geopolitical tensions, which we note in the table of Principal risks and uncertainties. Whilst 2018 was a strong year for our underlying markets, the Board remains alive to the challenges that could come from a slowdown in trade.

Finally, the Board continued to monitor the developing issues posed by cyber threats, and received reports from the Group's multi-disciplinary committee appointed to assess the Group's controls in this area and respond to emerging cyber trends. As discussed above, the Directors' views on each of the above issues, and on emerging risks in general were independently gathered and integrated into the management discussions and actions taken on risk.

Risk remains an integrated part of all business unit presentations to the Board, informing the Board of the approach taken to risk management on a day to day basis.

Brexit

Whilst at the time of writing the terms and timing of the exit of the UK from the EU remain uncertain, Vesuvius has analysed the potential challenges posed by Brexit, including a 'no-deal' or 'hard' Brexit, and identified mitigation strategies to address those challenges.

For our customers located in the EU28 countries, most of our products are manufactured by Vesuvius outside the UK, so we would not envisage a material impact from Brexit. For those customers located in the UK or located in the EU28 and supplied from our UK plants, we have contingency plans and we are working with these customers to meet their needs in a cost-efficient way.

Risk mitigation

The risks identified are actively managed in order to mitigate exposure. Senior management 'owners' are identified for each principal risk to manage the mitigations of that specific risk and contribute to the analysis of its likelihood and materiality. This is reported to the Board. The risks are analysed in the context of our business structure which gives protection against a number of principal risks we face with diversified currencies, a widespread customer base, local production matching the diversity of our markets and intensive training of our employees. Additionally, we seek to mitigate risk through contractual measures. Where cost-effective, the risk is transferred to insurers.

Resilience

In partnership with our risk management advisers and our insurers, we seek to identify the most effective means of reducing or eliminating insurable risks, through a combination of risk management and the placing of insurance cover.

Our Insurer Property Loss Control Programme is based upon insurer loss modelling and focuses on insured losses. The insurer's loss control engineers

Viability Process

Identify	Assess	Model	Report
Viability time horizon and risk analysis framework	Principal risks and stress scenarios	Viability against risk scenarios, examining probabilities and impacts	See **Viability statement**

Risk, viability and going concern continued

undertake a series of on-site inspections focused on machinery breakdown, fire, natural catastrophe and other property damage and business interruption risks. These surveys yield a series of loss reduction recommendations. The execution of these recommendations is agreed with site management and then followed through to completion.

In parallel Vesuvius' own loss management programme focuses on strategic sites and sites not covered by insurers. Assisted by an independent consultant, we undertake property loss control and business continuity surveys using Vesuvius' bespoke risk and exposure-based protocol. These reports yield further risk reduction recommendations, and improvement actions and timescales are agreed and followed through by site management.

To support the Group's loss control activities, risk management workshops are conducted covering loss prevention, emergency planning, crisis management and business recovery.

With regard to fire safety, for example, the Group monitors all fire-related near misses or minor dangerous occurrences. Any fires including overheating, are reported and analysed locally and by senior HSE Management in order that safety improvement initiatives can be prioritised. Underlying causes are established with detailed analysis undertaken as a means of proposing improvement priorities in order that safety and process safety initiatives can be targeted on a risk-assessed basis.

Internal control

The Group's internal control system is designed to manage, rather than eliminate, the financial risks facing the Group and safeguard its assets. No system of internal control can provide absolute assurance against material misstatement or loss. The Group's system is designed to provide the Directors with reasonable assurance that problems are identified on a timely basis and are dealt with appropriately.

The Audit Committee assists the Board in reviewing the effectiveness of the Group's system of internal control, including financial, operational and compliance controls, and risk management systems. The key features of the Group's system of internal control are set out in the table below.

Key features of risk management and internal control

Strategy and financial reporting	> Comprehensive strategic planning and forecasting process > Annual budget approved by the Board > Monthly operating financial information reported against budget > Key trends and variances analysed and action taken as appropriate
Vesuvius GAAP	> Accounting policies and procedures formulated and disseminated to all Group operations > Covers the application of accounting standards, the maintenance of accounting records and key financial control procedures
Operational controls	> Operating companies and corporate offices maintain internal controls and procedures appropriate to their structure and business environment > Compliance with Group policies on items such as authorisation of capital expenditure, treasury transactions, the management of intellectual property and legal/regulatory issues > Use of common accounting policies and procedures and financial reporting software used in financial reporting and consolidation > Significant financing and investment decisions reserved to the Board > Monitoring of policy and control mechanisms for managing treasury risk by the Board
Risk assessment and management	> Continuous process for identifying, evaluating and managing any significant risks > Risk management process designed to identify the key risks facing each business > Reports made to the Board on how those risks are managed > Each major Group business unit produces a risk map to identify key risks, assess the likelihood of risks occurring, their impact and mitigating actions > Top-down risk identification undertaken at Group Executive Committee and Board meetings > Board review of insurance and other measures used in managing risks across the Group > The Board is notified of major issues and makes an annual assessment of how risks have changed > Ongoing assurance processes by the legal function and Internal Audit including the annual certification process > Externally supported 'Speak Up' whistleblowing line

Reviewing the effectiveness of risk management and internal control

The internal control system covers the Group as a whole, and is monitored and supported by the Group's Internal Audit function, which conducts reviews of Vesuvius' businesses and reports objectively both on the adequacy and effectiveness of the system of internal control and on those businesses' compliance with Group policies and procedures. The Audit Committee receives reports from the Group Head of Internal Audit and reports to the Board on the results of its review.

As part of the Board's process for reviewing the effectiveness of the system of internal control, it delegates certain matters to the Audit Committee.

Following the Audit Committee's review of internal financial controls and of the processes covering other controls, the Board annually evaluates the results of the internal control and risk management procedures conducted by senior management. This includes a self-certification exercise by which senior financial, operational and functional management certify the compliance throughout the year of the areas under their responsibility with the Group's policies and procedures and highlight any material issues that have occurred during the year. Since the date of this review, there have been no significant changes in internal controls or other matters identified which could significantly affect them.

In accordance with the provisions of the UK Corporate Governance Code, the Directors confirm that they have carried out a robust assessment of the principal risks facing the Company, including those that threaten its business model, future performance, solvency or liquidity. They have also reviewed the effectiveness of the Group's system of internal control and confirm that the necessary actions have been taken to remedy any control weaknesses identified during the year.

Further detail regarding the Audit Committee's review of the effectiveness of the Group's risk management and internal control systems is contained in the Audit Committee report on pages 89 and 90.

Principal risks

The risks identified on pages 32 and 33 are those the Board considers to be the most relevant to the Group in relation to their potential impact on the achievement of its strategic objectives. All of the risks set out on these pages could materially affect the Group, its businesses, future operations and financial condition and could cause actual results to differ materially from expected or historical results. These risks are not the only ones that the Group will face. Some risks are not yet known and some currently not deemed to be material could become so.

Viability statement

In accordance with the UK Corporate Governance Code, the Directors have assessed the viability of the Group over a three-year period to 31 December 2021, taking into account the Group's current position and the potential impact of the principal risks and uncertainties.

The Directors have determined that three-years is an appropriate period over which to provide the Viability statement because this is the Company's planning cycle and it is sufficiently funded by financing facilities with average maturity terms of approximately 5 years.

In making this statement, the Directors have carried out a robust assessment of the principal risks that may threaten the business model, future performance, solvency and liquidity of the Group. This is embodied in the annual review of a three-year business plan which includes a review of sensitivity to 'business as usual' risks, such as profit growth and working capital variances, severe but plausible events and the impact these could have on the Group's debt covenants and available liquidity. The results take account of the availability and likely effectiveness of the mitigating actions that could be taken to avoid or reduce the impact or occurrence of the underlying risks.

Whilst the review has considered all the principal risks identified by the Group, the following were selected for enhanced stress testing: an unplanned drop in customer demand; debt recovery risk due to customer default; business interruption due to the unplanned closure of a key plant; raw material price inflation; reduction in earnings from increased interest charges; and the impact of volatility in foreign currency earnings. The Group's prudent balance sheet management, flexible cost base to react quickly to end market conditions, access to long-term capital at acceptable financing costs and well diversified international businesses in different currency earning profiles leaves it well placed to manage these principal risks.

In performing the stress testing, certain assumptions were made including that: customer failures result in write-offs of the full value of the receivables with no lost revenue replacement; and, cash flow is supported by working capital releases, restricted capital expenditure and operating cost reductions. Under the enhanced stress testing described above, a potential breach of a covenant would only occur in the event of an unforeseen reduction in revenue greater than 35%.

Accordingly, the Directors confirm that they have a reasonable expectation that the Group will be able to continue in operation and meet its liabilities as they fall due over the three-year period to 31 December 2021.

Furthermore, the Board believes the Group continues to be well positioned for success in the longer term because of our exposure to end markets that are growing faster than underlying global GDP; our market-leading position that is supported by ongoing investment in innovation and R&D; our strong degree of customer intimacy by virtue of around a third of our employees working at customer facilities; and the focus we have on building quality teams with clear organisational responsibility.

Going concern

The Directors have prepared profit and loss, balance sheet and cash flow forecasts for the Group for a period in excess of 12 months from the date of approval of the 2018 financial statements. These forecasts reflect an assessment of current and future end-market conditions and their impact on the Group's future trading performance. The forecasts show that the Group will be able to operate within the current committed debt facilities and show continued compliance with the Company's financial covenants. On the basis of the exercise described above and the Group's available committed debt facilities, the Directors consider that the Group and Company have adequate resources to continue in operational existence for a period of at least 12 months from the date of signing these financial statements. Accordingly, they continue to adopt a going concern basis in preparing the financial statements of the Group and the Company.

Risk continued

Principal risks and uncertainties

Risk	Potential Impact	Mitigation
End market risks Vesuvius suffers an unplanned drop in demand, revenue and/or margin because of market volatility beyond its control Strategic alignment	**Unplanned drop in demand and/or revenue due to reduced production by our customers** **Margin reduction** **Customer failure leading to increased bad debts** **Loss of market share to competition** **Cost pressures at customers leading to use of cheaper solutions**	Geographic diversification of revenues Product innovation and service offerings securing long-term revenue streams and maintaining performance differential Increase in service and product lines by the development of the Technical Services offering R&D includes assessment of emerging technologies Manufacturing capacity rationalisation and flexible cost base Diversified customer base: no customer is greater than 10% of revenue Robust credit and working capital control to mitigate the risk of default by counterparties
Protectionism and globalisation The Vesuvius business model cannot adapt or respond quickly enough to threats from protectionism and globalisation Strategic alignment	**Restricted access to market due to enforced preference of local suppliers** **Increased barriers to entry for new businesses or expansion** **Increased costs from import duties, taxation or tariffs** **Loss of market share** **Trade restrictions**	Highly diversified manufacturing footprint with manufacturing sites located in 26 countries Strong local management with delegated authority to run their businesses and manage customer relationships Cost flexibility Tax risk management and control framework together with a strong control of inter-company trading
Product quality failure Vesuvius staff/contractors are injured at work or customers, staff or third parties suffer physical injury or financial loss because of failures in Vesuvius products Strategic alignment	**Injury to staff and contractors** **Product or application failures lead to adverse financial impact or loss of reputation as technology leader** **Incident at customer plant causes manufacturing downtime or damage to infrastructure** **Customer claims from product quality issues**	Quality management programmes including stringent quality control standards, monitoring and reporting Experienced technical staff knowledgeable in the application of our products and technology Targeted global insurance programme Experienced internal legal function controlling third-party contracting
Complex and changing regulatory environment Vesuvius experiences a contracting customer base or increased transaction and administrative costs due to compliance with changing regulatory requirements Strategic alignment	**Revenue reduction from reduced end-market access** **Disruption of supply chain and route to market** **Increased internal control processes** **Increased frequency of regulatory investigations** **Reputational damage**	Globally disseminated Code of Conduct highlighting ethical approach to business Compliance programmes and training across the Group Internal Audit function Experienced internal legal function Global procurement category management of strategic raw materials

Strategic Alignment

Deliver growth	Generate sustainable profitability and create shareholder value	Maintain strong cash generation and an efficient capital structure	Provide a safe working environment for our people	Be at the forefront of innovation	Run top-quality, cost-efficient and sustainable operations	Foster talent, skill and motivation in our people

See more about **Our Strategy** on p16-17

Risk | **Potential Impact** | **Mitigation**

Failure to secure innovation

Vesuvius fails to achieve continuous improvement in its products, systems and services

Strategic alignment

Potential Impact

- **Product substitution by customers**
- **Increased competitive pressure through lack of differentiation of Vesuvius offering**
- **Commoditisation of product portfolio through lack of development**
- **Lack of response to changing customer needs**
- **Loss of intellectual property protection**

Mitigation

- Enduring and significant investment in R&D, with market-leading research
- A shared strategy for innovation throughout the Group, deployed via our R&D centres
- Stage gate process from innovation to commercialisation to foster innovation and increase alignment with strategy
- Programme of manufacturing and process excellence
- Quality programme, focused on quality and consistency
- Stringent intellectual property registration and defence

Business interruption

Vesuvius loses production capacity or experiences supply chain disruption due to physical site damage (accident, fire, natural disaster, terrorism), industrial action or cyber attack

Strategic alignment

Potential Impact

- **Loss of a major plant temporarily or permanently impairing our ability to serve our customers**
- **Damage to or restriction in ability to use assets**
- **Denial of access to critical systems or control processes**
- **Disruption of manufacturing processes**
- **Inability to source critical raw materials**

Mitigation

- Diversified manufacturing footprint
- Disaster recovery planning
- Business continuity planning with strategic maintenance of excess capacity
- Physical and IT control systems security, access and training
- Cyber risks integrated into wider risk-management structure
- Well-established global insurance programme
- Group-wide safety management programmes
- Dual sourcing strategy and development of substitutes

People, culture and performance

Vesuvius is unable to attract and retain the right calibre of staff, fails to instil an appropriate culture or fails to embed the right systems to drive personal performance in pursuit of the Group's long-term growth

Strategic alignment

Potential Impact

- **Organisational culture of high performance is not achieved**
- **Staff turnover in growing economies and regions**
- **Stagnation of ideas and development opportunities**
- **Loss of expertise and critical business knowledge**
- **Reduced management pipeline for succession to senior positions**

Mitigation

- Internal focus on talent development and training, with tailored career-stage programmes and clear performance management strategies
- Contacts with universities to identify and develop talent
- Career path planning and global opportunities for high-potential staff
- Internal programmes for the structured transfer of technical and other knowledge
- Clearly elucidated Values underpin business culture

Health, safety and environment

Vesuvius staff or contractors are injured at work because of failures in Vesuvius' operations, equipment or processes

Strategic alignment

Potential Impact

- **Injury to staff and contractors**
- **Health and safety breaches**
- **Manufacturing downtime or damage to infrastructure from incident at plant**
- **Inability to attract the necessary workforce**
- **Reputational damage**

Mitigation

- Active safety programmes, with ongoing wide-ranging monitoring and safety training
- Independent safety audit team
- Quality management programmes including stringent manufacturing process control standards, monitoring and reporting

The arrows indicate the change in risk year-on-year

Increased | Decreased | Stable

SECTION TWO

OUR PERFORMANCE

In this section:

I AM PROUD TO SAY I WORK AT VESUVIUS.

Tsuyoshi Miki
BU Manager Steel, Japan

In my early career, I spent more than 25 years in high-end steel and metal industries mainly within sales and market development functions; gaining experience of both the domestic and global marketplace.

I joined Vesuvius in June 2018 as BU Manager Steel in Japan. My role is to bring change and deliver growth in our business in the Japanese market.

I decided to join Vesuvius because I was attracted by the sense of respect and diversity it has, on top of my personal connection with the steel and metal industries. As a new employee I was invited to attend the Spark Leadership Forum in Rome, Italy, where I had the chance to meet colleagues from all over the world. I was able to exchange ideas and opinions in very open and respectful discussions with colleagues and also senior management, about future expectations and the importance of the Japanese market.

Since then, I have been implementing a series of actions to grow our business in Japan with support from colleagues all over the world and from the senior managers I met in Rome. Vesuvius is a dynamic, transparent and cooperative organisation, where career progression is considered the norm for those who are focused and ambitious enough to take the opportunities on offer. I am proud to say I work at Vesuvius and would recommend the Company to others.

Find out more about Tsuyoshi's career journey at Vesuvius.
Visit **report2018.vesuvius.com**

Financial review

Balance sheet strength provides the required flexibility

The strength of our balance sheet and cash generation is key to our financial flexibility and enables us to take opportunities and manage risk.

£1,798.0m
Revenue

Reported	Underlying[1]
+6.8%	+10.7%

£197.2m
Trading profit[2]

Reported	Underlying[1]
+19.1%	+24.1%

51.3p
Statutory EPS

Reported
+263.8%

11.0%
Return on sales[2]

Reported	Underlying[1]
+120bps	+120bps

Guy Young
Chief Financial Officer

Basis of Preparation

All references in this financial review are to headline performance unless stated otherwise. See Note 4 to the Group Financial Statements on pages 136 and 137.

Introduction

We continued to build on our financial strategy during 2018 and progressed in particular with the stabilisation of our European Shared Service Centre, consolidation of our global finance team, and reporting and control improvements. Our focus to continuously improve both service delivery and results will remain, along with our commitment to further improve working capital and business efficiency.

2018 Performance overview

Strong end-market performance in 2018 has driven demand for our products in both Steel and Foundry and we have successfully outperformed the market in terms of growth. Reported revenue increased by £114.1m over the prior year and by £172.2m on an underlying basis. The restructuring programmes continued to deliver during 2018 with a total of £14.0m of incremental benefits reported.

The increased revenue and restructuring benefits drove the higher reported trading profit of £197.2m, which was 19.1% higher than prior year. Return on sales for 2018 on a reported basis at 11.0% was higher than the prior year by 120bps. In a year of strong sales growth, our cash management performance was strong, achieving a 91% cash conversion, due largely to a continued focus on working capital management. As a result, we have decreased our net debt position and improved our leverage ratio of net debt to EBITDA to 1.0x from 1.3x at December 2017.

1. Underlying basis is at constant currency and excludes separately reported items and the impact of acquisitions and disposals.
2. For definitions of alternative performance measures, refer to Note 4 of the Group Financial Statements.

Dividend

The Board has recommended a final dividend of 13.8 pence per share to be paid, subject to shareholder approval, on 24 May 2019 to shareholders on the register at 23 April 2019. When added to the 2018 interim dividend of 6.0 pence per share paid on 21 September 2018, this represents a full-year dividend of 19.8 pence per share.

It remains the Board's intention to deliver long-term dividend growth, provided this is supported by underlying earnings, cash flows, capital expenditure requirements and the prevailing market outlook.

Capital allocation

We believe that the ideal leverage ratio for Vesuvius is somewhere between 1.25x–1.75x net debt to EBITDA. This gives us a reasonable comfort zone to be able to cater for any potential economic down-cycles. However, given we are currently below this range at approximately 1.0x net debt to EBITDA, it is increasingly relevant to consider our capital allocation priorities. In order of priority these are:

1. **Organic growth.** We have capital expenditure and restructuring programmes that we believe deliver the best possible returns to our shareholders.
2. **Inorganic growth.** We review acquisition opportunities against a strict set of assessment criteria, including: strategic fit; margin relative to group target return on sales of 12.5%; return on capital.
3. **Return cash to shareholders.** In the event that our organic and inorganic growth opportunities leave us with residual cash, we will seek to return that to our shareholders.

Key Performance Indicators

We have identified a number of KPIs against which we have consistently reported. Details of the KPIs are provided on pages 18 and 19. As with prior years, we measure our results on an underlying basis, which we adjust to ensure appropriate comparability between periods, irrespective of currency fluctuations and any business acquisitions and disposals.

This is done by:

> Restating the previous period's results at the same foreign exchange ('FX') rates used in the current period

> Removing the results of disposed businesses in both the current and prior years

> Removing the results of businesses acquired in both the current year and prior years

Therefore, for 2018, we have:

> Retranslated 2017 results at the FX rates used in calculating the 2018 results

> Removed the results of the BMI refractory installation business, which was disposed of during 2018

Objective: Deliver growth

KPI: Underlying revenue growth

Reported revenue for 2017 was £1,683.9m, which after FX translation effects and removing the impact of disposed businesses, equates to £1,608.3m on an underlying basis. The reported revenue in 2018 of £1,798.0m, when adjusted for disposals made, is £1,780.5m on an underlying basis, which is an increase of 10.7% year-on-year. The growth has been as a result of stronger end-market demand, selling price increases to offset raw material and other cost inflation, and business gains during the period.

Objective: Generate sustainable profitability and create shareholder value

KPI: Trading profit and return on sales

We continue to measure underlying trading profit of the Group as well as trading profit as a percentage of sales, which we refer to as our return on sales or 'RoS'.

Trading profit of £197.2m increased by 24.1% on an underlying basis versus last year whilst RoS on an underlying basis was 11.0%, a 120bps improvement over 2017. The improved trading profit is due in part to the higher revenue, along with the ongoing delivery of benefits from the restructuring programmes.

In a globally favourable market environment our Steel and Foundry Divisions registered strong commercial performances and continued to outperform the general market growth in terms of volume. The pricing of our products was successfully adjusted to compensate for the sharp increase in raw material prices which had negatively impacted our performance in 2017. Additionally, the production bottlenecks in our Flow Control European manufacturing network, which had also negatively impacted our 2017 performance, were completely eliminated. As a result, the Steel Division recorded RoS of 10.4% in 2018, an increase from 8.7% in 2017 whilst Foundry reported a 12.3% RoS, another improvement over the prior year (2017: 12.2%).

KPI: Headline PBT and headline EPS

Headline profit before tax ('PBT') and headline earnings per share ('EPS') are used to measure the underlying financial performance of the Group. The main difference between trading profit and PBT is net finance costs.

Revenue

	2018 Revenue			2017 Revenue				% change	
£m	As reported	Acquisitions/ (Disposals)	Underlying	As reported	Currency	Acquisitions/ (Disposals)	Underlying	Reported	Underlying
Steel	**1,236.7**	**(17.5)**	**1,219.2**	1,148.7	(35.0)	(24.0)	1,089.7	7.7%	11.9%
Foundry	**561.3**	**—**	**561.3**	535.2	(16.6)	—	518.6	4.9%	8.2%
Total Group	**1,798.0**	**(17.5)**	**1,780.5**	1,683.9	(51.6)	(24.0)	1,608.3	6.8%	10.7%

Trading profit

	2018 Trading profit			2017 Trading profit				% change	
£m	As reported	Acquisitions/ (Disposals)	Underlying	As reported	Currency	Acquisitions/ (Disposals)	Underlying	Reported	Underlying
Steel	**128.3**	**(0.7)**	**127.6**	100.4	(3.7)	(0.4)	96.3	27.9%	32.6%
Foundry	**68.9**	**—**	**68.9**	65.1	(3.1)	—	62.0	5.7%	10.9%
Total Group	**197.2**	**(0.7)**	**196.5**	165.5	(6.8)	(0.4)	158.3	19.1%	24.1%

Financial review continued

Net finance costs in 2018 of £11.1m were £2.8m below 2017. The reduction in finance costs was largely due to more favourable terms secured on renewal of our revolving credit facility at the end of 2017.

Our headline PBT was £188.9m, 23.5% higher than last year on a reported basis. Including amortisation (£12.9m), restructuring charges (£15.3m) and a GMP equalisation charge (£4.5m), our PBT of £156.2m was 60.9% higher than 2017. Headline EPS at 49.6p was 21.9% higher than 2017.

KPI: Return on net assets ('RONA')

RONA is our principal measure of capital efficiency. We do not exclude the results of businesses acquired and disposed from this calculation, as capital efficiency is an important consideration in our portfolio decisions. It is calculated by dividing trading profit plus our share of post-tax profits from joint ventures by our average operating assets (property, plant and equipment, trade working capital, interests in joint ventures and associates, investments, and other operating receivables, payables and provisions).

As with most of our KPIs, we measure this on a 12-month moving average basis at constant currency to ensure that we focus on sustainable underlying improvements. Our RONA for 2018 was 29.9% (2017: 24.2%).

Objective: Maintain strong cash generation and an efficient capital structure

KPI: Free cash flow and working capital

Fundamental to ensuring that we have adequate capital to execute our corporate strategy is converting our profits into cash, partly through strict management of our working capital. Free cash flow from continuing operations was £106.1m for the year, £13.0m higher than last year on a reported basis due to the improved trading performance, partially offset by the additional investment in working capital to support our growing revenues. Our cash conversion in 2018 was 91% (2017: 104%).

We measure working capital both in terms of actual cash flow movements, and as a percentage of sales revenue. Trade working capital as a percentage of sales in 2018 was 23.9% (2017: 24.9%), measured on a 12-month moving average basis. In absolute terms on a constant currency basis, trade working capital increased by £15.2m, well below the increase in sales, whilst the continued focus on working capital management has contributed to an improvement as a percentage of sales.

KPI: Interest cover and net debt

As at 31 December 2018, the Group had committed borrowing facilities of £573.7m (2017: £563.4m), of which £119.2m was undrawn (2017: £153.7m).

Net debt at 31 December 2018 was £248.0m, a £26.3m decrease from 2017, as a result of our good cash generation. The main drivers of the decrease were the impact of strong cash conversion partially offset by restructuring costs, tax payments, purchase of Company shares for the Vesuvius Group Employee Share Ownership Plan ('ESOP'), and shareholder dividends.

The Group's debt facilities have two financial covenants: the ratios of net debt to EBITDA (maximum three times limit) and EBITDA to interest (minimum four times limit). These ratios are monitored regularly to ensure that the Group has sufficient financing available to run the business and fund future growth. At the end of 2018, the net debt to EBITDA ratio was 1.0x, an improvement over last year (2017: 1.3x) and EBITDA to interest was 22.8x (2017: 15.8x).

Further information on our finance costs can be found in Note 9 to the Group Financial Statements on page 142.

Operating cash flow and cash conversion

	2018 £m	2017 £m
Cash generated from continuing operations (Note 12)	**195.3**	176.6
Add: Outflows relating to restructuring charges	**19.3**	27.3
Add: Net retirement benefit obligations	**3.4**	4.8
Less: Capital expenditure	**(41.2)**	(39.0)
Add: Proceeds from the sale of property, plant and equipment	**2.6**	1.8
Operating cash flow	**179.4**	171.5
Trading profit	**197.2**	165.5
Cash conversion	**91%**	104%

Researcher inserts samples into scanning electron microscope (SEM) for imaging and elemental mapping

Objective: Be at the forefront of innovation

KPI: R&D spend

We believe that our market-leading product technology and services deliver fundamental value to our customers and that the primary mechanism to deliver that value is to invest significantly in research and development. In 2018, we spent £33.6m on R&D activities, an increase of 3.0% from 2017 on a constant currency basis, which represented 1.9% of our revenue (2017: 2.0%).

Financial risk factors

The Group undertakes regular risk reviews and, as a minimum, a full risk assessment process twice a year. As in previous years this included input from the Board in both the assessment of risk and the proposed mitigation. As referred to in the Viability statement and Principal risks and uncertainties sections on pages 31 to 33, we consider the main financial risks faced by the Group as being those posed by a decline in our end markets, leading to reduced revenue and profit as well as potential customer default. We also monitor carefully the challenges that come from broader financial uncertainty, which could bring lack of liquidity and market volatility. Important but lesser risk exists in interest rate movements and cost inflation, but neither is expected to have a material impact on the business after considering the controls we have in place.

Our key mitigation of end market risk is to manage the Group's exposure through balancing our portfolio of business geographically and to invest in product innovation. We do so through targeted capital investment in new and growing businesses and a combination of capital and human resource in emerging markets. When considering other financial risks we mitigate liquidity concerns by financing using both the bank and private placement markets. The Group also seeks to avoid a concentration of debt maturities in any one period to spread its refinancing risk. The Group's undrawn committed bank facilities at 31 December 2018 were £119.2m. Counterparty risk and customer default are mitigated by our relatively widespread customer base – with no customer being greater than 10% of revenue – and credit control procedures.

Other relevant financial information

Restructuring

We continued to make good progress in implementing our previously announced restructuring programmes, with £14.0m of incremental savings delivered in 2018. In 2018, we reported £15.3m of restructuring costs (2017: £36.3m) within separately reported items that were predominantly made up of redundancy and plant closure costs for the new programmes launched in 2018. The cash costs in 2018 were £19.3m (2017: £27.3m). We are carrying forward into 2019 a restructuring provision of £17.4m.

Taxation

A key measure of tax performance is the effective tax rate, which is calculated on the income tax associated with headline performance, divided by the headline profit before tax and before the Group's share of post-tax profit of joint ventures (2018: £186.1m, 2017: £151.6m). The Group's effective tax rate, based on the income tax costs associated with headline performance of £48.4m (2017: £36.4m), was 26.0% in 2018 (2017: 24.0%).

The Board has decided to substantially increase the amount reflected on our balance sheet in respect of the previously unrecognised value of our US tax losses and other temporary differences. In addition, the Board has decided to reflect the utilisation of those assets in offsetting our US taxable headline profits as part of our headline tax charge, rather than as part of the tax charge on separately reported items in the Group Income Statement. This has increased the headline tax charge in 2018 by £7.8m, increasing the effective rate of tax on headline profit before tax and share of post-tax profits from joint ventures by 4.2%. The Group's prior year headline tax charge has not been restated as the impact is not material.

The Group's effective tax rate is sensitive to changes in the geographic mix of profits and level of profits and reflects a combination of higher rates in certain jurisdictions such as India, Mexico,

Financial review continued

Germany and Belgium, a nil effective rate in the UK due to the availability of unutilised tax losses, and rates that lie somewhere in between.

Other key factors impacting the sustainability of the Group's effective tax rate are set out in Note 10.6 to the Group Financial Statements.

The income tax credit on separately reported items of £36.8m (2017: £18.0m charge) comprises £2.8m non-cash deferred tax movements relating to the amortisation of a deferred tax liability arising from the 2008 acquisition of Foseco plc (2017: £6.0m), £1.8m tax credits relating to restructuring charges (2017: £4.3m), and a net increase in the deferred tax asset recognised in respect of US tax losses and certain other temporary differences of £32.2m (2017: £28.3m reduction). The reduction in deferred tax asset in 2017 was largely caused by US tax reform enacted in late December 2017 in the form of the US Tax Cuts and Jobs Act ('TCJA'). However, this write-down did not impact our headline earnings after tax, as the change in the asset was reflected through separately reported items.

We previously reported that we expected the Group's effective tax rate from 2018 onwards to be adversely impacted by US tax reform, particularly the provisions of the Base Erosion and Anti-Abuse Tax ('BEAT'). Our further analysis of these provisions and the recently issued guidance clarify that the impact of the BEAT was not material to Vesuvius' tax position. However, the new Global Intangible Low-Taxed Income ('GILTI') rules introduced as part of the tax reform has had an impact on the tax position of the Group and gave rise to an increase in the headline tax charge of £2.4m in 2018, increasing the effective rate of tax on headline profit before tax and before the share of post-tax profits from joint ventures by 1.3%.

We expect the Group's effective rate of tax on headline profit before tax and before the share of post-tax profits from joint ventures to be around 28% in 2019.

The net tax credit reflected in the Group Statement of Comprehensive Income in the year amounted to £6.0m (2017: £3.1m charge), comprising a credit of £7.3m (2017: £nil) for additional recognition of US pension deferred tax asset and a £1.3m charge (2017: £2.4m charge) related to tax on net actuarial gains and losses on the employee benefits plan. In addition, £nil (2017: £0.7m charge) related to UK tax in respect of foreign exchange differences arising on hedged positions.

Capital expenditure

Capital expenditure in 2018 of £48.4m (2017: £44.3m) comprised £34.4m in the Steel Division (2017: £34.0m) and £14.0m in the Foundry Division (2017: £10.3m). Capital expenditure on revenue-generating customer installation assets, primarily in Steel, was £7.7m (2017: £10.7m).

Pensions

The Group has a limited number of historical defined benefit plans mainly in the UK, US, Germany and Belgium. The main plans in the UK and US are largely closed to further benefit accruals and 58.1% of the liabilities in the UK have already been insured. The total net deficit attributed to these defined benefit obligations at the end of December 2018 was £15.3m (2017: £16.5m), representing an improvement of £1.2m.

The improvement is driven by £5.1m from changes to actuarial assumptions (attributable to increasing discount rates; updated mortality assumptions and pension membership data) and £8.5m from cash contributions and payments of unfunded benefits; offset by additional accrual and administrative expenditure paid for the year of £9.8m (of which £4.5m relates to a GMP equalisation charge), and foreign exchange movements of £2.6m.

The majority of the ongoing pension plans are defined contribution plans, where our only obligation is to make contributions, with no further commitments on the level of post-retirement benefits. During 2018, cash contributions of £11.4m (2017: £12.6m) were made into the defined contribution plans and charged to trading profit.

Corporate activity

In October 2018 Advanced Refractories divested its BMI refractory installation business.

On 27 February 2019 the Group signed an agreement to acquire the entire issued share capital of CCPI Inc ("CCPI"), a specialty refractory producer focused on tundish (steel continuous casting) applications (65% of sales) and aluminium (35% of sales). CCPI is based in Ohio, USA, and will become part of the Group's Advanced Refractories business unit. The transaction values CCPI at US$43.4m (£33.1m) on a cash and debt free basis. The acquisition is expected to close within the coming week.

Guy Young
Chief Financial Officer
27 February 2019

WE ARE TRANSFORMING OUR STRUCTURES TO STRENGTHEN COLLABORATION.

This will enhance the level of understanding, support and challenge provided to the Group in driving performance.

Ian Lawson
Group Financial Controller,
London, UK

Operating reviews

Steel Division*

Vesuvius' Steel Division reported revenues of £1,236.7m in 2018, an increase of 7.7% compared to 2017. On an underlying basis, Steel Division revenue was up 11.9%.

This higher growth rate relative to global steel production is a result of three factors:

1. High exposure of Flow Control to the fastest growing segment of the steel market
2. Market share gains in Flow Control
3. Selling price increases in both Flow Control and Advanced Refractories mitigated by a decrease in market share for Advanced Refractories in some regions where priority was given to selling price increases to offset raw material and other cost inflation

On a reported basis, Steel Division trading profit improved 27.9% year-on-year. On an underlying basis, trading profit increased 32.6%, with return on sales increasing by 160 basis points.

Steel Flow Control

2018 Performance

Our Steel Flow Control business unit reported revenues of £662.6m in 2018, an increase of 7.9% compared to 2017 on a reported basis, whilst underlying revenue increased 11.5%. All regions outperformed underlying steel production volume growth in terms of both revenue and volume growth. The Americas was our fastest growing region, with underlying revenues increasing 13.3% to £216.2m, against a 3.3% increase in steel production volumes. We outperformed in both North and South America relative to steel production, driven by market share gains and selling price increases. Steel production in EMEA increased by 1.4% in 2018, and Vesuvius outperformed the market with underlying revenue up 10.0% to £266.2m, reflecting both market share gains and the effects of increased selling prices to offset raw material and other cost inflation. Underlying revenue increased by 11.5% in Asia-Pacific in 2018 to £180.2m, compared to a 5.6% increase in steel production volume in the region. Revenue also increased faster than underlying steel volumes in each of our key regional markets of China and India.

£662.6m

Steel Flow Control revenue £m

2017: £614.2m

Roel van der Sluis
President, Steel Flow Control

Strategic highlights from the year

Restructuring programmes and process improvement initiatives

During 2018, we continued our focus on cost leadership with our manufacturing rationalisation programme in the NAFTA region delivering improvements in our cost base through a combination of increasing plant efficiency and optimising production volumes between plants.

We also started restructuring programmes in new territories, like Brazil and India where the projects identified are focused on industrial efficiency.

In addition to these initiatives, we targeted process improvements aimed at increasing the quality and consistency of products, for example in China, where we have increased the level of automation of our production process. Our optimisation work performed here has allowed us to increase cost-efficiency and create capacity to absorb volume growth.

Global mechatronic business

Over the last few years, Vesuvius has invested in developing a unique competency in robotic solutions which improve the safety and consistency of our customers' operations while supporting our sales. Our unique value proposition is the result of integrating Vesuvius consumables and systems, and our world-class knowledge of the continuous casting process. Several steel makers have been pioneers in adopting this technology, delivering process efficiency and removing personnel from the harsh environment around the caster. In 2018, we saw an increase in demand for robotics solutions and received orders to convert steel plants in Europe, Brazil and Turkey to this technology. This positions Vesuvius well in supporting our customers to face the future challenge of automation and underpins a greater focus on quality.

* Since 1 January 2018, some of the products previously included under the Digital Services business unit have been allocated to Flow Control and Advanced Refractories. For this reason, we have restated 2017 and 2016 financials to ensure comparability with 2018 performance. The overall Steel Division figures are unchanged.

BREAKTHROUGH IS A WORD WE ARE LOOKING FOR ON A DAILY BASIS.

As a research engineer, I design the new technologies and products which will be used by our customers tomorrow.

Benjamin Delattre
Research Engineer – VISO,
Feignies, France

Operating review – Steel Flow Control continued

Global digital services offering

In 2018, we further developed our capabilities in digital services, with a focus on providing our customers with a complete solution for the collection and analysis of data to improve the efficiency of their continuous casting processes. Our solution includes, for example, continuous temperature measurement sensors for the tundish and the mould, as well as surface quality sensors. Our equipment allows the customer to monitor and control their continuous casting process, optimising productivity and yield whilst also improving the quality and consistency of the steel produced.

Global mould flux business

During 2018 we have continued to develop our flux feeding equipment, increasing the level of automation, improving safety around the caster and optimising the consumption of mould flux. In addition, further progress was made in the development of a new type of mould flux aimed at reducing corrosion of the caster whilst improving steel quality.

Technological leadership

During the year, we accelerated our R&D effort to support long-term profitable growth. We launched a new family of stirring devices which help our customers to create a homogeneous temperature and composition in the ladle and improve the quality of steel. Significant progress has also been made in developing our next generation of ladle slide gates. During the year we also commenced the reorganisation and expansion of our global R&D network, which will be focused around three main R&D centres in the US (Pittsburgh), Europe (Ghlin) and China (Suzhou) operating under a common leadership.

Technical support

We continue to develop our technical support offering, providing our customers with a complete solution to help them understand better the flow patterns of steel into the tundish and the mould. For example, for one European customer we used our technical capabilities in computerised flow modelling to redesign their tundish and optimised the usage of Vesuvius' refractories to allow our customer to produce higher quality steel – enabling them to supply higher technology products in a cost-effective way.

Our people

We continue our efforts to attract, develop and retain the best talent worldwide. We believe in diversity of talent, underlined by our focus on ensuring our R&D network is global and our team of P&L managers is as international as possible. We have also focused on our culture, introducing our new corporate values and organising our company around empowered, accountable and results-oriented P&L managers operating close to our end-markets and customers.

Roel van der Sluis
President, Steel Flow Control
27 February 2019

Flow Control's global R&D network is focused around three main R&D centres in the US (Pittsburgh), Europe (Ghlin) and China (Suzhou) operating under common leadership.

Steel Flow Control's value-added solutions include:

- Refractories: Consumable ceramic products to contain the flow of molten steel e.g. ladle shroud and slide gate refractory
- Systems: Mechanisms using ceramic products that control the flow of molten steel e.g. slide gate and stopper mechanisms
- Robotics: Installing and replacing Vesuvius' consumables in very harsh environments increasing the safety and consistency of our customers' operations
- Digital Services: Process control of the continuous casting process including mould level control, laser measurements of the ladle and continuous temperature measurement devices
- Technical support: Teams of experts available to our customers helping them with the design and modelling of the molten steel through the continuous casting process

THESE ARE EXCITING TIMES FOR VESUVIUS.

I joined Chicago Heights at a time when there was huge potential to make a difference, at a facility that was changing – I'm thrilled to be part of the team.

Marcus Cilfone
Operations Manager,
Chicago Heights, USA

Steel Advanced Refractories

During 2018 we continued to improve our value-added solution offering for our customers, which includes refractories, installation technologies (including robots), computational fluid dynamics capabilities and lasers.

£541.1m

Steel Advanced Refractories revenue £m

2017: £502.3m

Tanmay Ganguly
President, Steel Advanced Refractories

2018 Performance

Our Steel Advanced Refractories business unit reported revenues of £541.1m in 2018, an increase of 7.7% compared to 2017 on a reported basis, whilst underlying revenue increased 12.5%. The strong sales growth was supported by selling price increases to offset raw material and other cost inflation.

We achieved underlying revenue growth in each of our key regions with the Americas up 22.9%, EMEA up 8.6% and Asia-Pacific up 8.7%. However, we experienced some market share loss especially in North Asia and in certain European countries as priority was given to the selling price increases to recoup raw material and other cost inflation.

Strategic highlights from the year

Restructuring programmes and process improvement initiatives

We continued the review and improvement of our manufacturing network, reinforcing our operational excellence and manufacturing operations. Following the success of the manufacturing rationalisation programme in South America, similar initiatives were launched in Europe and NAFTA delivering improvements in the cost base through a combination of increased efficiency and adapting production volumes between plants. As part of our restructuring initiatives in North America, we divested the BMI installation business in October 2018 to Reftech International. This continued focus on operational excellence allows us to reinforce our cost leadership and the competitiveness of our manufacturing network.

Operating review – Steel Advanced Refractories continued

Advanced Refractories' value-added solutions include:

> **Monolithics and shaped refractory materials:** (In both magnesia (basic) and alumina silicate (acid) formulations) supplied by Vesuvius in the form of powder mixes, which are spray-applied or cast onto the vessel to be lined (i.e. monolithics) and in the form of shapes (e.g. bricks, pads, dams and other larger precast shapes)

> **Tap hole clay:** A refractory mass used to plug the tapping hole at the base of a blast furnace. When molten iron is ready to be extracted from the blast furnace, a drilling machine perforates a hole through the solidified clay to start the tapping process

> **Installation technologies:** Are key to ensure the quality of the end product and are critical for the installation of refractory products in extreme temperature environments

> **Lasers:** Help track the performance of the installed refractories and instruct the customer in advance, when for example, a vessel becomes unsuitable for use

> **Computational fluid dynamic capabilities:** Are used by our engineers to simulate the flow of molten metal during the process of steel-making, aluminium making, etc. Our engineers help our customers optimise their molten metal flow by designing customised refractory shapes to ensure the most efficient flow dynamics

Tundish water modelling is used to optimise the design of Vesuvius' tundish solution offerings

Technological leadership

During 2018 we continued to improve our value-added solution offerings for our customers, which includes refractories, installation technologies (including robots), computational fluid dynamics capabilities and lasers. We are experiencing increased demand for our refractory application robots, which enable our customers to eliminate the risk of human presence in dangerous working areas and also the risk of human errors, while at the same time improving the quality of installation. At the same time we have registered an increased interest globally in laser measurements, which allow customers to track the wear profile of the refractories in use to enable targeted repair, delaying the need for costly full replacements.

In 2018, we continued to invest in our global R&D network with the expansion of our research facility in Visakhapatnam, India to reinforce our presence in this key market for our future growth, and to enable us to better tap into the growing talent pool of engineers and scientists in the country.

New value-added solutions

In 2018, we accelerated our R&D effort as we launched several additional new value-added solutions. Our product launches are focused on enhancing our customers' productivity, efficiency and safety in the blast and reheat furnaces and tundish operations, through new and optimised monolithic formulations, precast shapes and installation practices.

Our people

We continued our focus on attracting the best talent everywhere in the world, reinforcing our management team and ensuring our organisation is run by entrepreneurial, empowered and accountable managers on the ground, who are close to our end-markets and customers. One of Vesuvius' key strengths is the strong relationship between Vesuvius' employees and our customers, with the majority of our customer-facing employees working every day at a steel mill or aluminium plant. The knowledge of the flow of molten metal of our employees and their ability to understand our customers allows us differentiation which is intrinsic to us maintaining our position in the market.

Tanmay Ganguly
President, Advanced Refractories
27 February 2019

Steel Digital Services

During 2018 we introduced a number of new features in our sensors, probes and related instruments which allow our customers to meet increasing end-product consistency and quality demands.

The Digital Services business unit offers digital products to our customers to make their underlying processes more efficient and reliable. Digital Services focuses on providing products that enhance the control and monitoring of our customers' production processes, complementing Vesuvius' strong presence and expertise in molten metal engineering to create new technologies and integrate them into expert process management systems.

The products provided by Digital Services include temperature sensors, oxygen, hydrogen and sublance probes, iron oxide and metal sampling for the steel, aluminium and foundry industries.

By using these technologies customers can focus on critical parameters within their processes, enabling them to refine their production methods to improve quality, lower production costs and maximise efficiency.

2018 Performance

Digital Services generated revenue of £33.0m, an increase of 2.4% year-on-year on a reported basis. On an underlying basis, revenue increased 10.8%. The strong sales growth in the Americas was due to market share gains and increased penetration of our products. In EMEA, our sales growth was impacted by Russia where priority was given to improving profitability. In Asia-Pacific, we continued to increase the penetration of our products in India, gaining market share with new and existing customers.

Strategic highlights from the year

During 2018 we introduced a number of new features in our sensors, probes and related instruments which allow our customers to meet increasing end product consistency and quality requirements.

In 2018 we integrated the Digital Services companies, ECIL Met Tec and Sidermes, into the Group sales networks. This enabled these businesses to access the wider footprint of the Vesuvius customer base.

We also continued the restructuring actions started in 2017 to optimise our cost base and manufacturing footprint for sensors and probes, and to reduce operating costs. We have also continued our investment programme to increase automation in our manufacturing processes.

Davide Guarnieri
Director, Group Digital Services
27 February 2019

£33.0m
Digital Services revenue £m
2017: £32.2m

Platinum thermocouple loop for disposable Sensors and Probes

Operating review – Foundry

Foundry Division

We continue to invest in our team of technical experts to provide to our customers the best solutions and advice on how to maximise the efficiency of their production processes.

2018 Performance

Foundry reported revenues of £561.3m in 2018, an increase of 4.9% compared to 2017 on a reported basis, whilst underlying revenue increased 8.2%. On a reported basis, our trading profit improved 5.7% year-on-year. On an underlying basis, trading profit increased by 10.9%, with return on sales increasing by 30 basis points. Our sales growth in 2018 benefited from market share gains in the key product lines of feeding systems, filters and coatings as well as selling price increases. Trading profit also benefited from the ongoing organisational restructuring in Europe and North America, which is now focused on a rationalised, leaner structure. However, overall profitability was impacted by a time lag in selling price increases to compensate for raw material and other cost inflation, particularly in North Asia. Fused Silica, a specialised product line, also suffered from significant market weakness in the fourth quarter, particularly in China and EMEA, where customers choose to delay purchases and extend year-end maintenance shutdowns.

Underlying revenue in EMEA increased by 7.2% year-on-year as a result of growth across the majority of foundry end-markets with particular strength in general engineering as well as some improvements in our business at European steel foundries, albeit from a low base.

In the Americas, despite weakness in US light vehicle production, underlying revenue increased by 15.3%, supported, in particular, by growth in the heavy truck and mining markets as well as increases in iron casting output related to construction and agricultural equipment. Furthermore, we were successful in gaining market share across all our key product lines aided by several important new product launches.

In Asia-Pacific, underlying revenue increased by 5.5%, with sales increasing in all major markets. Our revenues in China were up 7%, driven by growth in engineering machinery and construction and agricultural equipment, and supported by successful new product launches. In India, where our revenues were only up 2%, we prioritised passing through raw material and other cost inflation, as well as managing customer risk and optimising working capital.

£561.3m

Foundry revenue £m

2017: £535.2m

Glenn Cowie
President, Foundry

Foundry's value-added foundry solutions include:

- Feeding Systems: Our customised insulating and exothermic feeding systems allow for the efficient supply of molten metal to key areas of complex and/or large castings, and prevent liquid shrinkage defects in the finished casting, improving yields and productivity by reducing the amount of molten metal required per casting. In addition, our exothermic feeding systems provide a secondary heat source which can also control metal cooling, minimising the adverse effects of shrinkage during solidification
- Filters: Remove impurities from the liquid metal and reduce turbulence during pouring
- Coatings: Protect both sand and permanent moulds from the effects of being filled with liquid metal
- Crucibles: Used in a wide range of melting and holding applications for non-ferrous alloys, particularly aluminium, copper and zinc. Each of these applications requires a crucible with specific properties to maximise productivity and minimise energy use
- Other products: These include binders which are used to prepare the sand moulds and cores, inoculants used for ferrous and non-ferrous castings, flux degassing equipment for removing unwanted gas in liquid aluminium and refractory materials used for the transportation of liquid metal

WE USE OUR DIFFERENT PERSPECTIVES TO SOLVE ISSUES.

Working together, we help move the Company forward.

Branden Reber
Maintenance Journeyman,
Cleveland, USA

Strategic highlights from the year

Restructuring programmes and process improvement initiatives

The organisational restructuring in North America and Europe, which commenced in 2016 and 2017 respectively, continued through the year. With a focus on rationalising our manufacturing footprint and maximising capacity utilisation.

We also continued to focus on operational excellence by implementing lean improvement programmes at all our plants, investing in robotic packaging lines, other forms of automation in our operations, and increasing global raw material and product sourcing.

New value-added solutions

In 2018, our R&D efforts resulted in several new product launches. During the year, we launched two new feeding systems – a high precision feeding system for turbochargers and an innovative modular design feeding system to be used in iron and steel foundries.

We continued to develop our technical services offering, and during 2018 we launched a new temperature measurement system which increases uniformity in iron quality, thus reducing variation in the properties of finished castings and ultimately enabling a reduction in the number of waste castings.

We continued to invest in our team of technical experts, especially in the emerging markets of China, India and Eastern Europe to provide to our customers the best solutions and advice on how to maximise the efficiency of their production processes.

Increased penetration in selected emerging markets

In China we emphasised the introduction of new products, specifically designed for the Chinese market and developed by our local technical team. The launches of our break-through feeding system and customised coatings were particularly successful and very well received by the market, driving revenue growth with both existing and new customers. In Mexico we have successfully increased attention on non-ferrous customers requiring sophisticated and complex castings for the aerospace industry.

Our people

We have continued to focus on succession planning with several key new employees joining during the year. We have also invested time in selecting entrepreneurial managers to strengthen our team and drive future growth in the business. Each of these initiatives delivered an improved organisational culture and accountability, while moving decision-making closer to the customer and increasing our speed of doing business.

Glenn Cowie
President, Foundry
27 February 2019

SECTION THREE

NON-FINANCIAL INFORMATION

In this section:

I ENJOY THE FAST MOVING AND CHALLENGING ENVIRONMENT AT VESUVIUS.

I get to move from project to project, working in locations all around the world.

Lynda Yaker
Audit Manager,
London, UK

Non-financial information statement

In accordance with the requirements of the Companies Act 2006, Vesuvius presents its Non-financial information statement, which forms part of the Strategic Report.

The non-financial information statement provides information on the Group's activities and policies in respect of:

Environmental matters
See Sustainability p62-65

Company's employees
See People and community p66-69

Social matters
See People and community p70-71

Respect for human rights
See Our principles p54

Anti-corruption and anti-bribery matters
See Our principles p54

The statement also details, where relevant, the due diligence processes implemented by the Company in pursuance of these policies.

Further information, disclosed in other sections of the Strategic Report, is incorporated into this statement by reference, including:

Information on the Group's principal risks
Details of the Group's principal risks relating to these non-financial matters are detailed in the Group's schedule of Principal risks and uncertainties on pages 32-33

See Risk, viability and going concern p28-33

Details of the Group's business model
See p14-15

Details of the Group's non-financial KPI's
See p18-19

Sample in preparation for differential scanning calorimetry at our R&D laboratory in Enschede, Netherlands

Our principles

Working together with shared values makes Vesuvius stronger

Vesuvius is a geographically and culturally diverse group, employing nearly 11,000 people in 41 countries.

This geographical diversity places us close to our customers across the globe, but also highlights the importance of maintaining and applying strong and consistent ethical values in our worldwide approach to business. Our employees' engagement with our values and culture is vital to our success and the sustainable delivery of the Group's strategy.

Vesuvius has established a framework for explaining and delivering the culture and principles we consider to be fundamental to our sustained success:

Values

Code of Conduct **Policies and procedures**

Training

Monitoring and Evaluation

Performance improvements

Vesuvius' Values

In 2018 we launched a new set of Values for the Group: Courage, Ownership, Respect and Energy. These CORE Values are actively supporting the Group's priorities, encouraging consistent behaviours across the Group in order to sustain our business success in the future.

These values, and the described behaviours underpinning them, convey the mindset and attitudes we expect each employee to actively demonstrate every day. They are an expression of the culture of the Group, promoting our image to external stakeholders, and underpinning the commercial promise we provide to our customers.

These values were rolled out across all our sites. They are prominently displayed as visual reminders and they are reinforced in our performance management systems, ensuring they are firmly embedded in our day-to-day conversations.

Our strength comes from our CORE

We are creating a culture of energetic, empowered and accountable entrepreneurs, courageously challenging the status quo and driving sustainable growth.

With our CORE values we are telling the world who we are and what we stand for

Courage

> I systematically say, decide and do what is right for Vesuvius including when it is difficult, unpopular or not consensual.

> I express my opinions openly during discussions but I also defend group decisions once they've been taken, even if they do not correspond to my initial position.

> I proactively take leadership responsibility on difficult projects and topics that are important to the Group's performance, motivated by the perspective of success rather than paralysed by the risk of personal failure.

Ownership

> I am personally accountable for the consequences of my actions and for the performance of the Group in my area of responsibility or oversight, without blaming external circumstances or the actions of others.

> I demonstrate an entrepreneurial spirit, looking for and seizing business opportunities and I immediately address problems that come up as soon as I become aware of them.

> I manage the Group's money and resources as though they were my own.

Respect

> I demonstrate respect for other people's ideas and opinions even if I disagree with them.

> I welcome open debate.

> I listen to others, foster esteem and fairness with customers, suppliers, coworkers, shareholders and the communities where we operate.

> I communicate my objectives clearly and take time to explain all decisions. I behave with the highest level of integrity.

> I promote diversity at all levels of the company.

Energy

> I work hard and professionally in pursuit of excellence.

> I constantly raise the bar and challenge the status quo. For me, the sky is the limit.

> I lead by example, inspiring and motivating my team to go the extra mile. I promote a positive and energising work environment. I continuously deliver outstanding customer experience and innovative solutions.

> I never underestimate competitors and permanently strive to reinforce the Group's leadership position.

Our principles continued

Code of Conduct

Our Code of Conduct sets out the standards of conduct expected, without exception, of everyone who works for Vesuvius in any of its worldwide operations. The Code emphasises our commitment to ethics and compliance with the law, and covers every aspect of our approach to business, from the way that we engage with customers, employees, the markets, and each of our other stakeholders, to the safety of our employees and workplaces. Everyone within Vesuvius is individually accountable for upholding its requirements. We recognise that lasting business success is measured not only in our financial performance, but in the way in which we deal with our customers, business associates, employees, investors and local communities. The Code of Conduct is published in our 29 major functional languages.

Code of Conduct principles

Health, safety and the environment

Trading, customers, products and services

Anti-bribery and corruption

Employees and human rights

Disclosure and investors

Government, society and local communities

Conflicts of interest

Competitors

The Code of Conduct is available in 29 languages at **www.vesuvius.com**

Policies and procedures

We continue to enhance the policies that underpin the principles set out in the Code of Conduct. These assist employees to comply with our ethical standards and the legal requirements of the jurisdictions in which we conduct our business. They also give practical guidance on how this can be achieved. Amongst these policies are:

Speak Up

Vesuvius employees can speak up without fear of retaliation, either to Vesuvius management or via independent channels. A third-party-operated confidential Employee Concern Helpline (Speak Up) is available for employees wishing to raise concerns anonymously or in situations where they feel unable to report internally. This independent facility supports online reporting through a web portal, or reporting by phone or by voicemail. Ensuring global accessibility, employees can speak with operators in any of our 29 functional languages. The helpline is publicised through local language posters at each of our sites, our internal website and during internal compliance training. No Vesuvius employee will ever be penalised or disadvantaged for reporting a legitimate concern in good faith.

Reports received via Speak Up channels are managed by the General Counsel and Compliance Director. When received, reports are assessed for risk and category of concern. All reports are investigated following a protocol for review, investigation, action, closure and feedback independent of management where necessary, but involving senior business unit or HR management as appropriate. For complex issues, formal investigation plans are drawn up, and support from external experts is engaged where necessary. Feedback is recognised as an important element of the Speak Up process and we aim to provide an update on all reports within 28 days of receipt.

Human Rights

The Group human rights policy reflects the principles contained within the United Nations Universal Declaration of Human Rights, the International Labour Organisation's Fundamental Conventions on Labour Standards and the United Nations Global Compact. The policy applies to all Group employees. It sets out the principles for our actions and behaviour in conducting our business and provides guidance to those working for us on how we approach human rights issues.

The Group commits not to discriminate in any of our employment practices and to offer equal opportunities to all. The Group respects the principles of freedom of association and the effective recognition of the right to collective bargaining and opposes the use of, and will not use, forced, compulsory or child labour. These principles have been integrated into the work of our procurement teams as we assess our suppliers and their business practices. In compliance with the UK Modern Slavery Act, the Group published its third annual statement in May 2018.

Anti-bribery and corruption and working with third parties

We engage with various third-party representatives and intermediaries in our business. We recognise that they can present an increased anti-bribery and corruption risk. Our procedure on working with third parties clearly outlines our zero-tolerance approach to bribery and provides practical guidance for our employees in identifying concerns and how to report them. Vesuvius engages with third-party sales agents, many of whom operate in countries where we do not have a physical presence. Our employees' use of, and interaction with, sales agents is supported by an ongoing training programme for those who have specific responsibility for these relationships.

Data protection

Our data protection policy requires a uniform approach in the handling of personal data to manage the privacy obligations of the Group. Everyone has rights in respect of how their personal data is handled. Our policy recognises that the lawful and correct treatment of personal data is vital to our continued success in an increasingly regulated global marketplace. During the course of our activities we may collect, store and process personal data about our staff, customers, suppliers and other third parties. We are committed to treating this data in an appropriate and compliant manner.

Training

During the year we continued to develop our training programme on the principles contained in the Vesuvius Code of Conduct and associated anti-bribery, corruption and other compliance policies and procedures. Training gives our employees a clearer understanding of the scope of risks that exist as we conduct our business and gives context to how the Group expects each one of us to respond to those risks. In 2017, we launched an integrated learning management system which allows us to deliver Vesuvius-specific e-learning modules to employees on topics relevant to their role through an online interactive platform. We have continued to utilise this system during 2018.

Training provided during 2018 included:

> E-learning modules for gifts, hospitality and entertainment, trade sanctions, due diligence and role-specific data protection modules

> Webex and video conference workshops

> Face-to-face training by the Legal and Compliance team to staff at several sites covering gifts, hospitality and entertainment and trade sanctions

Our e-learning platform supplements the face-to-face training provided to employees by the Legal and Compliance team, enabling us to reach more employees, more quickly and in a more targeted way. In 2019, we will continue to develop the training processes and modules available.

Monitoring and evaluation

Alongside our training programme, we assist employees with the implementation and interpretation of the Group's policies, and their application through a process of monitoring and evaluation. Part of this process involves performing ongoing and targeted due diligence and risk assessments to inform our policy design and its application. This forms part of our compliance framework to ensure that our ethical and legal approach remains fit for purpose and is understood throughout the business.

Speak Up

We continue to monitor the volume, geographic distribution and range of reports made to the Speak Up facility to ascertain not only whether there are significant regional compliance concerns, but also whether there are countries where access to this facility is less well understood or publicised. During 2018, the Audit Committee continued to monitor and oversee the Group's procedures for reporting allegations of improper behaviour, and throughout the year received updates on the nature and volume of reports received from the confidential Speak Up Helpline, key themes emerging from these reports and the results of any investigations undertaken. In 2018, we received 21 reports (2017: 76) through the Speak Up facility. Each one of these was investigated. Similar to 2017, a substantial majority of reports received in 2018 were human resource issues which indicated no compliance concerns, nor serious breaches of the Code of Conduct. Of the small number of reports received that contained allegations in breach of our Code of Conduct, thorough investigations were performed and, where appropriate, disciplinary action taken, including individuals leaving the Group as a result.

Prevention of slavery and human trafficking

During 2018 we published our third transparency statement outlining the Group's approach to the prevention of slavery and human trafficking in our business and supply chain. A copy of our latest statement is available to view on our website www.vesuvius.com. Since the publication of our first statement we have conducted a risk assessment of our purchasing activities, seeking to identify, by location and industry, where the potential risks of modern slavery are highest. Our assessment identified the following four industries that pose a higher risk of modern slavery for Vesuvius:

1. Mining and Extractive industries (raw materials)
2. Textiles (personal protective equipment (PPE) and work clothing)
3. Transport and packaging
4. Maintenance, cleaning, agricultural work and food preparation (contracted workers)

To ensure effective communication of our Human Rights Policy and output of our Modern Slavery risk assessment we provided face-to-face training to our key purchasing staff and continue to use an online e-learning module to upgrade the training given to all supplier-facing staff. This provides key guidance on the red flags associated with modern slavery to assist them in identifying these during supplier visits and accreditation.

Working with third parties

During 2018 the Group continued the review of our third-party representatives and intermediaries. Following the 2017 enhanced review of sales agents we extended our review to the work of our custom clearance agents. This included a detailed review of our due diligence activities on active custom clearance agents across the Group. This process covers reputation, public information searches, regulatory searches and activity review. The review of our due diligence processes will continue to be extended using a risk-based approach during 2019 and beyond.

During the year we also completed our global training programme with those employees who have responsibility for our sales agents and provided such employees with face-to-face enhanced Anti-Bribery training. This included applicable policy and procedure training, the identification of red flags and interactive case study sessions. Such training will remain a continuing part of our compliance programme.

Data protection

In 2018 we continued to review our approach to data protection, following the implementation of the EU General Data Protection Regulation (GDPR) in May 2018. Further due diligence was undertaken with the appointed Data Protection Officer ('DPO') and European legal entities, clarifying the data we control and process both globally and locally in Europe, the methods by which we do this, the security of the systems that hold our data and the assignment of responsibilities for responding to this. Annual self-assessment GDPR audits have been prepared and will be rolled out on each anniversary of GDPR implementation and thereafter to assess and ensure continued compliance with data protection legislation. We have identified further upcoming changes in data protection legislation in California, Brazil and India and are working with local teams to ensure our approach to data protection is compliant with these changes. The DPO is also responsible for raising awareness of data protection issues across the Group, supervising privacy impact assessments and training staff who undertake roles that involve the processing of data. Specific data protection training for IT and other targeted professionals was provided through e-learning in 2018.

Other due diligence

The Group continues to undertake focused, country- and function-specific risk assessments, reviewing financial records and the quality of implementation of our policies and procedures, often engaging the assistance of external advisers. The outputs of these assessments are used to identify activities that require further improvement, ensure that our Group policies and procedures for the management of anti-bribery and corruption risk continue to be appropriate for the business, and ensure that within our business there is the necessary awareness and understanding to be able to manage risks appropriately.

Health and safety

The Group is striving to become a best-in-class organisation for safety performance

We remain fundamentally committed to protecting the health and safety of employees, contractors, visitors, customers and any other persons affected by our activities.

Health and safety is identified as one of Vesuvius' key strategic objectives, and our commitment to health and safety is embedded throughout the organisation. Our ethos is to identify, eliminate, reduce or control all workplace risks, and an ongoing system of training, assessment and improvement is in place to focus on achieving this. In 2018, despite achieving our best overall safety performance since demerger, with a lost time injury frequency rate of 1.3 per million hours worked, a third-party contractor working at one of our premises was fatally electrocuted – a grave reminder that there is still much work to do on safety.

As a result of this incident we conducted a complete review of the working practices and procedures related to contractors, issuing a 'red stripe' alert to all employees. All related internal standards were updated and reissued.

Safety Breakthrough

Safety Breakthrough is our global initiative to reduce the number of accidents, fires and lost time injuries, and to increase safety awareness through greater employee engagement. Our aim is to raise health and safety performance to best-in-class levels throughout our business, attaining the lowest level of accidents within our industry sector with the target of reaching zero accidents throughout Vesuvius. This applies to all Vesuvius employees, whether working at one of our facilities or located on a customer site. The specific focus on customer location safety continues to yield results not only for our employees but also our customers' employees, helping to support the strong relationships built between customers and Vesuvius.

Changes were also made to the relevant local management team to strengthen management supervision and control.

Safety leadership

Safety performance remains the priority item on the agenda at all our Group Executive Committee and management meetings, and safety performance is reported to the Board by the Chief Executive as a matter of priority at each Board meeting. The Group Executive Committee reviews all of the more serious incidents, including all lost time injuries, and the responses to these from local management. The Group remains fully committed to continuing safety improvement with a Group health and safety policy stating a clear goal of:

> No lost time injuries

> No repeat injuries

> No harm to our people or contractors

Health and safety responsibility and accountability

The business units are directly accountable for their health and safety performance, with each business unit determining its own priorities and resource allocations. Health and safety performance is included in the objectives and linked to the remuneration of all senior managers. It is regarded as a core management responsibility, with executives and line managers directly accountable for health and safety matters in the operations under their control. This tone from the top is demonstrated by the requirement for all senior managers to perform executive safety tours, report on their findings to local operations

Our approach to health and safety is based on the following beliefs

1. Good health and safety is good business

2. Safety is everybody's responsibility

3. Working safely is a condition of employment

4. All work-related injuries and work-related ill-health are preventable

Vesuvius employees and contractors must carry out a Risk Assessment and obtain a Permit to Work for non-standard activities, to ensure risks have been properly identified and evaluated, and a safe work procedure defined.

management and follow up on improvement requirements. In this structure all employees understand that they have a responsibility to take care of themselves and others whilst at work.

We expect everyone to participate positively in the task of preserving workplace health and safety.

The Group Vice President HSE and Quality is responsible for setting the Group's policies for health and safety and controlling their application, with the business units taking full responsibility for their implementation and accountability for performance against them.

Every business facility has an appointed health and safety manager, who works with management and all employees to review site health and safety, assess training needs and develop and implement site safety improvement plans. These local health and safety managers are assisted by central experts who not only identify adverse trends and respond to them, but also enable the sharing of best practice across Vesuvius.

Accountable management for safety performance

Site safety improvement plans are now in place for all production sites with implementation being the direct responsibility of local managers. Any site experiencing a serious dangerous occurrence or medically treated injury is required to investigate using 8D methodology, they must then incorporate findings into their site safety improvement plans and share their incident investigation and action plans across the Group.

Health and Safety Policy and standards

All employees are required to adhere to the Group's Health and Safety Policy and Alcohol and Drug Policy. Copies of the policies signed by all members of the Group Executive Committee are translated into local languages and displayed prominently in all locations.

The Health and Safety Policy is supported with standards, procedures and ISO certifications, which are reviewed and updated on an ongoing basis. In 2018, a new standard was created relating to the safe storage of bulk bags and pallets of bags, and the standards relating to the Control of Contractors and the Inspection, Maintenance and Testing of Fixed Electrical Installations were reviewed and updated. The findings and lessons learned from incident investigations are incorporated into updates to prevent any reoccurrence and new or improved standards are issued for implementation across the Group.

Vesuvius health and safety standards

> Accident & Incident Reporting

> Business Continuity

> Control of Contractors

> Crisis Management & Crisis Communication

> Ergonomics Standard

> Fork Lift Truck Safety

> Gas Standards

> Inspection Maintenance and Testing of Fixed Electrical Installations

> Legionella

> Lock,Tag and Try

> Machine Safety

> Permit to Work

> Planning

> PPE Minimum

> Risk Assessment

> Road Vehicle

> Safe Storage of Bulk Bags and Pallets of 25kg Bags

> Working Safely with Fibres

Health and safety continued

Health and Safety highlights

Awards

In our Customer's plant in Huachipato (Chile) we received an award from the customer for our results in HSE and for the outstanding HSE systems we have in place.

Foseco India Ltd in Pune was recognised by the Deccan Chamber of Commerce Industries and Agriculture-Pune(DCCIA -Pune) for 'Excellence in Best Safety Practices -2018'. DCCIA recognised our unique safety practices, overall safety culture, the commitment of management to safety, and the efforts of employees in this regard, along with our continuous journey towards safety improvement.

ArcelorMittal South Africa ,Newcastle Works recognised Vesuvius for an exceptionally good safety performance.

Vesuvius India received awards from TATA including the award for best safety practices in runner management, best safety model, best safety Kaizen and best safety performance. Essar awarded Vesuvius their trophy for consistent performance in health and safety. JSW recognised Vesuvius for best safety practices in runner management, best performing safety contractor and best contractor employee performance in safety for 2018.

Vesuvius Health and Safety Policy

We will operate all work and business activities in a manner which ensures the health and safety of employees, contractors, visitors, customers and any other persons affected by these activities.

We will comply with the legal health and safety obligations.

We will be pro-active in preventing injuries and ill-health, and continuously improve our H&S systems and performance.

Organisation and Responsibilities

We regard health and safety matters as a mainstream management responsibility. Executives and line managers are directly responsible for health and safety matters in operations under their control. Management is accountable for H&S performance against objectives.

All employees have a responsibility to take care of themselves and others whilst at work. We expect everyone to participate positively in the task of preserving workplace health and safety.

We will encourage our Suppliers to adhere to the same Health & Safety standards as we do.

Our Beliefs

> Good Health and Safety is Good Business

> Safety is everybody's responsibility

> Working safely is a condition of employment

> All work-related injuries and work-related ill-health are preventable

Our Aims

> No Accidents

> No Repeat Injuries

> No Harm to People

Our Commitments

> Every business facility will follow the agreed H&S plans

> We will thoroughly investigate any incident to learn, share and avoid repeats

> Risk assessments will be undertaken to identify hazards, prioritise any deficiencies and correct them in an appropriate way as well as to develop appropriate safe work procedures

> We will abide with simple and non-negotiable standards

> We will provide Training for all employees and contractors to ensure that they understand their responsibilities and are able to act accordingly

> Every business facility will have an appointed H&S Manager

This policy has been approved by the Group Executive Committee and is displayed and implemented at all facilities.

The Group Executive Committee
Version 2.0.6, 10/2018

Health and safety certifications

We have 11 sites certified to OHSAS 18001:2015, eight (14%) manufacturing sites and three Vesuvius operations in customers. Vesuvius sites choose to certify based on local regulatory and customer requirements.

Training employees to work safely

Turbo S training pulls together all of our safety management practices. Using a train-the-trainer approach, Turbo S training sessions are tailored to the audience and their activities. For example, there is a special training course developed for employees at customer locations that focuses on the specific risks faced by these individuals. We conduct Permit to Work training in all Group facilities, including customer locations, which ensures that all non-standard work conducted in our facilities, whether by our employees or contractors, is the subject of a pre-commencement risk assessment and a formal permission to commence activity, setting out the safety requirements. We have developed machinery safety training with an outside industry leader, Pilz GmbH & Co, a company specialising in safe automation technology. We are now extending recognised best practices throughout the Group through a series of machinery assessments and training programmes with each site identifying and addressing the top five issues by severity as a matter of priority.

Working in tidy plants

The continuing use of 5S, the workplace organisation method, throughout the Group has driven significant improvements in our workplace environment. Employees are encouraged to develop ownership of their working areas and take pride in their cleanliness and organisation. The added support of our lean specialists has been key to improving plant safety by removing hazards for employees and offering a clear, bright and safe working environment. Regular 5S audits led by team leaders ensure continuous improvement of working conditions and promote a safer workplace.

Training activities undertaken in 2018 for our employees and contractors included:

> 5S
> Arc flash hazard training
> Control of Contractors
> Environmental Waste Reporting
> Ergonomics
> Executive Safety Tour Leader
> Fire Fighting
> First Aid
> General Health and Safety and refresher training
> Hazard Perception
> Hazardous Goods
> Health and Safety Representatives
> ISO 45001:2018
> Legionella
> Lock, Tag and Try
> Incident and Performance reporting
> Machine Safety
> Permit to Work
> Practical Safety in Steel Customers
> Radiation
> Safe Stacking
> Steel mill orientation
> Safety and Environmental Auditing
> Turbo S Safety and Safety Leadership
> Working at Heights

And in relation to vehicles

> Bike Safety
> Defensive Driving
> Fork Lift Truck

Turbo S

Turbo S, as part of our Safety Breakthrough initiative, builds on the foundation of Safety Breakthrough and includes a strong focus on the standardisation of all our repetitive activities. Turbo S also integrates good management practices in the workplace, with a strong emphasis on developing an organisation that enables everybody to work to the same high standards in safety performance.

As part of the continuing Turbo S initiative:

> Senior executives regularly lead safety tours at all locations
> Severe accidents are formally reviewed by the Group Executive Committee
> Employees are routinely engaged in safety audits
> We invest significantly in safety training for all employees, irrespective of their role and function within our business
> All employees are expected to routinely raise and implement safety improvement opportunities; we focus on the number of implemented ideas
> Safety standards are continually updated, translated and deployed throughout the Group
> All injuries and dangerous occurrences are analysed locally, with a formal presentation of findings, root causes and improvement actions cascaded through management

Health and safety continued

Health and safety auditing

In 2018 a new central safety auditing team was established, reporting to the Vice President HSE and Quality. Its main purpose is to verify the deployment and ongoing application of the Group's standards and policies in our locations (including manufacturing sites, warehouses and R&D facilities) and the customer locations in which a significant number of our employees operate daily. This team will systematically audit Group locations worldwide against these policies and standards, and will include an assessment of each site's HSE leadership. In doing this they will contribute to the ongoing improvement of Vesuvius' health and safety standards by combining their experience from other industries, the observations made during audits, and the application of risk-based improvements in response to external developments on a consistent Group-wide basis.

The Group HSE audit team will report the results of audits as well as the progress of action plans addressing the most critical issues to the Board.

Executive safety tours

The executive safety tours carried out by senior managers provide visible safety leadership on the shop floor in our sites and at our customer locations. These, along with our daily safety audits, are a pillar of our Safety Breakthrough initiative. In 2018, 115 Executive Safety Tours, of which seven were in customer locations, were carried out by members of the Group Executive Committee and their direct reports.

Accident and incident reporting and analysis

A significant investment in time and resources has been made over recent years to develop robust, comprehensive and timely reporting of incidents (including all fires, explosions and any material spill or other chemical releases). In our internal standards, we continue to use more stringent definitions for lost time injuries (LTIs) and 'severe accidents' than the definitions used by many regulatory bodies. As the number of lost time injuries sustained in the organisation fell, we introduced reporting on Medically Treated Injuries to maintain the focus on safety, with investigation extended to all serious dangerous occurrences and all Medically Treated Injuries.

In 2018, there was tragically one fatality of a contractor working at a Vesuvius site. In addition, 37 LTI's were reported which resulted in 2,132 lost days, and gave an LTI frequency rate for the year of 1.3, a marked reduction versus the 1.6 recorded in 2017 The LTI frequency rate for the 782 contractors who worked for us during the year was 0.65.

200 medically treated injuries ('MTI's) were reported in 2018 out of a total of 491 injuries reported, resulting in an MTI frequency rate of 7.26. One additional MTI recordable was reported in respect of contractors giving a contractor recordable MTI frequency rate of 1.30. There was also one other medically treated injury reported in relation to a contractor, a total for three contractor accidents.

We have actively been encouraging the reporting of all dangerous occurrences and injuries as only through reporting, sound root cause analysis and preventative action plans, can future occurrences be prevented. As a consequence, there was an increase in the number of dangerous occurrences reported in 2018 to 649 (2017: 409).

Vesuvius' investigation procedures are based on the 8D Practical Problem Solving ('8D') tool, which aims to identify the true root causes of incidents to prevent a repeat. Results are formally presented to management, with details of the 8D-based root causes and improvement actions cascaded throughout the organisation.

Based on the analysis of the kind of accident, type of injury and parts of the body affected, the businesses develop risk-based action plans that consider both the frequency and severity of incidents and track progress. Every site management team receives a monthly dashboard of health and safety related performance indicators covering both lagging and leading metrics.

As part of management reporting, the Board receives a detailed monthly update on all lost time injuries.

Executive Safety Tours carried out in 2018

Vesuvius 8D Practical Problem Solving Methodology

D1	clarify the problem
D2	grasp the current situation
D3	contain and set target
D4	analyse causes
D5	define countermeasures
D6	execute and track progress
D7	check results
D8	standardise and establish control

In 2018, we achieved our best overall safety performance since demerger, with a lost time injury frequency rate of 1.3 per million hours worked.

Lead and lag indicators

In our plants in 2018, more than 80% of our working population performed routine safety audits every month, generating an average of more than ten implemented improvement opportunities per person, more than 9,900 in total, resulting in an improvement in worker safety. The audit programme involves employees at all levels – from the Group Executive Committee and safety specialists through to local site management, employees and contractors.

Our Take 2 initiative ensures that employees think again before performing any unusual or non-standard activity. Simply stated, the employees take 2 minutes to discuss the task, any hazards and how to prevent accidents before any work is started. This process allows the team to consider and reflect on hazards and the controls required before work commences.

For new contracts in customer locations, we use a formal risk assessment which aims to identify significant risks to our employees and contractors. This enables appropriate control measures to be agreed and implemented with the support of our customers in advance of work commencing. We continue to work hard to reduce incident severity and generate actionable insights from the performance indicators we capture. The lost time injuries frequency chart shows how injuries have been reduced and how that reduction has been maintained through a combination of a behaviour-based approaches to safety and the implementation of physical safeguards. We focus on the safety of all our personnel, whether they are employees or contractors.

Safety performance in 2018 is detailed below:

Performance Indicators	All Employees Contractors and Visitors
Work Related Death	1
Severe Injuries	2
Lost Time Injuries (LTI)	37
Lost Time Injuries frequency (LTIFR)	1.34
Recordable Injuries	122
Recordable Injuries frequency (RFR)	4.43
Medically Treated Injuries (MTI)	200
Medically Treated Injuries frequency (MTIFR)	7.26
Total Number of Injuries	491
Injury frequency	17.83
Lost Time Incident Lost Days	2,132
Lost Time Incident Severity Frequency Rate (Lost Days)	77
Dangerous Occurrences (DO)	649
Dangerous Occurrences Frequency Rate	23.56
Safety Audits Number	121,202
Safety Audits per 20 Employees per month	16
Employees Participating in monthly Safety Audits	9,971
Employees Participating in monthly Safety Audits %	80%
SIOPA	92,793
Other IOPA	36,502
IOPA Total	129,295
SIOPA per Employee	7
Other IOPA per Employee	3
IOPA Total per Employee	10
Hours Worked	27,544,837

All Frequency Rates are per million hours worked
IOPA: Improvement opportunity implemented with a permanent corrective action
SIOPA: Safety Improvement opportunity implemented with a permanent corrective action

Sustainability

We continue our efforts to reduce energy consumption and waste generation in our manufacturing processes

Our solutions improve the quality of our customers' products and reduce the environmental footprint of their processes.

Vesuvius and climate change

Vesuvius recognises society's expectations for greater transparency around climate change, expressed by initiatives such as the recommendations of the Financial Stability Board's Task Force on Climate-related Financial Disclosures. Vesuvius' businesses focus on delivering solutions to help our customers improve the productivity of their operations and reduce their environmental footprint. According to estimates from the World Steel Association, on average for 2017, 1.83 tonnes of CO_2 were emitted for every tonne of steel produced, with the steel industry generating between 7% and 9% of direct emissions from the global use of fossil fuel. With around 10 kg of refractory material required per tonne of steel produced, the careful selection and use of energy-saving refractories can beneficially impact on the net emission of CO_2 in the steel manufacturing process.

In the foundry process, the amount of metal melted versus the amount sold as finished castings is the critical factor impacting a foundry's environmental efficiency. Vesuvius continuously works with its customers to increase the ratio of metal in finished castings to metal melted.

With respect to our own operations, the Board recognises that good environmental management is aligned with our focus on cost optimisation and operational excellence. Whilst Vesuvius' products vary significantly in the energy intensity of their manufacture, the majority of our manufacturing processes are not energy intensive nor do they produce large quantities of waste and emissions. Two of our 35 main manufacturing processes (VISO and Slagdol production) account for 39% of our energy consumption and 58% of our CO_2e emissions. (We report in kg of CO_2 equivalent ('CO_2e').) A further four processes consume more than 24% of the Group's total energy consumption. The Group has clear targets for energy saving, with ongoing effort focused on increasing the efficiency of our production processes. As a result of this work and also as a result of increased efficiency in Slagdol production, we achieved a 19.8% decrease in the amount of coal consumed in the past year. Vesuvius' total energy costs are less than 3% of revenue, with only 1.6% of the total energy requirements across the Group consumed in the UK.

Vesuvius operates sites in a number of developing markets where environmental concerns have become politically significant, as air quality deteriorates and residential expansion takes people closer to areas historically reserved to manufacturing. As a result, environmental compliance at our sites, reduction in waste, increased recycling and treatment of emissions, are now fundamental to Vesuvius' operations, and can be a key differentiator for our business. Correctly managed, these issues can deliver social, environmental and economic benefits to the Group and to our wider stakeholders.

Our customers and their processes

Under the Vesuvius and Foseco brands, we deliver a wide range of solutions that help our customers improve the productivity of their operations. These solutions also improve the quality of our customers' products and reduce the environmental footprint of their processes.

Thermal optimisation and reject reduction are key factors in the efficiency of the processes for which we supply solutions. We contribute to the reduction of our customers' energy usage and subsequent CO_2 emissions through insulating materials, metal flow management, facilitating extended manufacturing sequences (meaning less reheating) and reduced downtime.

How does Vesuvius Contribute?

Since 2011 we have used a CO_2 impact stamp to highlight the most energy-efficient solutions in our portfolio of products and services and to support the deployment of energy-efficient and sustainable solutions engineered by our technology departments.

The table below details the fuel consumption for the main fuels consumed across the Group in 2018.

Category	Energy Used MWh 2018	Energy Used MWh 2017	% change	CO_2e m kg, 2018	CO_2e m kg, 2017	% change
Coal	**274,684**	342,399	-19.8%	**89**	111	-19.7%
Electricity	**214,195**	215,577	-0.6%	**111**	119	-6.5%
External Heat	**4,615**	5,045	-8.5%	**1**	1	-8.8%
LPG	**70,389**	71,879	-2.1%	**15**	15	-2.1%
Natural Gas	**731,273**	711,460	2.8%	**135**	131	2.7%
Non Fuel Emissions	**0**	0	0.0%	**130**	137	-5.5%
Total[1]	**1,295,156**	1,346,360	-3.8%	**481**	514	-6.6%

All fuel consumption is converted to MWh for reporting.

1. Total reflects total of those fuels identified, not total consumption of all fuels in the Group as data for some minor forms of fuel use are not currently collated.

Vesuvius products and services facilitate environmental benefits by:

- Enabling lighter, thinner and stronger components, leading to lighter vehicles and less energy consumption
- Improving customer processes through the supply of innovative consumables to reduce energy intensity and the CO_2e intensity ratio
- Reducing customers' refractory usage per tonne of steel produced through higher-quality, longer service-life products
- Increasing the level of sound castings produced per tonne of metal melted through improved mould design and the application of molten metal filtration and feeding systems

Vesuvius' energy consumption and emissions

In 2018, we achieved a 3.8% decrease in the amount of energy consumed. Natural gas use increased by 2.8%, primarily as a result of an increase in production volumes and changes in product mix, whereas electricity use decreased by 0.6%. Coal consumption decreased by 19.8%, from 45.6 thousand metric tonnes in 2017 to 36.4 thousand metric tonnes in 2018. In 2018, the Group also consumed 387 cubic metres of diesel in the operation of fork-lift trucks on its sites and 236 cubic metres of fuel oil. Thanks to this improved energy mix and global energy consumption decrease, we decreased our CO_2 emissions by 6.6%.

Environmental monitoring

All our factory emissions are proactively managed in accordance with local regulations. Regular analysis enables us to act to reduce our emissions where possible and to operate more efficiently. The Group monitors its energy consumption, worldwide CO_2e emissions and usage of water. Vesuvius proactively seeks to reduce waste in production and to reuse and to recycle materials where practical.

In 2018, Vesuvius recorded 22 minor environmental incidents. All but one of these related to minor spills on-site that were immediately cleaned up, with the other pertaining to an on-site odour generated from a research experiment. Total spills are estimated to be less than one tonne. Where incidents occur they are contained via Vesuvius' site environmental response plans and reported through the Vesuvius incident reporting system. We comply with local reporting requirements in respect of such incidents. No action was taken by any authority in relation to any incident in 2018.

Energy conservation plan

The Vesuvius Energy Conservation Plan was launched in 2011 with the objective of reducing our normalised energy consumption by 10% over the following three years. In June 2015, we reset our focus and set the objective of a 10% improvement (using 2014 as our base year) by 2018. Against that 2014 base, a 10.2% improvement has been realised surpassing this target.

Managing our energy intensity not only has an environmental benefit but is also part of our long-term strategy to enhance our cost-competitiveness.

Water Conservation

Vesuvius works to reduce the consumption of water in its manufacturing processes by recycling and improving processes to reduce consumption. No saltwater or cooling water is obstracted. As with energy use, normalised consumption of water varies with product mix. In 2018 there was a slight increase in both absolute water consumption, and normalised water consumption – that is water use per tonne of product manufactured – reflecting changes in product mix and product packed for shipment where we manufacture more of our products that demand water consumption.

Sustainability continued

Greenhouse gas reporting

In line with our total energy consumption, both total emissions and normalised emissions decreased in 2018. Our Greenhouse gas ('GHG') emissions are limited to CO_2, with emissions of other GHGs at a de minimis level.

In reporting GHG emissions, we have used the GHG Protocol Corporate Accounting and Reporting Standard (revised edition) methodology to identify our GHG inventory of Scope 1 (direct) and Scope 2 (indirect) CO_2e. We report in kg of CO_2 equivalent ('CO_2e').

The Group also meets all its obligations in relation to the Carbon Reduction Commitment ('CRC') Energy Efficiency Scheme, the Producer Responsibility Packaging Waste regulations and the Energy Saving Opportunity Scheme by which the UK has implemented the EU Energy Efficiency Directive.

Environmental Policy

All employees are expected to adhere to the Group's Environmental policy, which is translated into local languages and displayed prominently in all locations. This policy is supported with standards and procedures which are reviewed and updated on an ongoing basis.

Global GHG emissions (kg of CO_2e)

	2018	2017
Emissions source		
Combustion of fuel and operation of facilities (Scope 1)	**370m**	397m
Electricity, heat, steam and cooling purchased for own use (Scope 2)	**113m**	121m
Total GHG emissions	**483m**	518m
Change	**-6.6%**	
Vesuvius' chosen intensity measurement (kg of CO^2e per metric tonne of product packed for shipment)		
Emissions reported above, normalised to per tonne of product output	**478.9**	527.5
Change	**-9.2%**	

Methodology We have reported to the extent reasonably practicable on all the emission sources required under Part 7 of the Accounting Regulations which fall within our Group Financial Statements.

Scope 1 covers emissions from fuels used in our factories and offices.

Scope 2 relates to the indirect emissions resulting from the generation of electricity, heat, steam and hot water we purchase to supply our offices and factories.

We have used data gathered to fulfil our requirements under the CRC Energy Efficiency scheme and emission factors from UK Government's and the IEA GHG Conversion Factors for Company Reporting 2018 in the calculation of our GHG.

Vesuvius Environmental Policy

We will operate all work and business activities in a manner which ensures appropriate care and protection of the environment.

We will comply with all applicable legal and other local environmental obligations. We will be pro-active in preventing negative effects to the environment, and will continuously improve our environmental management systems and performance.

Organisation and Responsibilities

We regard environmental matters as a mainstream management responsibility. Executives and line managers are directly responsible for environmental matters in operations under their control. Management is accountable for environmental performance against objectives.

Each and every employee is responsible and accountable for environmental matters in activities under their control.

We will encourage our Suppliers to adhere to the same Environmental standards as we do.

We expect everyone to participate positively in achieving our environmental aims.

Our Beliefs

> Preserving the Environment is Good Business

> All employees must contribute to protect the environment

> All environmental incidents are preventable

Our Aims

> Reduce waste at source and during production

> Minimise consumption of energy, water and other resources

> Minimise releases of substances which could adversely affect humans or the environment

Our Commitments

> We will raise environmental issues at all levels and openly address them

> We will build environmental protection into our products and processes

> Environmental risk assessments will be undertaken to identify hazards, prioritise any deficiencies and correct them in an appropriate way as well as to develop appropriate procedures

> We will provide training to all employees and contractors to ensure that they understand their responsibilities and are able to act accordingly

> Every business facility will have an appointed Environmental Manager

This policy has been approved by the Group Executive Committee and is displayed and implemented at all facilities.

The Group Executive Committee
Version 2.0.6, 10/2018

Certifications

We have 25 manufacturing sites certified to ISO 14001:2015, representing 42% of our manufacturing sites. Local management makes the decision on whether to certify their site based on local regulatory and customer requirements.

Country	Company Name	Site
Australia	Foseco Pty Ltd	Sydney
Belgium	Vesuvius Belgium N.V.	Ostend
Brazil	Foseco Industrial e Comercial Ltda	Sao Paulo
China	VSV Advanced Ceramics (Anshan) Co.,Ltd.	Anshan
China	Vesuvius Advanced Ceramics (Suzhou) Co., Ltd	Suzhou
Czech Republic	Vesuvius Česká Republika, a.s.	Trinec
Czech Republic	Vesuvius Solar Crucible, s.r.o.	Moravia
Germany	SIR Feuerfestprodukte GmbH	Siegen
Germany	SIR Feuerfestprodukte GmbH	Kreuztal
Germany	Vesuvius GmbH	Grossalmerode
Germany	Vesuvius GmbH	Borken
India	Foseco India Limited	Puducherry
India	Foseco India Limited	Pune
Indonesia	P.T.Foseco Indonesia	Jakarta
Japan	Foseco Japan Limited	Toyokawa
Netherlands	Foseco Nederland BV	Hengelo
Poland	Vesuvius Poland Sp. z o.o.	Skawina
South Africa	Vesuvius South Africa (Pty) Limited	Olifantsfontein
South Korea	Foseco Korea Limited	Gyeonggi-do
Spain	Vesuvius Iberica Refractarios S.A.	Langreo
Sweden	Vesuvius Scandinavia AB	Amal
Taiwan	Foseco Golden Gate Co. Limited	Ping Tung
United Kingdom	Vesuvius UK Limited	Chesterfield
United Kingdom	Vesuvius UK Limited	Tamworth
USA	Vesuvius USA Corporation	Cleveland

People and community

People are the centre of our business

We believe that the personal growth and job satisfaction of our employees is key to the success and growth of the business.

Our objective is to support and drive a high-performance culture leading to better business outcomes delivered by a cadre of truly engaged employees. We do this by building broad organisational understanding of our strategy, goals and accountability, supported by our CORE values, continuous improvement and positive management behaviours. We also foster a working environment that is inclusive and diverse, where people can be themselves without fear of harassment, bullying or discrimination.

Our leaders take full responsibility for managing and developing their teams. They are provided with access to a central resource, offering expertise in Global Rewards & Mobility, Talent & Performance Management, Culture and Learning, and supported by Group-wide processes and information systems. We have implemented best-in-class talent development programmes for high potentials and we collaborate with market-leading learning institutions to deliver this.

The Group Executive Committee holds direct responsibility for the top managers, jointly reviewing capability needs and deciding on development, succession and cross organisational moves for this leadership group. This illustrates the strong commitment at the highest level of our organisation towards growing the Group using its Company-wide resources.

We employ individuals who embody an entrepreneurial mindset and an international outlook. Whether they are recent graduates or seasoned professionals, everybody who wants to leave their mark in a dynamic rapidly developing business environment has a chance to succeed. Special attention is paid to building strong, diverse teams that bring different backgrounds and experiences to our daily work. The team of top leaders currently consists of 25 nationalities located in 24 countries.

The Company invests in a constant dialogue with employees at various levels, using a mix of traditional communication channels, such as posters and websites, as well as modern digital solutions, such as mobile applications. Feedback mechanisms are built into our processes, so that we can capture the spirit of our workforce and the best ideas of employees.

Our training programmes

ADVANCE

This is a first-generation management development programme aimed at developing individual contributors who are likely to occupy a line management role and managers who need to be familiar with a broad range of people management skills to use in projects.

Last year we ran the programme for our first cohort and we have since launched it across all regions. The programme is designed to last 12 months and blends learning approaches, using online, face-to-face and project-based techniques. Participants are supported by line management and HR business partners for the duration of the programme.

WINGS

This is the Vesuvius middle management development programme aimed at those who manage other managers. Wings is an established programme in partnership with Vlerick University, Belgium. The programme provides an introduction to general management theory and practice, and encourages managers to explore their leadership styles.

ASCENT

This is the Vesuvius high-potential and senior leadership development programme which we developed in partnership with INSEAD. It is aimed at accelerating the development of top talent within the organisation and developing skills such as strategic business leadership, general business administration, value innovation and performance culture development.

The programme takes place over a nine-month period, and involves initial online modules, face-to-face workshops and individual and group projects, in which participants are assessed individually for further development. Participants are individually sponsored by members of our Group Executive Committee, and actively supported by their line managers and by senior HR management for the duration of the programme.

HeaTt

These courses form part of the Vesuvius Technical University aimed at the continuous technical development of Vesuvius employees. Courses range from entry to expert levels and are continuously updated to keep pace with developing technology, thereby guaranteeing that Vesuvius experts are at the forefront of technical innovation. They are a great way for our hugely experienced technical experts to pass on their knowledge to the next generation and ensure the sustainability of our know-how.

VESUVIUS HAS OFFERED ME NUMEROUS OPPORTUNITIES TO GROW AND DEVELOP MY CAREER.

I love that my job exposes me to new and exciting situations.

Alex Brown
Product Development Engineer
Cleveland, USA

Employee diversity

At Vesuvius, we believe that the dedication and professionalism of our people is the most significant contributor to our success. Having a balance of cultures, ethnicities and genders helps to promote innovation and creativity, and the diversity of our employees is one of the core strengths of the Group.

We are committed to providing equality of opportunity in all areas of human resources, whether in recruitment and selection, promotion, or training and development. Wherever a gap, we seek to address it as part of our wider commitment to promoting diversity and inclusion.

	Female	Male	Total	Female	Male
Group Executive Committee member	**1**	**8**	9	**11%**	**89%**
Senior management[1]	**9**	**113**	122	**7%**	**93%**
Middle management	**51**	**318**	369	**14%**	**86%**
All other employees	**1,369**	**8,940**	10,309	**13%**	**87%**
Grand total	**1,430**	**9,379**	10,809	**13%**	**87%**
Directors of subsidiaries included in consolidation[2]	44	408	452	10%	90%

1. Of these 122 senior managers, 43 directly report to members of the Group Executive Committee, and of these, three are women.
2. There are 452 directors of Group subsidiaries, 10% of which are women. This disclosure is made to comply with regulatory requirements. It includes Directors of dormant companies. Some individuals hold multiple directorships.

Employee consultation and industrial relations

In most of the countries in which we operate we inform and consult local works councils and trade unions in matters concerning the Vesuvius business. These processes and procedures are regulated by local law and we find that the constructive dialogue that takes place between employee representatives and management provides benefit to our business. In addition to local employee representation we operate a European Works Council ('EWC') that contains representatives from each of the EU countries where Vesuvius has employees. European management and the EWC meet formally once a year. At this meeting management provides an update on the performance of the business, with a focus on developments likely to impact European employees. Additional 'Special Event Meetings' are held when the Group is required to consult with the EWC about particular matters, including proposed restructurings in the European organisation. The EWC Select Committee also meets twice a year to receive additional updates, and the Chief HR Officer of Vesuvius joins part of these meetings. All EWC representatives receive four dedicated training days per year, to ensure they are appropriately equipped to fulfil their duties. In 2018 management notified one special event to the EWC, relating to the restructuring of the European Advanced Refractories and Foundry operations, which had transnational application.

In addition to formal discussion and consultation mechanisms, in many countries our operations hold 'town hall' meetings on a regular basis. These provide an opportunity for local management to meet with staff and provide an update on corporate developments and matters material to the business.

People and community continued

Spark Leadership Forum 2018

The Spark Leadership Forum was hosted by Patrick André and the Group Executive Committee, in June 2018, in Rome, Italy. The Group's top managers from around the globe, attended a two-day programme focused on Vesuvius' strategic growth and profitability targets.

Patrick André and Guy Young gave presentations on Vesuvius' vision and strategy, emphasising the need for everyone to strive to 'be the best', to focus on delivering to our customers and becoming world class performers. Each of the business unit Presidents expanded on this vision and strategy, providing operational detail on the plans proposed to achieve this performance.

The Forum was also used as an opportunity to launch the new set of corporate values: CORE – Courage, Ownership, Respect, Energy, and managers discussed action plans for promoting their use, embedding the associated behaviours, and for disseminating them throughout the organisation.

Our Chairman, John McDonough, CBE gave a keynote address emphasising the fundamental role of people in achieving Vesuvius' growth objectives. He remarked, "It is incumbent on everyone in this room to focus your efforts, on attracting, developing and retaining the very best people worldwide bearing in mind the proven fact that there is strength through diversity."

Talent management

Strengthening the leadership pipeline and facilitating people development throughout the organisation remain key areas of focus for Vesuvius. In 2018 we worked hard to ensure that we have the right capability in every part of the organisation to drive our strategy and realise market opportunities. As a result, we have built high-calibre leadership teams, many of whom are relatively new to their roles and to Vesuvius. As a next step we will focus on integrating this new talent into our organisation, building strong teams across all our geographies.

We empower our people to drive the business with an entrepreneurial spirit. To develop a focused, performance-oriented culture as well as support the entrepreneurial drive, we align our senior management in their strategic business outlook and performance goals across all operational and functional business areas.

We encourage and reward high performance, foster talent and aim to create an environment where all can realise their individual potential. To meet the demands of the business and add rigour to our employee value proposition, we have launched several training programmes to assist our employees to develop their skills and progress their careers, details of which are set out on page 66.

Global reward

Reward and recognition are integral components of our employee value proposition, enabling us to attract, engage and retain key talent and highly-qualified employees. Our reward systems are designed to create a market-competitive and fair pay environment for all our employees and to reinforce the vision, strategy and expectations set by the Board.

We seek to create a culture that champions performance, building a strong link between individual performance and pay. Supported by our online people management platform, 'MyVesuvius', performance reviews and subsequent reward decisions are based not only on how employees have performed against their individual objectives but also on assessments of behaviour and commitment to our CORE values. Our global job grading framework, based on a structured assessment methodology, enables us to compare roles and ensure internal consistency throughout the organisation. We are committed to creating reward and performance management systems which are transparent and objective, where employees receive equal pay for work of equal value, regardless of their age, race, disability, sexual orientation, gender, marital, civil partnership or parental status, religion or beliefs. Our management Annual Incentive Plans are measured against both Vesuvius' financial targets and personal performance, an incentive structure consistent with that of our Executive Directors. The Vesuvius Share Plan for Executive Directors and Group Executive Committee members encourages decisions based on long-term goals rather than short-term gains and works to align the interests of participants and shareholders.

Global mobility

Vesuvius is active worldwide. We believe that our companies should be managed and staffed by local personnel. However, we also provide selected groups of employees with a range of international assignments. These assignments are usually for a limited period, most often three years.

Vesuvius expatriates do not come from one or two countries alone. We have a truly international mix of nationalities in our expatriate population. Individuals move not only within a region, but also between regions, with existing assignments including Malaysia to China, China to Germany, Poland to the USA and Brazil to China. Our mobility programme shows that our expatriate population is as diverse as our Group.

Vesuvius operates a number of international assignment policies to provide for the different circumstances of these assignments – whether they be short term, longer-term, or require extended commuting. These policies are supplemented with clearly identified benefits, delivering support appropriate to the nature of the assignment. By accessing this broad range of policies, we can manage our international assignments with greater flexibility, thus catering for changing expectations and demands from employees, whilst at the same time meeting the needs of the business.

Vesuvius International Scholarship Programme

The Vesuvius International Scholarship Programme is set up to assist qualified dependent children of Vesuvius employees in helping to finance undergraduate and graduate education at accredited institutions. Awards are granted globally without regard to race, colour, creed, religion, sexual orientation, age, gender, disability or national origin.

Vesuvius has been involved in this programme for 23 years, during which period it has paid out $1,157,000 to assist 992 students in achieving their higher education goals. Individual scholarships have been awarded to employees' children living in: Australia, Belgium, Brazil, China, the Czech Republic, France, India, Indonesia, Italy, Malaysia, Netherlands, Philippines, Poland, Romania, South Africa, South Korea, Spain, UAE and the UK.

Key rationale behind international assignments

Vesuvius considers individuals for international assignment for three primary reasons:

> **Providing Vesuvius companies with skills that are not locally available and that are required at short notice.** This typically occurs in countries where we are establishing a new presence. The number of expatriates working on this basis diminishes over time as the organisation matures and we recruit and train local talent to take over

> **Career development.** We believe that the personal development plan of any employee being developed for a senior management, or senior expert position should include a posting outside their home country. This encourages them to develop the skills necessary to function successfully in an international environment. These postings are tailored to the needs of the organisation and the needs of the individual

> **Enhancing diversity.** Management teams benefit from having a mix of gender and cultures. In specific cases we use international assignments to achieve this goal

People and community continued

Vesuvius in the local community

Our social responsibility activities complement our values and drive our culture. Our operating sites engage with their local communities through various social action projects.

Mexico – Annual Homes Visit

In December 2018, employees and CORE committee members from Vesuvius Mexico volunteered at a children's home for girls and home for the elderly. The home for girls aged 2-18, who are victims of domestic violence, and nursing home for 53 elderly people, are both run by nuns. The team spent the day with the residents and donated clothing and groceries. These annual visits have been taking place for the past five years.

Aosta Half Marathon

In September 2018 Vesuvius Italia sponsored the fourth annual half marathon of Aosta, Italy. The half marathon, organized by COGNE steelworks, passes monuments and other sites of historical importance and beauty in the town of Aosta in north western Italy. A group of Flow Control and Advanced Refractories sales, technical and administrative staff plus their family members, teamed up to form a group of runners. In addition to the half marathon, other shorter races are held including an 11 km race, a 6 km family run, a 1 km baby run, and a 4 km tour, offering tasting options with typical Aosta Valley food! The runs raise a significant amount of money for local charities.

Pink October

In October, Vesuvius France and Mexico employees took part in 'Pink October' – Breast Cancer Awareness Month. This worldwide annual campaign involving thousands of organisations, highlights the importance of breast awareness, education and research. Sites hosted full day events which included speakers from local Sport & Health Associations, physical activities and also a raffle draw for free checkups. A donation of €400 was made for breast cancer research.

Alongside its work with those members of the community who are not directly connected with our facilities, Vesuvius also organises activities to involve the families and local communities with our operations.

Family Day and Open House 2018 Vesuvius Mexico

In August 2018, Vesuvius Mexico held an Open House event, to give the families of its employees the opportunity to get to know the facilities where their father, mother, husband or wife works. Around 90 children attended the event, at which Vesuvius Mexico launched a new award 'Successful father – successful son' to recognise children with a grade 90 or higher and parents with excellent work performance. There were emotional scenes when children received their awards with their parents. There were 56 winners of this award.

Everyone received a tour of the facility and offices, and as a gift the children received their own personal protective equipment.

Foseco India celebrates Family Day at Pune

In 2018 Foseco India celebrated a 'Foseco Family Day' at Pune. The day was aimed at bringing employees and their families together in a fun-filled environment to build stronger ties with each other. 400 people attended, with various events laid on throughout the afternoon and evening in an environment of energy, fun, creativity and entertainment. The party commenced with a 'Bollywood/Oscar theme' warm welcome, with people walking the red carpet to make an entry. Mrs and Mr Sanjay Mathur lit the lamp before a gala stage performance of a talent show was held. This was put together by Foseco family members and was followed by a team dinner.

The event drew together the wider Foseco India community, celebrating the pride of our employees in the Company they work for.

Vesuvius Foundry China sponsors first Young Entrepreneur forum

In May 2018 Vesuvius sponsored the first Young Entrepreneur forum of the China foundry industry, organised by the China Foundry Association (CFA), and held in Beijing. The General Manager of our Foundry Division in China, Benny Yang, gave a speech in which he encouraged young entrepreneurs to embrace the challenges and opportunities that the foundry industry is facing and offering. The foundry industry needs to inspire a new generation of entrepreneurs to promote innovation and secure the future growth of the industry. Vesuvius is proud to support such events.

The Strategic Report set out on pages 1 to 71 contains a fair review of our businesses, strategy, and business model and the associated principal risks and uncertainties. We also deliver a review of our 2018 performance and set out an overview of our markets. Details of our principles, our people and community engagement, together with our focus on safety, are also contained in the Strategic Report.

Approved by the Board on 27 February 2019 and signed on its behalf by

Patrick André
Chief Executive

Guy Young
Chief Financial Officer

SECTION FOUR
GOVERNANCE

In this section:

WE'RE ADVANCING THE EFFECTIVENESS OF OUR TREASURY SOLUTIONS ACROSS THE GROUP.

I work with my finance colleagues around the globe to provide proactive treasury support.

Andrew Matthews
Group Treasurer, London, UK

Board of Directors

John McDonough CBE
Chairman

Committees

Date appointed to the Board
31 October 2012

Independent
N/A

Key strengths
> Proven strategic and leadership skills gained in a complex multinational business
> Strong engineering background and global commercial experience
> Clear leadership understanding of safety issues
> Operational and strategic understanding of a range of business environments gained from working in Asia-Pacific, EMEA and the UK
> Experience as CEO with an international listed company

Career experience
John spent 11 years as Group Chief Executive Officer of Carillion plc until he retired in 2011. Prior to this he spent nine years working for Johnson Controls. He has previously served as a Non-executive Director and Chairman of the Remuneration Committee of Tomkins plc, and as a Trustee of Team Rubicon UK.

John was awarded a CBE in 2011 for services to industry.

Current external appointments
Chairman of The Vitec Group plc and Sunbird Business Services Limited, and a Non-executive Director of Cornerstone Property Assets Limited. John will retire from the Board of The Vitec Group plc in May 2019.

Patrick André
Chief Executive

Committees
–

Date appointed to the Board
1 September 2017

Independent
N/A

Key strengths
> Global career serving the steel industry
> Strong background in strategic development and implementation
> Consumer focus and proven record of delivery, with strong commercial acumen
> Drive and energy in promoting his strategic vision

Career experience
Patrick was President of the Vesuvius Flow Control business unit prior to his appointment as Chief Executive of the Group.

Before joining the Group in 2016, he served as Executive Vice President Strategic Growth, CEO Europe and CEO for Asia, CIS and Africa for Lhoist company, the world leader in lime production. Prior to this he was CEO of the Nickel division, then CEO of the Manganese division of ERAMET group, a global manufacturer of nickel and special alloys.

Current external appointments
None

Guy Young
Chief Financial Officer

Committees
–

Date appointed to the Board
1 November 2015

Independent
N/A

Key strengths
> Extensive international experience gained in the mining and industrial sectors
> Qualified Chartered Accountant, with significant financial and business development experience
> Drive and energy in managing people and teams
> Focus on strategic execution and business optimisation

Career experience
Guy was Chief Financial Officer of Tarmac and latterly Lafarge Tarmac, the British building materials company, between 2011and 2015. Prior to this he spent 13 years working at Anglo American plc in various senior financial and business development positions, including as Chief Financial Officer of Scaw Metals Group, the South African steel products manufacturer.

Guy is qualified with the South African Institute of Chartered Accountants.

Current external appointments
None

Christer Gardell
Non-executive Director

Committees

Date appointed to the Board
31 October 2012

Independent
No

Key strengths
> A wealth of commercial acumen gained through his extensive business investment and management experience
> A strong track record of supporting the growth of international businesses, advocating focus and driving change
> Experienced non-executive director across a range of business sectors

Career experience
Christer is co-founder of Cevian Capital* and Managing Partner.

Christer served as Chief Executive Officer of AB Custos, the Swedish investment company until 2001, prior to which he was a Partner of Nordic Capital and McKinsey & Company. He has previously served as a non-executive Director of AB Lindex and of Tieto Corporation.

Current external appointments
Managing Partner of Cevian Capital, and Vice Chairman of Metso Corporation. A member of the Nomination Committees of Ericsson and Nordea Bank Abp, although not a member of the Ericsson or Nordea boards.

* Cevian Capital is a shareholder of Vesuvius plc and, at 27 February 2019, held 21.11% of Vesuvius' issued share capital.

Key to Board Committee membership

Audit Committee
Nomination Committee
Remuneration Committee
Committee Chairman

Board Committees

Audit: See p86
Nomination: See p93
Remuneration: See p95

Hock Goh
Non-executive Director

Committees

Date appointed to the Board
2 April 2015

Independent
Yes

Key strengths
- Strong focus on R&D and technology
- Wealth of experience dealing with safety and sustainability matters gained from more than 35 years working in the oil and gas industry
- In-depth knowledge of Asian markets
- Strong international commercial experience, gained through a global career in the oil and gas industry

Career experience
Hock spent 25 years with Schlumberger, where his roles included serving as President of Network and Infrastructure Solutions in London, President of Asia-Pacific, and Vice President and General Manager of China. Following this Hock spent seven years as a Partner of Baird Capital Partners Asia, based in China. He has previously served as Chairman of MEC Resources Ltd and a Non-executive Director of Harbour Energy Ltd.

Current external appointments
Chairman of Advent Energy Ltd, and a Non-executive Director of AB SKF, Santos Ltd and Stora Enso Oyj.

Jane Hinkley
Non-executive Director

Committees

Date appointed to the Board
3 December 2012

Independent
Yes

Key strengths
- Proven track record of managing complex global trading business
- Qualified Chartered Accountant, with significant financial and operational experience in large multinational companies
- Well-developed leadership and global team management skills

Career experience
Jane was Managing Director of Navion Shipping AS for three years until 2001. Prior to this she spent a large part of her Executive career working at Gotaas-Larsen Shipping Corporation, the liquefied natural gas shipping specialist, where she served as Chief Financial Officer and Managing Director. She has previously served as a Non-executive Director of Revus Energy ASA.

Jane is a Chartered Accountant.

Current external appointments
Chairman of Teekay GP L.L.C and a Non-executive Director and Chairman of the Remuneration Committee of Premier Oil plc.

Douglas Hurt
Senior Independent Director

Committees

Date appointed to the Board
2 April 2015

Independent
Yes

Key strengths
- Qualified Chartered Accountant, with significant recent and relevant financial experience having served as Finance Director of a listed UK company for nine years
- Highly knowledgeable of both corporate and operational financial matters, with significant US and European experience
- Proven general management and leadership skills

Career experience
Douglas was Finance Director of IMI plc, the global engineering group for nine years until 2015. Prior to this he spent 23 years at GlaxoSmithKline plc where he held a number of senior finance and general management positions. He began his career at Price Waterhouse.

Douglas is a Chartered Accountant.

Current external appointments
Senior Independent Director and Chairman of the Audit Committees of Tate & Lyle PLC, and Countryside Properties PLC, and Non-executive Director and Chairman of the Audit Committee of the British Standards Institution.

Holly Koeppel
Non-executive Director

Committees

Date appointed to the Board
3 April 2017

Independent
Yes

Key strengths
- A strong track record of growing businesses, with more than 35 years of domestic and international utility, power and infrastructure experience
- International financial and operational experience managing assets on five continents
- Strong board experience both as an independent non-executive director and as an investor, in the US and internationally

Career experience
From 2000 to 2009, Holly worked at American Electric Power Company, Inc., latterly serving as Chief Financial Officer. Prior to this she spent 15 years at the Consolidated Natural Gas Corporation in a variety of management roles which included four years based in Australia. From 2010 to 2017 Holly was Co-Head of Citi Infrastructure Investors (which was renamed Gateway). She has also served as a Director of Integrys Energy Group, Inc., and Reynolds American Inc.

Current external appointments
Non-executive Director and Chairman of the Audit Committee of British American Tobacco p.l.c., and a Non-executive Director of The AES Corporation.

Group Executive Committee

1 **Henry Knowles**
General Counsel & Company Secretary

5 years with the Group

Appointed as General Counsel & Company Secretary in September 2013. Prior to joining Vesuvius, Henry spent seven years at Hikma Pharmaceuticals PLC, a generic pharmaceutical manufacturer with significant operations in the Middle East, North Africa and the United States where he held the roles of General Counsel, Company Secretary and also led the compliance function.

Henry is based in London.

2 **Glenn Cowie**
President, Foundry

37 years with the Group

Appointed President Foundry in November 2014, having delivered significant change in business structure and performance as President Advanced Refractories during the prior three years. He started his career in Foseco South Africa, where he held several technical and sales positions in both the Foundry and Steel Divisions, before taking the following roles of Chief Executive Sub Saharan Africa, an international Strategic Growth Initiative role in the UK, Area Director Northern Europe, based in Borken, Germany and then Vice President Foundry NAFTA and the Americas.

Glenn is based in Tamworth, UK.

3 **Tanmay Ganguly**
President, Advanced Refractories

11 years with the Group

Appointed President Advanced Refractories in November 2014. Previously Tanmay led the refractory business in India as Managing Director of Vesuvius India Ltd, and latterly as Vice President Steel Flow Control and Advanced Refractories, South Asia, where he successfully increased both businesses' revenue and profitability.

Tanmay is based in Barlborough, UK.

4 **Guy Young**
Chief Financial Officer

3 years with the Group

For biographical details please see the Board of Directors on page 74.

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5 **Roel van der Sluis**
President, Flow Control

28 years with the Group

Appointed President Flow Control in October 2017. Roel joined Vesuvius in the European Foundry Division and held marketing and technology roles in Northern Europe, Central Europe and the Middle East. He was appointed President Vesuvius China North Asia Steel and his remit subsequently increased to include Foundry operations in China, Japan and Korea. Roel has wide experience in both the foundry and the steel industries.

Roel is based in Ghlin, Belgium.

6 **Agnieszka Tomczak**
Chief HR Officer

5 months with the Group

Appointed as Chief HR Officer in October 2018. Agnieszka has over 25 years of senior leadership experience in multinational companies spanning various business sectors and industries. Prior to joining Vesuvius, she spent 12 years at ICI, subsequently acquired by Akzo Nobel, in regional and global HR roles.

Agnieszka is based in London.

7 **Patrick Bikard**
President, Operations

10 years with the Group

Appointed President Operations in January 2014 with an emphasis on improving safety, quality and reducing inventories, creating value through customer focus, lean techniques and continuous improvement. He was previously Vice President for Manufacturing, QHSE, Engineering and Purchasing and, prior to joining Vesuvius, he held senior operational roles at Renault, Alstom and Faurecia.

Patrick is based in Ghlin, Belgium.

8 **Patrick André**
Chief Executive

3 years with the Group

For biographical details please see the Board of Directors on page 74.

9 **Alan Charnock**
Vice President and Chief Technology Officer

34 years with the Group

Appointed Chief Technology Officer in April 2015. Alan began his career in the Foundry Division in South Africa and held various senior appointments within the Foundry, Flow Control and Advanced Refractories businesses in Spain, the US, Venezuela, Japan and China. Prior to his appointment as Vice President and Chief Technology Officer, he was Vice President of Marketing & Technology for Flow Control, based in Ghlin, Belgium. Alan has wide global experience of all aspects of Vesuvius' manufacturing business.

Alan is based in Ghlin, Belgium.

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Corporate Governance Statement
Chairman's Governance Letter

Dear Shareholder,

On behalf of the Board I am delighted to present the 2018 Corporate Governance Statement. I am pleased to confirm that your Company is fully compliant with the principles and provisions of the 2016 UK Corporate Governance Code (the 'Code') upon which we report this year. Within the Corporate Governance Statement we provide investors and other stakeholders with an annual insight into the governance activities of the Board and its committees.

In July 2018, the Financial Reporting Council published a new 2018 UK Corporate Governance Code (the 'New Code') which includes revised remuneration practices, and places greater emphasis on the Board's responsibility to embody and promote an appropriate corporate culture. The Company will report on its compliance with the New Code in its 2019 Annual Report, and work is already well-progressed on identifying the procedures and practices within Vesuvius that already respond to the requirements of the New Code, updating them where necessary. This will ensure that we can report full compliance with the New Code next year. As a Board, we remain committed to applying the highest standards of corporate governance, recognising that robust governance and culture underpin business success.

For the Board, 2018 was a year of consolidation. We focused on supporting Patrick André's significant drive and energy in leading the Group in the next stages of its development. A key area of emphasis for the business was on the strengthening of the Group's talent pool. The Nomination Committee focused on succession planning for the senior management levels immediately below the Board, with a review of Divisional and functional resourcing and also considered the development of high-potential individuals throughout the organisation. We have made a significant number of new appointments throughout the Group's senior management tiers which have added appreciably to the diversity in skills, background and experience at senior management level.

The Board continues to take seriously its responsibility for shaping the corporate culture of the Group. In 2018 the Group Executive Committee launched the new CORE values – Courage, Ownership, Respect and Energy. You will find these mentioned throughout the Annual Report, highlighting their importance to the organisation. These new values define our priorities for corporate behaviour and are a practical representation of the culture we seek to foster. They support our governance and control processes and their implementation has already had an observable impact on the Group.

Another area of attention for the Board in 2018 was stakeholder engagement. Recognising the recent governance focus in this area, the Board took the opportunity to map the Group's key stakeholders and explore the strength of the Group's engagement with them. Our global and diverse community of stakeholders includes our shareholders, current, past and future employees, customers, suppliers, investors, banks, the communities in which we operate and the various agencies and organisations that regulate our operations. We respect the views of all our stakeholders, seek to engage with them and take their feedback into account and, as ever, consider the impact of our actions on them as part of our decision-making processes.

During 2018, the Non-executive Directors continued to broaden their understanding of the Group through individual site visits and scheduled Board visits. The full Board visited our new Shared Service Centre in Krakow and our operations in Skawina, Poland, and there was also a Board visit to our operations in India, visiting our major Steel and Foundry manufacturing sites and also undertaking a visit to key Steel customers. I was delighted to visit China in September and Brazil in October 2018. My Non-executive colleagues also visited our operations in China. The Directors remain committed to ongoing training and development, and alongside more formal training activities – these opportunities to meet with management and people at our facilities are invaluable.

The Board's formal evaluation process was again externally facilitated in 2018, by the corporate advisory firm, Lintstock. The results of the review concluded that the Board remained strong and effective with an appropriate composition and an environment that fosters effective support and constructive challenge. The evaluation highlighted a number of Board priorities which we look forward to progressing in 2019.

Yours sincerely

John McDonough CBE
Chairman

27 February 2019

In this section:

Board effectiveness on p82

Board accountability on p85

Audit Committee Report on p86

Nomination Committee Report on p93

Directors' Remuneration Report on p95

Also see:

Risk, viability and going concern on p28

Our principles on p53

Board Report

The Board of Vesuvius plc (the 'Company') is responsible for the Group's system of corporate governance and is committed to maintaining high standards of governance and to developing them to reflect progression in best practice. This report describes the Company's corporate governance structure and explains how, during the year ended 31 December 2018, Vesuvius applied the Main Principles of the UK Corporate Governance Code 2016 issued by the Financial Reporting Council (the 'Code'). Throughout the year and up until the date of this report, Vesuvius was in full compliance with the requirements of the Code. During the year the Board undertook a thorough review of the requirements of the new 2018 UK Corporate Governance Code (the 'New Code'). A significant amount of the requirements of the New Code are supported by processes that already form part of the governance activities of Vesuvius. In the areas where they do not, the Board has begun to implement the necessary changes to the Company's practices and procedures to ensure that Vesuvius will comply fully with the New Code in 2019.

A copy of the current Code can be found on the FRC website at: https://www.frc.org.uk/directors/corporate-governance-and-stewardship/uk-corporate-governance-code.

2018 Board programme

Ultimate responsibility for the management of the Group rests with the Board of Directors.

The Board focuses primarily upon strategic and policy issues and is responsible for the Group's long-term success. It sets the Group's strategy, oversees the allocation of resources and monitors the performance of the Group. It is responsible for effective risk assessment and management. In performance of these duties the Board has regard to the interests of the Group's key stakeholders and is cognisant of the potential impact of the decisions it makes. The Board discharges its responsibilities through an annual programme of meetings.

At each scheduled meeting the following standard items are considered:

> Directors' duties and conflicts of interest

> Minutes of the previous meeting and matters arising

> Reports from the Chief Executive, the Chief Financial Officer and Company Secretary on key aspects of the business

> Key performance indicators

In addition, in 2018 the Board focused on key areas of strategy, performance and governance, including the issues outlined below:

Strategy	> Receiving and reviewing reports on strategy from the Flow Control, Advanced Refractories, Digital Services and Foundry business units > Receiving and reviewing regular reports from the Chief Executive on implementation of the Group's strategic objectives including M&A opportunities > Reviewing and approving the launch of the Group's new CORE values > Receiving and considering a report on the Group's Quality, Health, Safety and Environmental strategy and objectives > Participation in a two-day off-site review of strategy attended by the Company's key advisors and each business unit President > Receiving and considering reports on the Group's Shared Service Centre, IT, tax and treasury strategies, legal and compliance activities and the management of the Group's key pension liabilities > Receiving and considering a report on the Group's research and development strategy and objectives > Reviewing the Group's financing structure
Performance	> Receiving monthly reports on the Group's financial performance against key indicators, including each of the Group's KPIs > Receiving monthly safety reports setting out our performance against key indicators > Receiving regular updates from the Chief Executive on the performance of the Group's businesses with a critical focus on safety > Scrutinising the Group's financial performance and forecasts > Reviewing the Group's internal control and risk management practices > Reviewing and agreeing the annual budget and forward-looking three-year plan > Approving trading updates, preliminary and half-year results
Governance	> Receiving regular reports from the Board Committees > Approving the Annual Report and Notice of AGM > Reviewing the Group's risk appetite and monitoring the Group's key risks > Completing an evaluation of the Board and Committees' performance and regularly reviewing progress against the improvement actions identified in 2017 > Reviewing and approving the Group's Modern Slavery Statement > Receiving regular updates on corporate governance and regulatory developments, and developing an action plan for modifying the Group's governance arrangements to ensure full compliance with the New Code in 2019 > Completing a formal annual review of the Group's governance arrangements > Renewing the Group's delegated authorities > Receiving reports from the Company's brokers on market issues

Board Report continued

The Group's governance structure

The Board

The Board has a formal schedule of matters reserved to it and delegates certain matters to its Committees. It is anticipated that the Board will convene on seven occasions during 2019, holding ad hoc meetings to consider non-scheduled business if required.

The Chairman and Chief Executive

The division of responsibilities between the Chairman and the Chief Executive is set out in writing. These were reviewed during the year as part of the Company's annual corporate governance review, and amendments made to ensure they conform with the New Code. They are available to view on the Company's website www.vesuvius.com.

Board committees

The principal governance Committees of the Board are the Audit, Remuneration and Nomination Committees. Each Committee has written terms of reference, which were reviewed during the year and amendments made to reflect the changing governance requirements outlined in the New Code. These are available to view on the Company's website www.vesuvius.com.

For biographical details see Board of Directors on pages 74 and 75.

The interactions in the governance process are shown in the schematic below.

Board

Governance Committees

Audit Committee To monitor the integrity of financial reporting and to assist the Board in its review of the effectiveness of the Group's internal controls and risk management systems	**Chairman** Douglas Hurt **Membership** All independent Non-executive Directors
Remuneration Committee To determine the overall remuneration for the Executive Directors and set the appropriate remuneration for the Chairman, Executive Directors and senior management	**Chairman** Jane Hinkley **Membership** All independent Non-executive Directors
Nomination Committee To advise the Board on appointments, retirements and resignations from the Board and its Committees and to review succession planning and talent development for the Board and senior management	**Chairman** John McDonough, Chairman (except when considering his own succession, in which case the Committee is chaired by an appropriate Non-executive Director) **Membership** Chairman and any three Non-executive Directors

Administrative Committees

In addition, the Board delegates certain responsibilities to a Finance Committee and Share Scheme Committee, which operate in accordance with the delegated authority agreed by the Board

Finance Committee To approve specific funding and Treasury-related matters in accordance with the Group's delegated authorities or as delegated by the Board	**Chairman** John McDonough, Chairman **Membership** Chairman, Chief Executive, Chief Financial Officer and Group Head of Corporate Finance
Share Scheme Committee To facilitate the administration of the Company's share schemes	**Chairman** Any Board member **Membership** Any two Directors or any two Directors and the Company Secretary

Group Executive Committee

The Group also operates a Group Executive Committee ('GEC'), which is convened and chaired by the Chief Executive and assists him in discharging his responsibilities. The GEC comprises the Chief Executive, Chief Financial Officer, the three business unit Presidents, the Chief HR Officer, the Chief Technology Officer, the President Operations, and the General Counsel /Company Secretary. The GEC met eight times during 2018 and is scheduled to meet eight times during 2019. Its meetings are held at different venues round the world.

Governance structure

The Board

Responsible for Group strategy, risk management, succession and policy issues. Sets the tone, values and culture for the Group. Monitors the Group's progress against the targets set

Chairman

Provides leadership and guidance for the Board, promoting a high standard of corporate governance. Sets the Board agenda and manages meetings. Independent on appointment, he is the link between the Executive and Non-executive Directors

Chief Executive

Develops strategy for review and approval of the Board. Directs, monitors and maintains the operational performance of the Company. Responsible for the application of Group policies, implementation of Group strategy and the resources for their delivery. Accountable to the Board for Group performance

Senior Independent Director

Acts as a sounding board for the Chairman, an alternative contact for shareholders and an intermediary for other Non-executive Directors. Leads the annual evaluation of the Chairman and recruitment process for his/her replacement, when required

Non-executive Directors

Exercise a strong, independent voice, challenging and supporting Executive Directors. Scrutinise performance against objectives and monitor financial reporting. Monitor and oversee risks and controls, determine Executive Director remuneration and manage Board succession through their Committee responsibilities

The Non-executive Directors meet regularly throughout the year without the Executive Directors being present

Company Secretary

Advises the Chairman on governance, together with updates on regulatory and compliance matters. Supports the Board agenda with clear information flow. Acts as a link between the Board and its Committees and between Non-executive Directors and senior management

Board and Committee attendance

The attendance of Directors at the Board meetings and at meetings of the principal Committees of which they are members held during 2018 is shown in the table below. The maximum number of meetings in the period during which the individual was a Board or Committee member is shown in brackets.

	Board	Audit Committee	Remuneration Committee	Nomination Committee
Chairman				
John McDonough CBE	7 (7)	—	—	5 (5)
Executive Directors				
Patrick André	7 (7)	—	—	—
Guy Young	7 (7)	—	—	—
Non-executive Directors				
Christer Gardell	7 (7)	—	-	4 (5)
Hock Goh	7 (7)	4 (5)	4 (5)	4 (5)
Jane Hinkley	7 (7)	5 (5)	5 (5)	5 (5)
Douglas Hurt	7 (7)	5 (5)	5 (5)	5 (5)
Holly Koeppel	7 (7)	3 (5)	3 (5)	3 (5)

Hock Goh was unable to attend a set of Committee meetings during the year due to a family bereavement, and Holly Koeppel was unable to attend some Committee meetings due to clashes with other professional responsibilities that had been previously notified to the Chairman.

To the extent that Directors are unable to attend scheduled meetings they receive the papers in advance and relay their comments to the Chairman for communication at the meeting. The Chairman follows up after the meeting in relation to the decisions taken. In 2018, the Committee Chairmen contacted those Directors who were unable to attend Committee meetings in advance of those meetings, to canvass their views and understand any issues they wished to raise in respect of the subject matters being discussed. These issues were then raised at the meeting through the relevant Chairman and followed up after the meeting.

Board report continued

Board effectiveness

Board composition

The Board comprises eight Directors – the Non-executive Chairman, John McDonough CBE; the Chief Executive, Patrick André; the Chief Financial Officer, Guy Young; and five Non-executive Directors. Douglas Hurt is the Senior Independent Director. Henry Knowles is the Company Secretary.

The Board focuses on ensuring that both it, and its Committees, have the appropriate range of diversity, skills, experience, independence and knowledge of the Company, and the markets in which it operates, to discharge its duties and responsibilities effectively. The Board continues to look at diversity in its broadest sense – reflected in the range of backgrounds and experience of Board members who are drawn from different nationalities and have managed a variety of complex global businesses. The Board has adopted a Board Diversity Policy as set out on this page. The Policy identifies the Board's objectives on diversity to ensure that the Company maintains the optimum Board and Committee composition, underpinning our desire to maintain the right balance of independence, skills and knowledge in the boardroom. Details of the Nomination Committee's activities during the year, with details of compliance with this policy, are included in the Nomination Committee report on pages 93 and 94.

The Board's overall skills and experience, as well as Non-executive Director independence, were reviewed during the year. The Board's composition also formed part of the Board evaluation process. Two of the eight Directors (25%) are women and four (50%) are non-UK citizens. The Board also contains individuals from a range of ethnic backgrounds. There were no new Directors appointed in 2018, so there were no changes in the Board's diversity during the year. The Board considers its diversity, size and composition to be appropriate for the requirements of the business, and in line with its adopted policy. The Board recognises that the Hampton-Alexander Review has set a target of 33% female representation on FTSE 350 Boards by 2020. Whilst the Board does not believe that it is appropriate to accelerate its planned rotation of Directors purely to meet this target, it will continue to consider the benefits of greater diversity in all future Director recruitment decisions.

Committee composition is set out in the relevant Committee reports. No one, other than the Committee Chairman and members of the Committee, is entitled to participate in meetings of the Audit, Nomination and Remuneration Committees. However, as detailed in the Committee reports, where the agenda permits, other Directors and senior management regularly attend by invitation, supporting the operation of each of the Committees in an open and consensual manner.

The Board considers that, for the purposes of the UK Corporate Governance Code, four Non-executive Directors (excluding the Non-executive Chairman), namely Hock Goh, Jane Hinkley, Douglas Hurt and Holly Koeppel, are independent of management and free from any business or other relationship which could affect the exercise of their independent judgement. Christer Gardell is Managing Partner of Cevian Capital which holds 21.11% of Vesuvius' issued ordinary share capital and is not considered to be independent. He brings a wealth of commercial acumen to the Board's deliberations. The Chairman satisfied the independence criteria on his appointment to the Board. Biographical details of the Directors are set out on pages 74 and 75.

Board Diversity Policy

Purpose

This policy sets out the approach to diversity in respect of the Board of Directors of Vesuvius plc. The policy is intended to assist the Board, through the work of the Nomination Committee, in creating and maintaining optimum Board and Committee composition.

The broad principles of diversity contained in the policy apply to all employees of the Vesuvius Group. The Vesuvius Code of Conduct reflects Vesuvius' commitment to diversity and respect for its employees.

Policy Statement

Vesuvius plc recognises the value of a diverse and skilled workforce and is committed to creating and maintaining an inclusive and collaborative workplace culture that will provide sustainability for the organisation into the future.

Policy Objectives

The Nomination Committee will focus on ensuring that it, the Board and the Board's other Committees have the appropriate range of diversity, skills, experience, independence and knowledge of the Company to enable them to discharge their duties and responsibilities effectively.

The Nomination Committee will ensure that all appointments to the Board are based on merit with each candidate assessed against objective criteria focused on the skills, experience and knowledge required of the position, and with due regard to the benefits of diversity on the Board.

The Nomination Committee will engage with executive search firms in a manner which ensures that opportunities are taken for a diverse range of candidates to be considered for appointment. This will include ensuring that the Committee only uses search firms that are signed up to the Voluntary Code of Conduct for Executive Search Firms.

The Nomination Committee supports senior management efforts to increase diversity in the senior management pipeline to facilitate succession planning towards executive Board positions.

With respect to the representation of women on the Board, highlighted by the Davies and Hampton-Alexander Reviews, the Board is supportive of the initiative to increase the proportion of women on the boards of FTSE 350 companies. Vesuvius, which at the date of this policy has a Board comprising 25% female membership, will continue to ensure that the Board of Vesuvius plc reflects this level, or greater levels of gender diversity, as are appropriate for its size and dynamics, to enable it to continue to deliver on the requirements of the Vesuvius business.

Monitoring and Reporting

This policy and progress against its objectives will be reviewed annually.

The Nomination Committee is responsible for the implementation of this policy and for monitoring progress towards the achievement of its objectives.

December 2017

Appointment to the Board

Recommendations for appointments to the Board are made by the Nomination Committee. Further information on the activities of the Nomination Committee is set out in the Nomination Committee report on pages 93 and 94.

Time commitment of the Chairman and the Non-executive Directors

The Chairman and Non-executive Directors each have a letter of appointment which sets out the terms and conditions of their directorship. An indication of the anticipated time commitment is provided in recruitment role specifications, and each Non-executive Director's letter of appointment provides details of the meetings that they are expected to attend, along with the need to accommodate travelling time. Non-executive Directors are required to set aside sufficient time to prepare for meetings, and regularly to refresh and update their skills and knowledge. All Non-executive Directors have agreed to commit sufficient time for the proper performance of their responsibilities, acknowledging that this will vary from year-to-year depending on the Group's activities, and will involve visiting manufacturing and customer sites around the Group. The Chairman in particular dedicates a significant amount of time to Vesuvius in discharging his duties. The Board notes that the Chairman holds chairmanships other than Vesuvius, but that only one of these is for a listed company. The other chairmanship is for a much smaller private company where the time commitment is limited. The Chairman stepped down as a Trustee of Team Rubicon UK during the year, and will be stepping down as Chairman of the Board, and as a Director of The Vitec Group plc on 21 May 2019.

Directors are expected to attend all scheduled Board and Committee meetings and any additional meetings as required. Each Director's other significant commitments are disclosed to the Board during the process for their appointment and they are required to notify the Board of any subsequent changes. The Company has reviewed the availability of the Chairman and the Non-executive Directors and considers that each of them can, and in practice does, devote the necessary amount of time to the Company's business.

At the 2018 AGM, the resolution for the re-election of Hock Goh was passed with the requisite majority of votes from shareholders, but with a significant percentage of votes against. The Company engaged with its shareholders to understand their concerns, which related to the number of listed company directorships that Hock Goh held. During 2018 Mr Goh stepped down as chairman and director of MEC Resources Ltd and resigned as a director of Harbour Energy Ltd. In addition to his directorship of Vesuvius, his portfolio of responsibilities has reduced to serving as Chairman of Advent Energy Ltd, and as a Non-executive Director of AB SKF, Santos Ltd and Stora Enso Oyj.

Information and support

The Board ensures that it receives, in a timely manner, information of an appropriate quality to enable it adequately to discharge its responsibilities. Papers are provided to the Directors in advance of the relevant Board or Committee meeting to enable them to make further enquiries about any matters prior to the meeting should they so wish. This also allows Directors who are unable to attend to submit views in advance of the meeting.

In addition to the formal Board processes, the Chief Executive provides written updates on important Company business issues between meetings, and the Board is provided with a comprehensive monthly report of key financial and management information, including updates on safety and quality performance. Regular updates on shareholder issues are provided to the Directors, who also receive copies of analysts' notes issued on the Company. For the distribution of all information, Directors have access to a secure online portal, which contains a reference section containing background information on the Company.

All Directors have access to the advice and services of the Company Secretary. There is also an agreed procedure in place for Non-executive Directors, in the furtherance of their duties, to take independent legal advice at the Company's expense. The procedure was not utilised during the year under review.

Induction and training

A comprehensive induction programme is available to new Directors. The core of the induction programme is designed in compliance with the UK Corporate Governance Code and is tailored to meet the requirements of the individual appointee and the dynamics of the Group.

The Chairman, through the Company Secretary, continues to ensure that there is an ongoing process to review training and development needs. Directors are provided with details of seminars and training courses relevant to their role and are encouraged and supported by the Company in attending them. In 2018, regulatory updates were provided as a standing item at each Board meeting in a Secretary's Report. External input on legal and regulatory developments impacting the business was also given, with specialist advisers invited to the Board and its Committees meetings to provide briefings on matters such as forthcoming accounting changes and the changing landscape of UK Corporate Governance.

All Non-executive Directors are encouraged to visit Vesuvius facilities on independent visits, to engage with management when they do and relay their findings from these trips to the full Board. In 2018 the full Board visited our Shared Service Centre in Krakow, Poland, with some Directors also taking the opportunity to visit our large operation in Skawina, Poland. There was also a Board visit to our operations in India. This covered the key manufacturing sites of both Steel and Foundry divisions as well as encompassing a visit to a major Steel customer, where the Board visited the operations and met with senior management exchanging views on the Group's activities and discussing opportunities for future cooperation. In addition, the Chairman visited our operations in China in September and Brazil in October, and other Non-executive Directors also visited operations in China during the year. During each of these visits the director received business presentations on current activity and future strategies, and met with local staff and management to understand better the dynamics of the jurisdiction.

Board Report continued

Performance evaluation

The Board carries out an evaluation of its performance and that of its Committees every year. In 2018, this evaluation was split, with a review of the Board strategy meeting held in June conducted immediately thereafter and a further, more general, review of performance conducted at the end of the year.
The evaluation was again externally facilitated by the corporate advisory firm, Lintstock. The Group subscribes to the use of Lintstock's Insider List database tool, but has no other connection with the organisation.

Each evaluation was conducted via a series of targeted questionnaires. As with previous years, the end-of-year evaluation not only covered the performance of the Board but also that of its Committees, along with individual reviews of each Director and analysis of the performance of the Chairman. Narrative reports were then presented to the Board and the Audit, Nomination and Remuneration Committees by Lintstock. A list of action points was drawn up by the Chairman based on the results of the evaluation. These will be implemented by the Board in 2019.

The 2017 evaluation highlighted a number of priorities for the Group. The Board focused on addressing these during 2018 as follows:

Area	Issue	Action taken in 2018
Strategy	> Strategy development and execution	> Chief Executive undertook a formal review of the Group's strategy culminating in the Capital Markets Day presentation in November > Board continued to monitor progress on strategic initiatives
People & Organisation	> New Chief Executive	> Board focused on supporting the new Chief Executive to deliver the business plan
	> Senior management succession and talent development	> More time dedicated to senior management succession and talent management at the Nomination Committee with actions implemented to refresh Group talent, including external hires to supplement bench strength and skills
	> Improvements to organisational structure	> Group organisational structure was clarified with devolution of 'P&L' responsibility to aid talent development
	> Continued focus on developing Board skills and experience	> Individual Non-executive Directors continued to undertake overseas site visits in 2018, and Board visits continued to incorporate opportunities to meet with employees and customers where possible
	> Board composition	> Board tenure and succession was considered
Risk & Culture	> Risk should maintain a clear position in Board priorities	> Further focus on measures to improve safety performance > Business unit presentations refocused to devote sufficient time to major risks and mitigation. The Board enhanced its understanding of risk appetite within the Group
Board Discussions & Agenda	> Board information flow, agenda and performance	> Business Unit and Functional presentations prioritised at meetings > Consistency of Board papers was enhanced – balancing conformity with flexibility to deliver the message and greater use of summaries to aid efficiency. Prompt feedback was provided to presenters

The Chairman noted that the 2018 review had provided particularly positive results, with the Board observed to be functioning well and with renewed vigour, and the new Chief Executive seen to be providing clarity of input and transparency at Board level. The individual assessment of Directors concluded that all continued to contribute effectively, devoting adequate time to their duties and being engaged and proactive in debate at all meetings. Each of the Committees was also considered to have operated effectively during the year.

Regarding priorities for 2019, the evaluation highlighted the need for the Board to continue its focus on key strategic issues including new product development, the Group's manufacturing footprint and talent development. Risk management, particularly the Group's risk appetite, remains a continued area for emphasis. Finally, the Board continues to focus on ensuring that it operates at optimum efficiency and efficacy with regard to prioritising and actioning items. As in previous years, a set of action points was compiled from the output of the evaluation to ensure that its findings are included in the Board's activities. Progress is reviewed by the Chairman at each Board meeting.

Appointment and replacement of Directors

The Company's Articles specify that Board membership should not be fewer than five nor more than 15 Directors, save that the Company may, by ordinary resolution, from time to time, vary this minimum and/or maximum number of Directors. Directors may be appointed by ordinary resolution or by the Board. The Board may appoint one or more Directors to any executive office, on such terms and for such period as it thinks fit, and it can also terminate or vary such an appointment at any time. The Articles specify that, at every Annual General Meeting ('AGM'), any Director who has been appointed by the Vesuvius Board since the last AGM and any Director who held office at the time of the two preceding AGMs and who did not retire at either of them, shall retire from office. However, in accordance with the requirements of the Code, all the Directors will offer themselves for election or re-election at this year's AGM. The biographical details of the Directors offering themselves for re-election, including details of their other directorships and relevant skills and experience, will be set out in the 2019 Notice of AGM. The biographical details of the Directors are also set out on pages 74 and 75.

The Board believes that each of the current Directors is effective and demonstrates commitment to his or her respective role. Accordingly, the Board recommends that shareholders approve the resolutions to be proposed at the 2019 AGM relating to the re-election of all the Directors.

Directors' conflicts of interest

The Board has established a formal system to authorise situations where a Director has an interest that conflicts, or may possibly conflict, with the interests of the Company (situational conflicts). Directors declare situational conflicts so that they can be considered for authorisation by the non-conflicted Directors. In considering a situational conflict, these Directors act in the way they consider would be most likely to promote the success of the Company and may impose limits or conditions when giving authorisation or subsequently if they think this is appropriate. The Company Secretary records the consideration of any conflict and records any authorisations granted. The Board believes that the approach it has in place for reporting situational conflicts continues to operate effectively. No situational conflicts were brought to the Board for authorisation during the year under review.

Board accountability

Risk management and internal control

The Board is responsible for setting the Group's risk appetite and ensuring that appropriate risk management systems are in place. The Audit Committee assists the Board in reviewing the effectiveness of the Group's system of internal control, including financial, operational and compliance controls, and risk management systems. Further information about the work of the Audit Committee can be found in the Audit Committee report on pages 86 to 92.

The Group's approach to risk management and internal control is discussed in greater detail on pages 28-31 and the Group's principal risks and how they are being managed or mitigated are detailed on pages 32 and 33. The Viability statement which considers the Group's future prospects is detailed on page 31. Risk management and internal control is discussed in greater detail in the Audit Committee report.

Executive compensation and risk

All of the independent Non-executive Directors serve on both the Audit and Remuneration Committees. They therefore bring their experience and knowledge of the activities of each Committee to bear when considering critical areas of judgement. This means that, for example, the Directors are able to consider carefully the impact of incentive arrangements on the Group's risk profile and to ensure that the Group's Remuneration Policy and programme are structured to align with the long-term objectives and risk appetite of the Company. Further information about the work of the Remuneration Committee can be found in the Directors' Remuneration report on pages 95 to 115.

Share capital and voting

Disclosure of the information regarding share capital, the authorisation received by Directors at the AGM regarding the issue of shares and the authority to purchase own shares, is contained on page 117 within the Directors' Report. There are no restrictions on voting contained in the Company's Articles of Association. Further details are set out in the Directors' Report on page 118.

Relations with shareholders

The Board is committed to communicating with shareholders and other stakeholders in a clear and open manner and seeks to ensure effective engagement through the Company's regular communications, the AGM and other investor relations activities. The Company undertakes an ongoing programme of meetings with investors, which is managed by the Investor Relations team. The majority of meetings with investors are led by the Chief Executive and Chief Financial Officer. In advance of the 2018 AGM, we wrote to our largest shareholders inviting discussion on any questions they might like to raise and making the Chairmen of the Board, the Audit Committee and the Remuneration Committee available to meet shareholders should they so wish. No formal requests for discussions were received from shareholders following this communication. Following the AGM when a significant number of votes were registered against the reappointment of Hock Goh, the Company again contacted its largest shareholders, to understand any concerns. A number of Shareholders responded to this contact and the 'over-boarding' concerns they expressed were communicated to the Board. As indicated on page 83 in this Report Hock Goh acted during the year to respond to these concerns. The Chairman, Senior Independent Director and Committee Chairmen remain available for discussion with shareholders throughout the year on matters under their areas of responsibility, either through contacting the Company Secretary, Investor Relations or directly at the AGM.

On 6 November 2018, the Company held a Capital Markets Day to provide more detail on the Company's strategy, new technologies, markets and the initiatives that support the delivery of the Group's growth targets. 80 people attended, including many investors, the majority of analysts covering the Company, and the presentations were broadcast live on the Company's website.

The Company reports its financial results to shareholders twice a year, with the publication of its annual and half-year financial reports. In addition, to maintain transparency in performance we also issued two scheduled trading updates during 2018. One was published in conjunction with the 2018 AGM on 10 May 2018, and the second was published in conjunction with the Capital Markets Day held on 6 November 2018. Additionally, presentations or teleconference calls were held by the Chief Executive and Chief Financial Officer with institutional investors and analysts on both of these dates.

All Directors are expected to attend the Company's AGM, providing shareholders with the opportunity to question them about issues relating to the Group, either during the meeting or informally afterwards.

Audit Committee

Dear Shareholder,

On behalf of the Audit Committee, I am pleased to present the Audit Committee Report for 2018. The Committee largely works to a recurring and structured programme of activities which are defined in an annual rolling Audit Committee timetable. Additional items are then added and the Committee agenda is modified as the year progresses, to accommodate new topics and priorities.

The Audit Committee Report describes the work of the Committee during the year including its role in monitoring the integrity of the Company's financial statements and the effectiveness of the internal and external audit processes. It provides an overview of the significant issues the Committee has considered during the year and its material judgements. It also describes how the Committee fulfilled its responsibilities to assist the Board in reviewing the effectiveness of the Group's system of internal control and risk management systems.

Yours sincerely

Douglas Hurt
Chairman, Audit Committee
27 February 2019

Committee Members

Douglas Hurt (Committee Chairman)
Hock Goh
Jane Hinkley
Holly Koeppel

The Audit Committee

The Audit Committee comprises all the independent Non-executive Directors of the Company, who bring a wide range of financial and commercial expertise to the Committee's decision-making and evaluation processes. Douglas Hurt is the Senior Independent Director and Chairman of the Audit Committee, having been appointed to these roles by the Board following the 2015 AGM. He was the Finance Director of IMI plc for nine years prior to that and has worked in various financial roles throughout his career. Douglas is also Chairman of the Audit Committees of Countryside Properties PLC and Tate & Lyle plc, and a Chartered Accountant. This background provides him with the 'recent and relevant financial experience' required under the Code. The Company Secretary is Secretary to the Committee.

The Code and Financial Conduct Authority Disclosure Guidance and Transparency Rules also contain requirements for the Audit Committee as a whole to have competence relevant to the sector in which the Company operates. Vesuvius' Non-executive Directors have significant breadth of experience and depth of knowledge on matters related to Vesuvius' operations, both from their previous roles and from their induction and other activities since joining the Board of Vesuvius. A chart detailing this experience is set out on page 82. The Directors' biographies on pages 74 and 75 outline their range of multinational business-to-business experience and expertise in fields including engineering, manufacturing, services and logistics as well as financial and commercial acumen. The Board therefore considers that the Audit Committee as a whole has competence relevant to Vesuvius' business sector.

Meetings

The Committee met five times during 2018. The Committee has also met twice since the end of the financial year and prior to the signing of this Annual Report. The Board Chairman, the non-independent Non-executive Director, the Chief Executive, the Chief Financial Officer, the Group Financial Controller, the Group Head of Internal Audit and the external Auditors were all invited to each meeting. Other management staff were also invited to attend as appropriate.

Audit Committee meetings are conducted to promote an open debate, to constructively challenge significant accounting judgements, to provide guidance and oversight to management to ensure that the business maintains an appropriately robust control environment and to provide informed advice to the Board on financial matters. The Chairman of the Audit Committee encourages open dialogue between the external Auditors, the management team and the Group Head of Internal Audit between Audit Committee meetings to ensure that emerging issues are addressed in a timely manner.

During the year, as is the Audit Committee's established practice, the Committee members met and discussed business and control matters with senior management during site visits, informal meetings and Board presentations. The Committee also met privately with the Group Head of Internal Audit, and the external Auditors without any executives present.

The outcomes of Audit Committee meetings were reported to the Board and all members of the Board received the agenda, papers and minutes of the Committee.

Role and responsibilities

During 2018 the main role and responsibilities of the Committee continued to be to:

> Monitor the integrity of the financial statements of the Company and the Group, and any formal announcements relating to the Group's financial performance, informing the Board of the outcome of the audit

> Monitor and review the effectiveness of the Group's internal financial controls and the Group's internal control and risk management systems

> Establish and review procedures for detecting fraud, systems and controls for the prevention of bribery and oversee the Company's arrangements for employees to raise concerns about possible wrongdoing in financial reporting or other matters

> Monitor and review the effectiveness of the Company's Internal Audit function

> Make recommendations to the Board on the appointment, reappointment and removal of the external Auditors and approve the remuneration and terms of engagement of the external Auditors

> Monitor and review the external Auditors' independence, objectivity and effectiveness, taking into consideration any non-audit services provided, and the relevant UK professional and regulatory requirements

> Take account of the findings and conclusions of any FRC audit inspection undertaken, when monitoring the performance of the audit

The Committee operates under formal terms of reference approved by the Board, which were reviewed during the year. They are available in the Investors/Corporate Governance section of the Company's website, www.vesuvius.com.

Within these terms, the Committee and its individual members are empowered to obtain outside legal or other independent professional advice at the cost of the Company. These powers were not utilised during the year. The Committee may also secure the attendance at its meetings of any employee or other parties with relevant experience and expertise should it be considered necessary.

Activities in 2018

1. The Committee's agenda covered the usual standing items – the review of financial results, the effectiveness of the Group's internal financial controls, and the review of the internal control and risk management systems – as well as additional topics, including an update on cyber security and in-depth reviews of the Group's US tax position and the Group's Total Refractory Management Service contracts, where revenue is based on tonnes of steel produced.
2. The Audit Committee continued to devote time to ensure that initiatives to mitigate potential risks and financial exposure remained robust and appropriate. The Committee challenged the adequacy of inventory and receivables provisions and the assumed growth rates and discount rates used for asset impairment assessments.
3. The Committee considered the Company's going concern statement and challenged the nature, quantum and assessment of the significant risks to the business model, future performance, solvency and liquidity of the Group that were modelled as part of the scenarios and stress testing undertaken to support the Viability statement made by the Company in the 2017 Accounts. The 2018 Viability statement, which was also critically reviewed, is contained within the Strategic Report and can be found on page 31.
4. The Committee monitored the resourcing and delivery of the 2018 Internal Audit plan and approved the 2019 Internal Audit plan, including changes made to Internal Audit processes by the new Group Head of Internal Audit. The Committee monitored both the responses from and follow-up by management to Internal Audit recommendations arising during the year and, where necessary, the Committee tasked management to verify their successful closure within defined timescales.
5. The Committee examined specific audit issues such as tax matters, including the judgements inherent in the partial recognition of deferred tax assets for US tax losses and the extent to which any movements should or should not be included in separately reported items.
6. The Committee regularly conducts a detailed review of provisions, challenging the reasonableness of underlying assumptions and estimates of costs and the quantum of any related insurance assets.
7. The Committee considered the impact of new accounting standards. IFRS 9 – Financial Instruments and IFRS 15 – Revenue from Contracts with Customers were adopted in the year. The impact of adopting these standards on the Group Financial Statements was not material and there was no adjustment to retained earnings on application at 1 January 2018. The Group has not restated the comparative results on adoption and the required additional disclosures from these standards are included in the notes to the financial statements. IFRS 16 – Leases is effective from 1 January 2019 and the Committee has reviewed the implementation plan for this standard. It is expected that the application of this standard will have a material impact on the Group's Financial Statements.
8. The Committee reviewed its terms of reference and recommended amendments to the Board to align them with the new UK Corporate Governance Code.

The Committee members believe that they received sufficient, relevant and reliable information throughout the year from management and the external Auditors to enable the Committee to fully discharge its responsibilities. The work of the Audit Committee is further elaborated in the paragraphs below.

Audit Committee continued

Statement of compliance with the Competition and Markets Authority ('CMA') Order

The Committee considers that the Company has complied with The Statutory Audit Services for Large Companies Market Investigation (Mandatory Use of Competitive Processes and Audit Committee Responsibilities) Order 2014 (Article 7.1), published by the CMA on 26 September 2014, including with respect to the Audit Committee's responsibilities for agreeing the audit scope and fees and authorising non-audit services.

Financial reporting

The Committee fulfilled its primary responsibility to review the integrity of the 2018 half-year and 2018 annual financial statements and recommended their approval to the Board. The Committee also reviewed the two trading updates released during the year.

In forming its views, the Committee assessed:

> The quality, acceptability and consistency of the accounting policies and practices

> The clarity and consistency of the disclosures, including compliance with relevant financial reporting standards and other reporting requirements

> Significant issues where management judgements and/or estimates had been made that were material to the reporting or where discussions had taken place with the external Auditors in arriving at the judgement or estimate

> In relation to the overall Annual Report, whether the Annual Report and Financial Statements taken as a whole was fair, balanced and understandable, taking into consideration all the information available to the Committee

> The application of the FRC's guidance on clear and concise reporting

> The disclosure and presentation of alternative performance measures, in view of the guidelines issued by the European Securities and Markets Association

The Committee actively deliberated and challenged reports from the Chief Financial Officer and Group Financial Controller. These were well prepared and, for areas of judgement and/or estimation, set out the rationale for the accounting treatment and disclosures, and the pertinent assumptions and the sensitivities of the estimates to changes in the assumptions. PwC also delivered memoranda for the half-year and year-end, stating their views on the treatment of significant issues. PwC provided a summary for each issue, including its assessment of the appropriateness of management's judgements or estimates. The Committee considered the overall level of prudence applied this year, compared this with the prior year and concluded that it remained unchanged.

Significant issues and material judgements

The Committee considered the following significant issues in the context of the 2018 financial statements. It considered these areas to be significant taking into account the level of materiality and the degree of judgement exercised by management. The Committee resolved that the judgements and estimates made on each of the significant issues detailed below were appropriate and acceptable.

Income tax

Income tax remains a complex area where significant judgements are required to estimate both uncertain tax liabilities and the value of deferred tax assets.

The Committee challenged the assumptions used to arrive at the £29.3m (2017: £34.3m) provided for income tax payable which includes £20.2m (2017: £23.2m) for uncertain tax provisions as set out in Note 10.5. After discussions with internal tax experts and considering the results of recent tax audits and the views of the external Auditors, the Committee concurred with management's judgement.

At the end of 2018, the Group recognised a US deferred tax asset of £67.3m (2017: £32.6m). The recognition of deferred tax assets for tax losses and other temporary differences is a highly technical area and the Committee has drawn on internal experts to understand the treatment. The prospects for US profitability were carefully modelled by management and challenged by the Committee. The Committee reviewed the Group's projections for trading in the US, which had further improved in 2018, and concurred with management that the US forecast profits are considered sufficient to sustain the deferred tax asset in the US at the end of 2018.

The Committee also reviewed with management the continuing impact of the significant tax reform announced in late December 2017 in the US Tax Cuts and Jobs Act ('TCJA'), which had a material impact on the Group's deferred tax position in 2017. The Committee concurred with management that the subsequent regulatory guidance on the operation of TCJA issued by the US Treasury during 2018, mostly in proposed form, did have a material impact on Vesuvius' reported tax position as it related to the new Global Intangible Low-Taxed Income ('GILTI') rules.

In light of the substantial recognition on the Group's balance sheet of the US tax losses and other temporary differences, the Committee decided that it is now more appropriate to reflect the utilisation of these deferred tax assets, which offset the Group's US taxable Headline profits, as part of the Group's Headline tax charge.

Other provisions

The Committee has been made aware of a number of potential exposures and claims arising from ongoing litigation, product quality issues, employee disputes, restructuring, environmental matters, onerous leases, indirect tax disputes and indemnities or warranties outstanding for disposed businesses. Due to the long gestation period before settlement can be reached, provisioning for these items requires careful judgement in order to establish a reasonable estimate of future liabilities. The Committee also assessed the strength of any insurance coverage for certain of these liabilities and challenged the accounting treatment for any amounts deemed to be recoverable from insurers. After due consideration and challenge, with expert advice sought in certain areas, the Committee is satisfied that there are appropriate levels of provisions set aside to settle third-party claims and disputes (Note 31) and that adequate disclosure has been made. Where the outcome of an existing issue is uncertain, or where no reliable estimate of the potential liability can be made, no provision has been made and appropriate disclosure is included under contingent liabilities (Note 33).

Restructuring charges

The original restructuring programme which was launched in 2015 is almost complete, and our new restructuring programme launched in March 2018 is well underway. The Committee critically reviewed the treatment of the restructuring costs disclosed as separately reported items in 2018 and concluded that these have been treated consistently with the accounting policy. This ensures that only significant restructuring programmes that have a defined scope and are material in nature are reported separately, which enables a clearer understanding of the underlying results of the Group.

Impairment of intangible assets

The year-end carrying value of goodwill of £654.5m was tested against the current and planned performance of the Steel and Foundry cash-generating units ('CGUs'). The Committee challenged both the determination of the relevant CGUs, the planned and terminal growth assumptions as well as the discount rates used in the assessments and the relevant sensitivities that were evaluated. The detailed assumptions, provided in Note 17, reflect both a reduction in global risk-free rates offset by the impact of the increasing contribution from the Group's operations in emerging markets.

The Committee considered the Board-approved medium-term business plans, the range of industry longer-term projections and expert views on discount rates. Given that the models indicated that there remains significant headroom between the value in use and the carrying value, the Committee concurred that no goodwill impairment charges were required.

Working capital provisions

The Committee challenged the level of provisions held against both receivables and inventories (Notes 18 and 19) and, after reviewing ageing analyses, regional analyses and specific customer accounts, concluded that the provisions held were appropriate. The receivables provisions were considered in conjunction with the adoption of IFRS 9 (Financial Instruments), which has required a new impairment model for financial assets which is based on expected credit losses rather than only incurred credit losses under IAS 39.

Pensions

Determining the current value of the Group's future pension obligations requires a number of assumptions. The appropriateness of assumptions used (described in Note 27) was questioned by the Committee, as small changes in the assumptions could have material effects and bond yields in particular have been volatile. The assumptions made by management for each of the major schemes were compared by PwC with other similar schemes. The Committee agreed the reasonableness of the assumptions. The Committee also considered the basis for the estimation of the cost of Guaranteed Minimum Pension equalisation, following a High Court judgement in October that impacts UK defined benefit pension schemes. Given the material and one-off nature of this cost, the Committee concurred with reporting this separately, which enables the reader more clearly to understand the underlying results of the Group.

Fair, balanced and understandable reporting

The Committee considered all the information available to it in reviewing the overall content of the Annual Report and Financial Statements and the process by which it was compiled and reviewed, to enable it to provide advice to the Board that the Annual Report is fair, balanced and understandable. In doing so, the Committee ensured that time was again dedicated to the drafting and review process so that internal linkages were identified and consistency was tested. Drafts of the Annual Report and Financial Statements were also reviewed by a senior executive not directly involved in the year-end process who reported to the Committee on his impressions of clarity, comprehensiveness, balance and disclosure in the document. On completion of the process, the Committee was satisfied that it could recommend to the Board that the Annual Report and Financial Statements is fair, balanced and understandable.

Risk management and internal controls

As highlighted in the reviews of strategy and principal risks in the Strategic Report, risk management is inherent in management's thinking and is embedded in the business planning processes of the Group. The Board has overall responsibility for establishing and maintaining a system of risk management and internal control, and for reviewing its effectiveness. The Audit Committee assists the Board in reviewing the effectiveness of the Group's system of internal control, including financial, operational and compliance controls, and risk management systems. This framework is consistent with the Code.

In 2018 Committee members fully participated in the Board review of existing risks and ongoing mitigating actions, further details of which are given on pages 32 and 33. The Committee believes that the Group's process for identifying and understanding the Group's principal risks and uncertainties remains robust and appropriate.

The Committee considered the Company's going concern statement and challenged the nature, quantum and effects of the combination of the unlikely but significant risks to the business model, future performance, solvency and liquidity of the Group. These were all modelled as part of the scenarios and stress testing undertaken to support the Viability statement. As part of this review, the Committee considered the Group's forecast funding requirements over the next three years and analysed the impact of key risks faced by the Group with reference to the Group's debt covenants. The scenarios considered the impact of multiple risks occurring simultaneously and the additional mitigating actions that the Group could take. The Committee noted that the Group's debt headroom was sufficient to accommodate the modelled stress scenarios. As a result of their review, the Committee was satisfied that the going concern and Viability statements had been prepared on an appropriate basis. The 2018 going concern statement and the 2018 Viability statement are contained within the Risk, viability and going concern section on page 31.

Audit Committee continued

The key features of the Group's internal control system, which provides assurance on the accuracy and reliability of the Group's financial reporting, are detailed in the Risk, viability and going concern section on pages 28 to 33. During 2018, the Committee considered the process by which management evaluates internal controls across the Group. The Group Head of Internal Audit provided the Committee with a summary overview of the assurance provided by the Group's control framework and the testing of these controls. PwC also reviewed controls in the businesses within the scope of its audit. This review indicated an appropriate control environment, with identified improvement actions under careful management by the Group.

The Group is made up of several large operating units, but also many small units in geographically diverse locations. Consequently, segregation of duties, overlapping access controls on systems and remote management oversight can give rise to control vulnerabilities and fraud opportunities. The Group has not adopted a common Enterprise Resource Planning system as a Group-wide standard. Over time, management intends to move to more sharing of services, enabled by process and systems standardisation between businesses. This is likely to improve the overall internal controls in the smaller operating units.

The Group undertakes a range of activities to mitigate the risk of fraud. This framework is regularly reviewed to determine areas for improvement. Eliminating the risk of fraud remains one of the key areas of focus for Internal Audit, forming a fundamental part of 'full scope' and financial audits. These assess the quality of the balance sheet reconciliations, review key judgement matters, consider ERP access rights, review tenders and quotations, review the entity's controls over master data changes, and controls over payments and associated applications.

During 2018 the Group continued its review of third-party representatives and intermediaries. This included detailed due diligence for active sales agents and custom clearance agents. The Committee also continued its assessment of the Group's potential exposure to bribery and corruption risks, noting the ongoing work conducted by the Group in this context, such as face-to-face visits to operations, providing focused, country-specific training and reviewing financial records. The output of these processes and previous risk assessments continue to be used to develop Group policies and procedures for the management of anti-bribery and corruption risk, reflecting an appropriate level of control for the business.

The Committee continues to monitor and oversee procedures regarding allegations of improper behaviour and employee concerns. Further details of the operation of the Group's Speak-Up policy and helpline can be found in the 'Our principles' section. Throughout the year the Audit Committee received updates on the volume of reports, key themes emerging from these reports and the results of investigations undertaken.

Each year the senior financial, operational and functional management of the businesses self-certify compliance with Group policies and procedures for the areas of the business under their responsibility and confirm the existence of adequate internal control systems throughout the year. The Committee reviews any exceptions noted in this bottom-up exercise.

After considering these various inputs, the Committee was able to provide assurance to the Board on the effectiveness of internal financial control within the Group, and on the adequacy of the Group's broader internal control systems.

Internal Audit

The Group's Internal Audit function operates on a global basis through professionally qualified and experienced individual members located around the world. They report to the Group Head of Internal Audit, based in London, who in turn reports directly to the Chairman of the Audit Committee.

Throughout 2018 Internal Audit continued to focus on two different categories of audit: Compliance & Control ('C&C'), and Effectiveness & Efficiency ('E&E'). C&C audits focus entirely on internal financial controls and key Board compliance issues, whereas E&E audits examine a broader range of business performance issues. This approach allows the Audit Committee to concentrate more specifically on key control issues for resolution, with reporting focused on C&C audit results and receiving a more general commentary on the outcome of the E&E audits given. The detailed outcomes of the E&E audits were used to engage management on broader performance issues identified by the Internal Audit team.

The Committee received, considered and approved the 2018 Internal Audit plan which was constructed using a risk-based approach to cover the Group's control environment. The plan was based on the premise that all operating units are audited at least once every three years, including the smaller operating units. Internal Audit annually audits each of the large operating entities located in Germany, the US, China, Mexico and Brazil. During the year the Committee also considered and approved changes to the Internal Audit plan as required.

In 2018, a total of 53 audit assignments, including one unplanned audit, were undertaken, covering 59% of the Group's revenue and 93% of the Group's profit before tax. The Committee received a report from the Group Head of Internal Audit at each of its meetings detailing progress against the agreed plan; key trends and findings and an update on the progress made towards resolving open issues. Common themes emerging from Internal Audit reports coupled with Internal Audit and Management's assessment of risk have informed the development of the 2019 Internal Audit plan.

When necessary Internal Audit uses external outsourced auditors to supplement internal resources on an ad hoc basis. The outsourcing process provides valuable learning opportunities and we expect to continue to use outsourcing in specialist areas and geographies in the future. Control issues continue to be recorded in a live web-based database into which management are required to report progress towards addressing any open issues. Internal Audit monitors the progress made and frequent meetings continue to be held with each business unit President to ensure that engagement on the resolution of issues is clearly understood at all levels of the business and responsibility for remediation has been appropriately assigned. The results are communicated to the Audit Committee which also involves senior management as necessary to provide an update against any high-priority actions and Internal Audit undertakes follow-up reviews as required. In situations where audit findings required longer-term solutions, the Committee oversaw the process for ensuring that adequate mitigating controls were in place.

During the year, a review was undertaken of the effectiveness of the Internal Audit function. The review, which canvassed the views of Non-executive Directors and senior management, confirmed that the Internal Audit function continued to operate to a high standard. It also noted that the Audit Committee had welcomed the successful induction and impact of the new Group Head of

Internal Audit during the year, and noted that considerable benefit had been derived from the Committee Chairman and the Committee meeting with the Head of Internal Audit on a regular basis without other management being present during the year.

Having considered the work of the Internal Audit function during 2018, including progress against the 2018 Internal Audit plan, the quality of reports provided to the Committee, and the results of the review of the function's effectiveness, the Committee concluded that the Internal Audit function operated effectively during 2018.

External audit

Auditors' appointment

In 2017 the Company appointed PricewaterhouseCoopers LLP ('PwC') as external Auditors to the Company and the Group and Mazars LLP to audit the non-material entities within the Group. PwC nominated Julian Jenkins as the audit partner responsible for the Group audit. In line with the regulations on auditor rotation, the external audit contract will be put out to tender at least every ten years. In addition, PwC will be required to rotate the audit partner every five years.

2018 Audit plan

PwC's 2018 year-end audit plan built on the foundation established in 2017, reflecting the transfer of activity to the European Shared Service Centre and focusing on areas identified as representing significant risk and requiring significant judgement. PwC undertook a range of activities during the year to further their understanding of the business and their assessment of the relevant risks. The results of these activities drove PwC's scoping of the 2018 audit and the composition of their audit testing.

PwC maintained an ongoing dialogue with the Audit Committee throughout the year providing regular updates including commentaries on significant issues and its assessment of consistency and appropriateness in the judgements and estimates made by management. Private sessions were held with PwC without management being present. In these sessions PwC confirmed that its work had not been constrained in any way and that it was able to exercise appropriate professional scepticism and challenge throughout the audit process. The Chairman of the Audit Committee met on a number of occasions with PwC to monitor the progress of the audit and discuss questions as they arose.

The Independent Auditors' Report provided by PwC on pages 121 to 126 includes PwC's assessment of the key audit matters. These key audit matters are discussed in the significant issues and material judgements comments above. The report also summarises the scope, coverage and materiality levels applied by PwC in their audit. As part of the audit planning process and based on a detailed risk assessment, the Committee agreed a materiality figure of £9.4m for Group financial reporting purposes which is higher than last year (£7.6m) and, in line with similar groups, is set at 5% of headline profit before tax of £188.9m. Importantly, much lower levels of materiality are used in the audit fieldwork on the individual businesses across the Group and these lower figures drive the scope and depth of audit work. Any misstatement at or above £0.5m was reported to the Committee.

There were no significant changes this year to the coverage of the audit which stood at 68% of the Group's revenue and 78% of headline profit before tax. This coverage was considered to be sufficient by the Committee. The audit coverage is reflective of the long tail of smaller businesses within the Group that individually are not 'material' to the Group result.

The Committee also received a report from Mazars during the year summarising the findings and recommendations from their audits of the non-material Group subsidiaries and management agreed to implement certain of these recommendations.

The PwC audit fee approved by the Audit Committee was £1.4m. This was constructed bottom-up on a local currency basis and was assessed in light of the audit work required by the agreed materiality level and scope. The fee agreed by Mazars for the audit of the non-material entities was £0.5m, resulting in a combined audit fee with PwC of £1.9m, compared to £1.6m in 2017.

Independence and objectivity

The Committee is responsible for safeguarding the independence and objectivity of the external Auditors in order to ensure the integrity of the external audit process. In discharging this responsibility during 2018, the Committee:

> Sought regular confirmation from the incumbent external Auditors that they considered themselves to be independent of the Company in their own professional judgement, and within the context of applicable professional standards

> Evaluated all the relationships between the external Auditors and the Group, including compliance with the Group's policy on the employment of former employees of the external Auditors, to determine whether these impaired, or appear to impair, the Auditors' independence

> Reviewed compliance against the policy on the provision of non-audit services by the external Auditors

> Reviewed details of the non-audit services provided by the external Auditors and associated fees

As a result of its review the Committee concluded that PwC remained appropriately independent.

Non-audit services

Vesuvius operates a policy for the approval of non-audit services. A copy is available to view on the 'Investors/Corporate Governance' section of the Company's website, www.vesuvius.com. Group companies are not permitted to use the external Auditors for any 'prohibited non-audit services' as specified by the UK Financial Reporting Council's (FRC's) Revised Ethical Standard 2016, unless subject to a permitted derogation. The restrictions broadly prohibit external Auditors' involvement in tax services, any services that involve playing a part in management decision-making, preparing accounting records, designing or implementing internal control/risk management services or financial systems, certain HR services and other legal, investment and share-dealing services. The external Auditors can be invited to provide non-audit services which, in their position as external Auditors, they must or are best placed to undertake and which do not impact auditor objectivity or independence. All audit-related and permissible non-audit services proposed to be carried out for any Group company worldwide by the external Auditors must be pre-approved by the Chief Financial Officer, who thereafter will refer matters to be further approved by the Chairman of the Audit Committee or the full Audit Committee before an engagement is agreed. Any assignment proposed to be carried out by the external Auditors must also have cleared the

Audit Committee continued

external Auditors' own internal pre-approval process to confirm the firm's ethical ability to do the work.

In practice, the Group did not seek to engage PwC for non-audit services during 2018 unless there were compelling advantages to doing so. In 2018, the fees for non-audit services payable to PwC amounted to £0.1m, 2017: £0.1m. The 2018 fees represent payment for assurance services related to the review of the Company's half-year financial statements, quarterly reviews and tax accounts in India, and a tax form audit in Mexico (as required by regulation).

Effectiveness of PwC

The Committee and the Board are committed to maintaining the high quality of the external audit process. Each year the Committee carries out a formal assessment of the performance of the external Auditors, taking account of the guidance for audit committees prepared by the FRC. Input into the evaluation was obtained from management and other key Company personnel, members of the Audit Committee and the external audit team. The review focused on the external Auditors' mindset and culture, skills, character and knowledge, and the quality of its controls.

In 2018, the evaluation of the external Auditors included the following steps:

> a survey of key finance and non-finance stakeholders in London and in-scope countries;

> a commentary-based survey of Audit Committee members focused on their experience of working with PwC;

> a review of other external evidence on PwC audit quality;

> an assessment of PwC's performance against the objectives outlined in PwC's Audit Objectives report; and

> discussions with PwC and key finance and non-finance personnel.

The evaluation concluded that PwC provided an effective audit for 2017, providing strong technical expertise and appropriate challenge. Particular strengths were the use of specialists in London and technical expertise and support on complex accounting matters. PwC was seen as independent by the Audit Committee and management, and provided an objective and challenging audit process.

A number of opportunities were identified for both PwC and Vesuvius to work together to improve on the timeliness of the external audit process for 2018, principally relating to the work that went into pre-audit planning, and improvements in communication between PwC and the local finance teams.

Reappointment of PwC for 2019

The Committee is responsible for making recommendations to the Board in relation to the appointment, re-appointment and removal of the Auditor. In undertaking this duty, the Committee takes into consideration a number of factors concerning the Auditor and the Group's current activity, including:

> the results of its most recent review of the effectiveness of the Auditors;

> the results of its review of the independence and objectivity of the Auditors, particularly in light of the provision of non-audit services;

> its ability to coordinate a global audit, working to tight deadlines;

> the cost-competitiveness of the Auditors in relation to the audit costs of comparable UK companies;

> the tenure of the incumbent Auditors; and

> the periodic rotation of the senior audit management assigned to the audit of the Company.

In addition, the Committee considers external reviews of the performance and quality of the Auditors, including:

> the annual report issued by the Audit Inspection Unit of the Financial Reporting Council on the work of the Auditors; and

> the Auditors' own annual Transparency Report.

Having considered the aforementioned factors, the Committee decided to recommend to the Board that PwC be reappointed for 2019. It confirms that its recommendation is free from the influence of any third party and that there are no contractual restrictions on the choice of auditor. A resolution proposing the reappointment of PwC is included in the notice of AGM for 2019.

The Committee noted the ruling by the Securities Exchange Board of India regarding the prohibition placed on PwC network companies performing audits of listed entities for two years from 1 January 2018. This allows a transitional period and the audit of Vesuvius entities in India remains permissible for the year ended 31 December 2018. The Committee is carefully watching developments on this matter in the context of the Group's two listed Indian subsidiaries, Foseco India Limited and Vesuvius India Limited. At the date of writing, the ruling remains under appeal by PwC, but unheard by the competent legal tribunal. The Group has considered contingency plans should the appeal be rejected and does not anticipate any material disruption.

Audit Committee evaluation

The Audit Committee's performance was evaluated as part of the overall externally facilitated Board and Committee performance evaluation, which is described in depth on page 84. The overall performance of the Audit Committee was rated highly, with the Committee operating effectively to review the work of the internal and external Auditors, providing appropriate challenge to management's assessment of significant audit issues and material accounting judgements, and appropriate oversight of the Group's risk management and internal control systems.

It was noted that there was scope to enhance the approach and effectiveness of Internal Audit under the new Head, and to gain efficiencies in both Internal and External Audit going forward. A number of priorities were identified for the Audit Committee over the coming year, including implementing new accounting rules, encouraging management to continue to improve the control environment and having regard to the development of shared services.

On behalf of the Audit Committee

Douglas Hurt
Chairman, Audit Committee
27 February 2019

Nomination Committee

Dear Shareholder,

On behalf of the Nomination Committee, I am pleased to present the Nomination Committee Report for 2018. The primary responsibility of the Nomination Committee is to focus on Board succession planning to ensure that the Board is made up of individuals with the appropriate drive, abilities, diversity and experience to lead the Company in the delivery of its strategy.

The Committee reviews the current and future needs of the Board and its Committees on an ongoing basis, and as part of the annual corporate governance review conducted each year, examines the independence and diversity of the Board and the balance of skills and development needs of Board members. During 2018, the Committee reviewed the tenure of all of the Directors and discussed future Board composition.

In addition, the Nomination Committee monitors succession planning for the senior management levels immediately below the Board. This was a particular area of focus during 2018, with the Committee reviewing the resourcing of key business unit roles, focusing on the quality of those with key 'P&L' responsibility and reviewing functional roles. It also reviewed talent development and assessed the development of 'high potential' individuals throughout the organisation.

The Committee is committed to supporting and encouraging the growth of a consistent pool of diverse talent to ensure there is a pipeline for future progression to the Board.

Yours sincerely

John McDonough CBE
Chairman, Nomination Committee
27 February 2019

Committee Members

John McDonough CBE (Committee Chairman)
Christer Gardell
Hock Goh
Jane Hinkley
Douglas Hurt
Holly Koeppel

The Nomination Committee

The Nomination Committee is made up of me, as Chairman of the Company, and any three of the Non-executive Directors. During the year I continued as Chairman of the Committee, though I would not act as Chairman if the Committee was considering my succession or the appointment of my successor. In that case, the Chairman would be an appropriate Non-executive Director. The Company Secretary is Secretary to the Committee. Members' biographies are set out on pages 74 and 75.

Meetings

The Committee met five times during the year.

Key activities during the year

> **Board composition:** The Committee reviewed the skills, knowledge and experience required for the Board to continue to function effectively, and evaluated the current Board composition against an assessment of these future business needs

> **Board succession:** The Committee reviewed the ongoing requirements for Board composition to maintain the correct skills, experience and diversity at Board level, in light of the tenure of existing Directors

> **Senior Management succession:** The Committee reviewed the Group's succession processes for the Group Executive Committee and the management cadre below this level and examined how the development of individuals flagged as 'high potential' was proceeding

> **Directors' elections:** The Committee considered the Directors' annual re-elections at the 2018 AGM

> **Committee evaluation:** The Committee reviewed its performance and effectiveness during 2018

> **Committee terms of reference:** The Committee reviewed its terms of reference and recommended amendments to the Board to align them with the new UK Corporate Governance Code

Role and Responsibilities

The Nomination Committee's foremost priorities are to ensure that the Company has the best possible leadership, maintains a clear plan for orderly Executive and Non-executive Director succession, and cultivates the appropriate skills, experience and diversity in the Board's overall composition. Its primary focus is therefore on the strength of the Board, for which appointments are made on merit, against objective criteria, selecting the best candidate for the post. The Nomination Committee advises the Board on appointments, retirements and resignations from the Board and its Committees.

Nomination Committee continued

The Committee operates under formal terms of reference which were reviewed during the year to update them for the new UK Corporate Governance Code. These revised terms of reference are available on the Group's website www.vesuvius.com.

The Committee and its members are empowered to obtain outside legal or other independent professional advice at the cost of the Company in relation to its deliberations. These rights were not exercised during the year. The Committee may also secure the attendance at its meetings of any employee or other parties it considers necessary.

Process for Board appointments

The Committee follows formal, rigorous and transparent procedures for the appointment of new Directors. When considering a Board appointment, the Nomination Committee draws up a specification for the role, taking into consideration the balance of skills, knowledge and experience of its existing members, the diversity of the Board, the independence of continuing Board members, and the ongoing requirements and anticipated strategic developments of the Group. The search process is then able to focus on appointing a candidate with the necessary attributes to enhance the Board's performance. The Committee uses the services of search firms to identify appropriate candidates, ensuring that any selected firm is not in any way conflicted in the delivery of its role. In addition, the Committee will only use those firms that have adopted the Voluntary Code of Conduct addressing gender diversity and best practice in search assignments.

The Committee begins any recruitment process by reviewing the skills and attributes required for the role and agreeing a job specification. The Committee selects a suitable search firm for the assignment based on their skills, expertise and price. Searches are conducted globally and a long-list of diverse potential appointees is produced. For Executive Director positions internal candidates are also considered. The Committee reviews the long-list and a shortlist of candidates for interview is drawn up based upon the objective criteria identified at inception. The initial short-list of candidates is interviewed by members of the Nomination Committee. The preferred candidate then meets with the other Board members. Finally, detailed external references are taken up and following this the Committee makes a formal recommendation to the Board for the appointment of the preferred candidate. The candidate is then supported in undertaking their own due diligence on the Company and meeting with its advisers. They are also required to demonstrate that they have sufficient time available to devote to the role and to identify any potential conflicts of interest.

Following a new appointment, the Committee continues to monitor the development and integration onto the Board of the new Director. They undertake a full induction programme, continuing to gain insight into the business and meeting executives throughout the organisation.

Board composition

On an ongoing basis, the Committee reviews the current and future needs of the Board and its Committees – reflecting on the balance of skills and experience of current Directors and comparing this against the Board's list of key skills. The Committee also considers existing lengths of tenure and the prospective rotation and retirement of Board members, so that it can plan accordingly. As part of the annual corporate governance review conducted during the year, the Committee examined the independence of the Board and the balance of skills, and development needs of Board members.

Diversity

The Nomination Committee believes that diversity underpins the successful operation of the Board. It recognises that this is a key ingredient in creating a balanced culture for discussions and minimising 'group-think', and continues with its policy to review the requirements for different skills, experience, background, ethnicity and gender in respect of the Board's composition. The Board's approach to diversity is formalised in the Board Diversity Policy, details of which are set out on page 82. All Directors have served at a very senior level in global organisations, have international experience across a variety of industries, and most have spent a considerable amount of time resident outside the UK.
The Committee continues to consider the mix of skills, experience and knowledge required on the Board, and promote diversity not only on the Board but also throughout the wider business.

Senior management succession

The Committee's succession planning activities do not exclusively relate to the Board, but encompass the senior management levels below the Board, aiming to support and encourage the growth of a consistent pool of talent able to step up to the top roles in future years. One of the key areas of focus for the Committee during the year was on this succession pipeline, with an emphasis on the development of the senior management cadre. The Committee considered detailed succession plans for the senior business unit positions and was appraised of the work being undertaken to develop smaller 'P&L' positions within the organisation to allow for the development of talented individuals who could then step up to regional roles. The Committee noted the significant, senior functional positions that were under recruitment, and examined how the development of high potentials was proceeding, particularly those who were undergoing management training. The Board met key executives throughout the Group to gain a greater understanding of the breadth and depth of management talent. This process included a series of presentations to the Board by business unit, functional and geographical heads, to inform the Committee's views on executive succession planning and talent development across the Group.

Committee evaluation

The Committee's activities were part of the externally facilitated evaluation of Board effectiveness during the year. The Committee was considered to have performed effectively over the past year, with the content of meetings and the information received by the Committee both rated highly, and as having continued to improve. The significant focus on senior management resourcing during the year, was favourably regarded. It was noted that the Board would benefit from greater interaction with 'high potentials' and it was agreed that the exposure of management to the Committee and the Board in general would be further developed. Other priorities for the Committee in 2019 include ongoing oversight of senior management talent development and succession planning, and monitoring the progress of the new talent introduced in 2018.

On behalf of the Nomination Committee

John McDonough CBE
Chairman, Nomination Committee
27 February 2019

Directors' Remuneration Report

Remuneration Overview

Dear Shareholder,

On behalf of the Remuneration Committee, I am pleased to present the Directors' Remuneration Report for 2018, which sets out details of the pay received by Directors in 2018 and how we intend to apply our Remuneration Policy in 2019. This report will be subject to an advisory shareholder vote at the 2019 AGM.

The existing Remuneration Policy was approved by Shareholders at the 2017 AGM, in line with legislative requirements a new Remuneration Policy will be tabled for shareholder approval at the 2020 AGM. All payments received by Directors in 2018 were in line with our Remuneration Policy. I have set out details below of the key decisions made by the Committee during 2018. More details about these are included in the Annual Report on Directors' Remuneration on pages 105 to 115.

Performance in 2018

As described in the Strategic Report, 2018 was a year of excellent progress for the Group with revenue growth of 6.8%, on a reported basis and a 19.1% increase in reported trading profit. In addition, our cash generation remained robust, despite the growth in our turnover and increased capital investment during the year, but we recognise there is more to do on this front. A global strategy review was conducted by the Board in 2018, which led to the confirmation of our five key execution priorities. It also highlighted opportunities to accelerate the delivery of results from this strategy by: reinforcing our presence in the high-end, high-quality segments of the steel and foundry markets; increasing our efforts to optimise our manufacturing cost base; and driving changes with a team of skillful, motivated and talented people. The Remuneration Committee continues to work to support these strategic initiatives.

In 2018, Annual Incentive awards for the Executive Directors were based 60% on Group headline earnings per share (EPS), 20% on the Group's working capital to sales ratio (based on the 12-month moving average) and 20% on specified personal objectives. 33% of the Annual Incentive earned will be deferred into awards over shares for three years.

In 2018, the Board resolved to adjust the accounting treatment for the Group's US Deferred Tax Asset. This change was entirely unrelated to Group financial performance (and had no bearing on incentive outcomes), but required the EPS targets for the Annual Incentive Plan and the Group's EPS for the base year of the performance period for awards under the Vesuvius Share plan to be retranslated, to ensure that the effects of this decision were neutralised as performance was evaluated. The targets set out below for the Annual Incentive are the adjusted targets.

In 2018, our retranslated headline EPS of 52.6 pence was above the maximum adjusted Annual Incentive target of 43.0 pence. The Group's 2018 working capital to sales ratio was between the threshold of 24.5% and the target of 23.5%. This results in awards of 75% and 7.5% of base salary respectively, being 82.5% in total for the Executive Directors in respect of the financial performance metrics. In addition, we assessed each Executive Director's achievement of the personal objectives they were set for 2018, awarding Mr André and Mr Young 21.53% and 17.65% respectively of their maximum entitlements of 25%. As a result, the overall Annual Incentives payable to Messrs André and Young for 2018 are 104.03% and 100.15% of base salary respectively against maximum bonus opportunities of 125%.

The performance period for the awards made under the Vesuvius Share Plan ('VSP') in 2016 matured at the end of December 2018. Performance was measured equally by reference to Total Shareholder Return ('TSR') relative to the FTSE 250 (excluding investment trusts) and headline EPS growth over the three-year period (adjusted as above). Relative TSR performance was above upper quintile; as a result 50% of Performance Share awards will vest under the TSR element (out of a maximum 50%). The annual compound headline EPS growth for the period was 26.5%, exceeding the maximum annual compound headline EPS growth target of 15%. As a result, 50% of Performance Share awards will vest under the EPS performance element (out of a maximum of 50%).

The Committee considered whether to exercise its discretion when confirming the vesting of the Performance Shares, and reviewed the underlying performance of the Company to satisfy itself that the outcome was justified. Awards will vest in April 2019.

Other key decisions made by the Committee in 2018

- The Committee reviewed the salary for Patrick André, noting that he was appointed Chief Executive in September 2017 on a salary of £525,000 per annum. This salary was 11% lower than his predecessor's salary of £590,000. At appointment we committed to review his salary annually for the first three years of his appointment (January 2019, 2020 and 2021), to allow the Committee the flexibility to adjust Mr André's salary to an appropriate level for an established Chief Executive, subject to the Board being satisfied with his performance in

Remuneration Strategic Alignment	Deliver growth	Generate sustainable profitability and create shareholder value	Maintain strong cash generation and an efficient capital structure	Provide a safe working environment for our people	Be at the forefront of innovation	Run top-quality, cost-efficient and sustainable operations	Foster talent, skill and motivation in our people
Annual Incentive Plan							
Vesuvius Share Plan							

Remuneration Overview continued

the role. At the end of 2018, the Board discussed Mr André's performance to date as Chief Executive. The overwhelming consensus was that he has developed quickly into a highly effective and high-performing Chief Executive. In light of this, the Committee concluded that it was an appropriate time to adjust his salary on a commensurate basis. Accordingly, Mr André's salary was increased by 14% to £600,000 per annum with effect from 1 January 2019.

> The Committee also reviewed the Chairman's fee. These fees were set on demerger in 2012 and were last reviewed in 2015 when no changes were made. Having considered the Chairman's performance, dedication to his role and the time commitment, the Remuneration Committee approved an 11% increase in the Chairman's fee to £205,000 with effect from 1 January 2019.

> The Committee considered the structure of performance measures for incentives in 2019. Having reviewed the existing arrangements, the Committee intends to use the same framework for performance measures in 2019 that was used in 2018 for Executive Directors' incentive awards. Thus, these measures reward:

  > Growth: through the EPS measure used in the Annual Incentive and the Vesuvius Share Plan

  > Effective working capital management: through a target of the Group's working capital to sales ratio (based on the 12-month moving average) to be used in the Annual Incentive

  > Delivery of shareholder value: through the TSR measure used in the Vesuvius Share Plan

> In addition, the Committee took decisions about the grant and vesting of Share Plan awards in 2018 and the Annual Incentive Plan payments made in 2018 in respect of 2017.

> Following the publication of the new 2018 UK Corporate Governance Code the 'New Code' and The Companies (Miscellaneous Reporting) Regulations 2018, the Committee considered the changes that would need to be made to the Committee's role and responsibilities, and to the structure of the Group's remuneration going forward to ensure full compliance with the New Code and these new Regulations. As a result of this the Committee:

  > recommended to the Board appropriate changes to the Committee's terms of reference, to incorporate the New Code requirements regarding such items as: the prior experience of the Remuneration Committee Chairman; the Committee's review of workforce remuneration and related policies; and the alignment of incentives and rewards with culture; share incentive plans promoting long-term shareholdings by Executive Directors; remuneration schemes and policies enabling the use of discretion to override formulaic outcomes; and post-employment shareholding requirements for Executive Directors

  > reviewed its activities on understanding workforce related remuneration policies

  > resolved to implement an additional two-year holding period for Performance Share awards that are granted under the Vesuvius Share Plan from 2019 onwards, such that these awards will be subject to a three-year vesting period, followed by a two-year holding period

  > resolved that share awards granted under the Vesuvius Share Plan from 2019 onwards would also be subject to post-employment termination holding requirements for the duration of the above holding period – noting that a formal policy on this would be developed as part of the Remuneration Policy to be submitted for shareholder approval in 2020

  > reviewed the terms of the existing discretion applicable to determination of the vesting of awards under the Vesuvius Share Plan and updated this to align with the principles set out in the New Code

  > reviewed the existing malus and clawback circumstances currently specified by the Company (as set out on page 99 of the Remuneration Policy) and concluded that they remained appropriate.

The Remuneration Committee will undertake further work on remuneration structure and disclosure and compliance in 2019, with the intention of ensuring that the Company is fully compliant with all its obligations in this regard by the end of the year.

Non-executive Directors' fees

The Committee noted that the Board resolved to increase the fees of Non-executive Directors during the year. With effect from 1 January 2019 the basic fee paid to Non-executive Directors has increased by £5,000 to £50,000 p.a. No changes were made to the supplementary fees paid to the Committee Chairmen and the Senior Independent Director.

Shareholders' views

The Committee encourages dialogue with its major shareholders. It is satisfied that the current Remuneration Policy is designed to promote the long-term success of the Company, and that the performance-related elements of remuneration, which are kept under review, are transparent, stretching and rigorously applied.

I remain keen to hear shareholders' views on remuneration matters and look forward to an ongoing dialogue with shareholders and their continued support for our Directors' Remuneration Report resolution at the AGM.

Yours sincerely

Jane Hinkley
Chairman, Remuneration Committee
27 February 2019

Directors' Remuneration Report
Remuneration Policy

The Company's existing Remuneration Policy was approved at the AGM held on 10 May 2017. The previous policy applied in its entirety up until this date and after this date those elements of the previous policy that related to remuneration that remained extant on this date (such as outstanding share awards) continued to apply until these commitments cease.

The full policy report, as approved by shareholders, can be found in the 2016 Annual Report (a copy of which is available under the Reports tab in the 'Investors' section of the Group website www.vesuvius.com). For the benefit of shareholders, we have reprinted the Policy below. To ensure that the Policy is relevant to the 2018 financial year, we have made minor textual changes to refer to the applicable financial year in the following sections: Illustration of the Application of the Remuneration Policy for 2019 (which also contains, as described, 2019 data); and Consideration of Shareholder Views. The 'Service contracts' section refers to the terms of the current Executive Directors and the 'Terms of service' section refers to the dates of appointment of the current Non-executive Directors.

The Remuneration Committee reserves the right to make any remuneration payments and payments for loss of office (including exercising any discretions available to it in connection with such payments), notwithstanding that they are not in line with the policy set out here, where the terms of the payment were agreed; (i) before the date the Company's first Remuneration Policy approved by shareholders in accordance with section 439A of the Companies Act came into effect; (ii) before the policy set out here came into effect, provided that the terms of the payment were consistent with the shareholder-approved Remuneration Policy in force at the time they were agreed; or (iii) at a time when the relevant individual was not a Director of the Company and, in the opinion of the Remuneration Committee, the payment was not in consideration for the individual becoming a Director of the Company. For these purposes, 'payments' includes the Remuneration Committee satisfying awards of variable remuneration and, in relation to an award over shares, the terms of the payment are 'agreed' at the time the award is granted.

Remuneration Policy Table for Executive Directors

Base salary

Alignment/purpose

Helps to recruit and retain key employees. Reflects the individual's experience, role and contribution within the Company.

Operation

The individual's performance is reviewed annually, with changes to base salary normally appraised over a two to three-year period.

Any change will normally be effective from 1 January in the year of the increase.

Base salary is positioned to be market competitive when considered against other global industrial companies, and relevant international and FTSE 250 companies (excluding Investment Trusts).

Paid in cash, subject to local tax and social security regulations.

Opportunity

Salary increases will normally be in line with the average increase awarded to other employees in the Group over a similar period. In considering any increase in base salary, the Committee will also consider:

(i) the role and value of the individual;

(ii) changes in job scope or responsibility;

(iii) progression in the role (e.g. for a new appointee);

(iv) a significant increase in the scale of role and/or size, value or complexity of the Group; and

(v) the need to maintain market competitiveness.

In line with the two to three-year period for base salary appraisal, individual increases when paid are likely to be in excess of those for the wider population of employees for that year.

No absolute maximum has been set for Executive Director base salaries. Current Executive Directors' salaries are set out in the Annual Report on Directors' Remuneration section of this Remuneration Report.

Performance

Any increase will take into account the individual's performance, contribution and increasing experience.

Other benefits

Alignment/purpose

Provides normal market practice benefits.

Operation

A range of standard benefits including, but not limited to: car allowance, private medical care (including spouse and dependent children), life insurance, disability and health insurance, together with relocation allowance and expatriate benefits, in some instances grossed up for tax, in accordance with the Group's policies, and participation in any employee share scheme operated by the Group.

Opportunity

There is no formal maximum as benefit costs can fluctuate depending on changes in provider, cost and individual circumstances.

Performance

None

Remuneration Policy continued

Pension

Alignment/purpose
Helps to recruit and retain key employees. Ensures income in retirement.

Operation
An allowance is given as a percentage of base salary. This may be used to participate in Vesuvius' pension arrangements, invested in own pension arrangements or taken as a cash supplement (or any combination of the above options).

Opportunity
Maximum of 30% of base salary.

Performance
None

Annual Incentive

Alignment/purpose
Incentivises Executive Directors to achieve key short-term financial and strategic targets of the Group.

Additional alignment with shareholders' interests through the operation of bonus deferral.

Operation
Normally 33% of any Annual Incentive earned by Executive Directors will be deferred into awards over shares under the Vesuvius Deferred Share Bonus Plan which normally vest after at least three years, other than in specified circumstances outlined elsewhere in this Policy. These may be cash or share settled.

The Committee has the discretion to determine that actual incentive payments should be lower than levels calculated by reference to achievement against targets if it considers this to be appropriate.

The Committee has the discretion to award participants the equivalent value of dividends accrued during the vesting period on any shares that vest.

Subject to malus and clawback.

Opportunity
Below threshold: 0%.

On-target: 62.5% of base salary.

Maximum: 125% of base salary.

Payments made between threshold and on-target and between on-target and maximum are pro-rated.

Performance
Annual Incentive is measured on targets set at the beginning of each year. The Committee establishes threshold and maximum performance targets for each financial year. The majority of the Annual Incentive will be determined by measure(s) of Group financial performance. The remainder of the Annual Incentive will be based on financial, strategic or operational measures appropriate to the individual Director. Performance is measured over a one-year period. Actual performance targets will be disclosed after the performance period has ended. They are not disclosed in advance due to their commercial sensitivity.

Vesuvius Share Plan

Alignment/purpose
Flexible 'umbrella' plan.

Aligns Executive Directors' interests with those of shareholders through the delivery of shares. Rewards Executive Directors for achieving the strategic objectives of growth in shareholder value and earnings.

Assists retention of Executive Directors over a three-year performance period.

Operation
Awards may be granted as:

> Performance share awards

> Deferred share bonus awards

> Restricted share awards

> Market-price options

These may be cash or share settled.

Individuals are entitled to an aggregate annual maximum amount of awards. If more than one type of award is granted, the individual limit for all awards is reduced to remain within the maximum.

Awards vest three years after their award date, other than in specified circumstances outlined elsewhere in this policy, subject to the achievement of specified conditions.

The Committee may decide that the shares in respect of which an award vests are delivered to participants at that point or that awards will then be subject to an additional holding period before participants are entitled to receive their shares.

The Committee has the discretion to award participants the equivalent value of dividends accrued during the vesting period on any shares that vest.

Subject to malus and clawback.

Opportunity
Executive Directors are eligible to receive an annual award with a face value of up to 200% of base salary in Performance share awards.

Vesting at threshold performance is 25% rising to vesting of the full award at maximum.

Performance
Vesting of Performance Share awards is usually dependent on measures of Group EPS and relative TSR with the precise measures and weighting of the measures determined by the Committee ahead of each award. These details are disclosed in the Annual Report on Directors' Remuneration section of this Remuneration Report.

The Company reserves the right only to disclose EPS performance targets after the performance period has ended, due to their commercial sensitivity.

Prior to any vesting, the Remuneration Committee also reviews the underlying financial performance of the Company over the performance period to ensure the vesting is justified.

Malus/Clawback arrangements

The Executive Directors' variable remuneration is subject to malus and clawback provisions. These provide the Committee with the flexibility, if required, to withhold or recover payments made to Executive Directors under the Annual Incentive Plan (including deferred awards) and/or to withhold or recover share awards granted to Executive Directors under the Vesuvius Share Plan, including any dividends granted on such awards.
The circumstances in which the Committee could potentially elect to apply malus and clawback provisions include: a material misstatement in the Company's financial statements; an error in the calculation of the extent of payment or vesting of an incentive; gross misconduct by an individual; or significant financial loss or serious reputational damage to Vesuvius plc resulting from an individual's conduct, a material failure of risk management or a serious breach of health and safety. These malus and clawback provisions apply for a period of up to three years after the end of a performance period (or end of the deferral period in respect of deferred awards).

Performance measures

In selecting performance measures for the Annual Incentive, the Committee seeks to reflect key strategic aims and the need for a rigorous focus on financial performance. Each year the Committee agrees challenging targets to ensure that underperformance is not rewarded. The Company will not be disclosing the specific financial or personal objectives set until after the relevant performance period has ended because of commercial sensitivities. The personal objectives are all non-financial or job-specific in nature and track performance against key strategic, organisational and operational goals.

In selecting performance measures for the Vesuvius Share Plan, the Committee seeks to focus Executive Directors on the execution of long-term strategy and also align their rewards with value created for shareholders. On this basis, the performance conditions for the Vesuvius Performance Share awards will usually be dependent on measures based on TSR and EPS performance.

Within the policy period, the Committee will continually review the performance measures used, including TSR and the applicable comparator group, and EPS and other financial measures, to ensure that awards are made on the basis of challenging targets that clearly support the achievement of the Group's strategic aims.

The Committee may vary or waive any performance condition(s) if circumstances occur which cause it to determine that the original condition(s) have ceased to be appropriate, provided that any such variation or waiver is fair, reasonable and not materially less difficult to satisfy than the original condition (in its opinion). In the event that the Committee were to make an adjustment of this sort, a full explanation would be provided in the next Remuneration Report.

The Committee may: (a) in the event of a variation of the Company's share capital, demerger, special dividend or any other corporate event which it reasonably determines justifies such an adjustment, adjust; and (b) amend the terms of awards granted under the share schemes referred to above in accordance with the rules of the relevant plans.

Share awards may be settled by the issue of new shares or by the transfer of existing shares. In line with prevailing best practice at the time this Policy Report was approved, any issuance of new shares is limited to 5% of share capital over a rolling ten-year period in relation to discretionary employee share schemes and 10% of share capital over a rolling ten-year period in relation to all employee share schemes.

Remuneration Policy continued

Illustration of the application of the Remuneration Policy for 2019

The charts below show the total remuneration for Executive Directors for 2019 for minimum, on-target and maximum performance. The fixed elements of remuneration comprise base salary, pension and other estimated benefits, using 2019 salary data. The assumptions on which they are calculated are as follows:

Minimum: Fixed remuneration only.

On-target: Fixed remuneration plus on-target Annual Incentive (made at 62.5% of base salary for Patrick André and Guy Young) and threshold vesting (i.e. median performance for TSR and threshold for EPS) for Performance Share awards (made at 200% of base salary for Patrick André and 150% of base salary for Guy Young) under the Vesuvius Share Plan.

Maximum: Fixed remuneration plus maximum Annual Incentive (being full achievement of financial and personal targets, made at 125% of base salary for Patrick André and Guy Young) and 100% vesting for Performance Share awards (made at 200% of base salary for Patrick André and 150% of base salary for Guy Young) under the Vesuvius Share Plan.

Note: In addition the Committee retains the discretion to award dividends (either shares or their cash equivalent) on any shares that vest.

Service contracts of Executive Directors

The Committee will periodically review the contractual terms for new Executive Directors to ensure these reflect best practice. Service contracts currently operate on a rolling basis and are limited to a 12-month notice period.

Patrick André is employed as Chief Executive of Vesuvius plc pursuant to the terms of a service agreement made with Vesuvius plc dated 17 July 2017. Guy Young is employed as Chief Financial Officer pursuant to the terms of a service agreement with Vesuvius plc dated 16 September 2015. Each Executive Director's appointment is terminable by Vesuvius on not less than 12 months' written notice, and by each Executive Director on not less than six months' written notice.

External appointments of Executive Directors

The Executive Directors do not currently serve as Non-executive Directors of any other quoted company. Subject always to consent being granted by the Company for them to take up such an appointment, were they to so serve, the Company would allow them to retain any fees they received for the performance of their duties.

Remuneration policy for Non-executive Directors

The Company seeks to appoint Non-executive Directors who have relevant professional knowledge, and have gained experience in a relevant industry and geographical sector, to support diversity of expertise at the Board and match the wide geographical spread of the Company's activities.

Non-executive Directors attend Board, Committee and other meetings, held mainly in the UK, together with an annual strategy review to debate the Company's strategic direction. All Non-executive Directors are expected to familiarise themselves with the scale and scope of the Company's business and to maintain their specific technical skills and knowledge.

The Board sets the level of fees paid to the Non-executive Directors after considering the role and responsibilities of each Director and the practice of other companies of a similar size and international complexity. The Non-executive Directors do not participate in Board discussions on their own remuneration. No variable remuneration is available to Non-executive Directors. Non-executive Directors receive reimbursement of reasonable expenses incurred in attending the Board, Committee and other ad hoc meetings, including gross up payments to cover any personal tax owed on such expenses.

Fees

Alignment/purpose

To attract and retain Non-executive Directors of the necessary skill and experience by offering market-competitive fees.

Operation

Fees are usually reviewed every other year by the Board.

Non-executive Directors are paid a base fee for the performance of their role, payable in cash, plus additional fees for Committee chairmanship or acting as the Senior Independent Director.

The Chairman is paid a single fee and receives administrative support from the Company.

Opportunity

Non-executive Directors and the Chairman will be paid market-appropriate fees, with any increase reflecting changes in the market or adjustments to a specific Non-executive Director's role.

No eligibility for bonuses, retirement benefits or to participate in the Group's employee share plans.

Base fees paid to Non-executive Directors will in aggregate remain within the aggregate limit stated in our Articles, currently being £500,000.

Performance

None

Benefits and expenses

Alignment/purpose

To facilitate execution of responsibilities and duties required by the role.

Operation

All Non-executive Directors are reimbursed for reasonable expenses incurred in carrying out their duties (including any personal tax owing on such expenses).

Opportunity

Non-executive Directors' expenses are paid in accordance with Vesuvius' expense procedures.

Performance

None

Terms of service of the Chairman and other Non-executive Directors

The terms of service of the Chairman and the Non-executive Directors are contained in letters of appointment. Each Non-executive Director is appointed subject to their election at the Company's first Annual General Meeting following their appointment and re-election at subsequent Annual General Meetings. During the first year of his/her appointment, the Chairman is entitled to 12 months' notice from the Company; thereafter, he/she is entitled to six months' notice from the Company. None of the other Non-executive Directors is entitled to receive compensation for loss of office at any time. All Non-executive Directors are subject to retirement, and election or re-election, in accordance with the Company's Articles of Association. The current policy is for Non-executive Directors to serve on the Board for a maximum of nine years, with review at the end of three and six years, subject always to mutual agreement and annual performance evaluation. The Board retains discretion to extend the tenure of Non-executive Directors beyond this time, subject to the requirements of Board balance and independence being satisfied.

Remuneration Policy continued

The table below shows the date of appointment for each of the Non-executive Directors:

Non-Executive Director	Date of Appointment
John McDonough CBE	31 October 2012
Christer Gardell	31 October 2012
Hock Goh	2 April 2015
Jane Hinkley	3 December 2012
Douglas Hurt	2 April 2015
Holly Koeppel	3 April 2017

Recruitment policy

On appointment or promotion of a new Executive Director, the Committee will typically use the Remuneration Policy in force at the time of the Committee's decision to determine ongoing remuneration.

Base salary levels will generally be set in accordance with the Remuneration Policy current at the time of the Committee's decision, taking into account the experience and calibre of the appointee. If it is appropriate to appoint an individual on a base salary initially below what is adjudged to be market positioning, contingent on individual performance, the Committee retains the discretion to realign base salary over the one to three years following appointment, which may result in a higher rate of annualised increase than might otherwise be awarded under the policy. If the Committee intends to rely on this discretion, it will be noted in the first Remuneration Report following an individual's appointment. Other than in exceptional circumstances, other elements of annual remuneration will, typically, be set in line with the Remuneration Policy including a limit on awards under the Annual Incentive and Vesuvius Share Plan of 325% of salary in aggregate. The Committee retains the discretion to make the following further exceptions:

> In the event that an internal appointment is made, or where a Director is appointed as a result of transfer into the Group on an acquisition of another Company, the Committee may continue with existing remuneration provisions for this individual, including pension entitlements, where appropriate

> If necessary and appropriate to secure the appointment of a candidate who has to move locations as a result of the appointment, whether internal or external, the Committee may make additional payments linked to relocation, above those outlined in the policy table, and would authorise the payment of a relocation allowance and repatriation, as well as other associated international mobility terms. Such benefits would be set at a level which the Committee considers appropriate for the role and the individual's circumstances

> If appropriate the Committee may apply different performance measures and/or targets to a Director's first incentive awards in his/her year of appointment

Service contracts will be entered into on terms similar to those for the existing Executive Directors, summarised in the 'Service contracts of Executive Directors' section above.

In addition to the annual remuneration elements noted above, the Committee may consider buying out terms, incentives and any other compensation arrangements forfeited on leaving a previous employer that an individual forfeits in accepting an appointment with Vesuvius. The Committee will have the authority to rely on Listing Rule 9.4.2R(2) or to apply the existing limits within the Vesuvius Share Plan to make Restricted Share awards on recruitment. In making any such awards, the Committee will review the terms of any forfeited awards, including, but not limited to, vesting periods, the expected value of such awards on vesting and the likelihood of the performance targets applicable to such awards being met, while retaining the discretion to make any buy-out award the Committee determines is necessary and appropriate. The Committee may also require the appointee to purchase shares in Vesuvius to a pre-agreed level prior to vesting of any such awards. The value of any buy-out award will be capped, to ensure its maximum value is no higher than the value of the awards that the individual forfeited on joining Vesuvius. Any such awards will be subject to malus and clawback.

With respect to the appointment of a new Chairman or Non-executive Director, appointment terms will be consistent with those applicable at the time the appointment is agreed. Variable pay will not be considered. With respect to Non-executive Directors, fees will be consistent with the policy at the time the appointment is agreed. If, in exceptional circumstances, a Non-executive Director was asked to assume an interim executive role, the Company retains the discretion to pay them appropriate executive compensation, in line with the policy.

Exit payment policy

Vesuvius has the option to make a payment in lieu of part or all of the required notice period for Executive Directors. Any such payment in lieu will consist of the base salary, pension contributions and value of benefits to which the Director would have been entitled for the duration of the remaining notice period, net of statutory deductions in each case. Half of any payments in lieu of notice would be made in a lump sum, the remainder in equal monthly instalments commencing in the month in which the midpoint of their foregone notice period falls (and are reduced or extinguished by salary from any role undertaken by the departing Executive in this time). Executive Directors are subject to certain non-compete covenants for a period of nine months, and non-solicitation covenants for a period of 12 months, following the termination of their employment. Their service agreements are governed by English law.

Executive Directors' contracts do not contain any change of control provisions; they do contain a duty to mitigate should the Director find an alternative paid occupation in any period during which the Company must otherwise pay compensation on early termination.

The table below summarises how the awards under the annual bonus and Vesuvius Share Plan are typically treated in different leaver scenarios and on a change of control. Whilst the Committee retains overall discretion on determining 'good leaver' status, it typically defines a 'good leaver' in circumstances such as retirement with agreement of the Company, ill health, disability, death, redundancy, or part of the business in which the individual is employed or engaged ceasing to be part of the Group. Final treatment is subject to the Committee's discretion.

Event	Timing	Calculation of vesting/payment
Annual Incentive Plan		
Good leaver	Paid at the same time as to continuing employees.	Annual bonus is paid only to the extent that any performance conditions have been satisfied and is pro-rated for the proportion of the financial year worked before cessation of employment.
Bad leaver	Not applicable.	Individuals lose the right to their annual bonus.
Change of control	Paid on the effective date of change of control.	Annual bonus is paid only to the extent that any performance conditions have been satisfied and is pro-rated for the proportion of the financial year worked.
Vesuvius Share Plan		
Good leaver	On normal vesting date (or earlier at the Committee's discretion).	Unvested awards vest to the extent that any performance conditions have been satisfied and a pro-rata reduction applies to the value of the awards to take into account the proportion of vesting period not served, unless the Committee decides that the reduction in the number of vested shares is inappropriate.
Bad leaver	Unvested awards lapse.	Unvested awards lapse on cessation of employment.
Change of control[1]	On the date of the event.	Unvested awards vest to the extent that any performance conditions have been satisfied and a pro-rata reduction applies for the proportion of the vesting period not served.

Note:
1. In certain circumstances, the Committee may determine that unvested awards under the Vesuvius Share Plan will not vest on a change of control but will instead be replaced by an equivalent grant of a new award, as determined by the Committee, in the new company.

In the case of the Vesuvius Deferred Share Bonus Plan if the individual leaves for any reason (other than dismissal for cause) or in the event of a change in control, the deferred award will vest in full, unless the Committee determines otherwise.

Benefits normally cease to be provided on the date employment ends. However, the Committee has the discretion to allow some minor benefits (such as health insurance, tax advice and repatriation expenses) to continue to be provided for a period following cessation where this is considered fair and reasonable or appropriate on the basis of local market practice. In addition, the Committee retains discretion to fund other expenses for the Executive Director, for example, payments to meet legal fees incurred in connection with termination of employment, or to meet the costs of providing outplacement support, and de minimis termination costs up to £5,000 to cover transfer of mobile phone or other administrative expenses.

The Committee reserves the right to make any other payments in connection with a Director's cessation of office or employment where the payments are made in good faith in discharge of an existing legal obligation (or by way of damages for breach of such an obligation) or by way of a compromise or settlement of any claim arising in connection with the cessation of a Director's office or employment.

In certain circumstances, the Committee may approve new contractual arrangements with departing Executive Directors including (but not limited to) settlement, confidentiality, restrictive covenants and/or consultancy arrangements. These would be used only where the Committee believed it was in the best interests of the Company to do so.

Remuneration Policy continued

Comparison of Remuneration Policy for Executive Directors with that for other employees

The Remuneration Policy for Executive Directors is designed in line with the remuneration philosophy set out in this report – which also underpins remuneration for the wider Group. Remuneration arrangements for Executive Directors draw on the same elements as those for other employees – base salary, fixed benefits and retirement benefits – with performance-related pay extending down into the management cadres and beyond. However, given that remuneration structures for other employees need to reflect both seniority and local market practice, they differ from the policy for Executive Directors. In particular, Executive Directors receive a higher proportion of their remuneration in performance-related pay and share-based payments. Individual percentages of fixed versus variable remuneration and participation in share-based structures decline as seniority decreases.

The process for delivering salary increases on a two to three-year cycle for Executive Directors is also applied to other members of the Group Executive Committee and their direct managerial reports. Whilst all employees receive an annual performance appraisal, other employees continue to receive salary reviews on an annual basis.

As with Executive Directors, middle and senior managers participate in the Annual Incentive Plan. For members of the Group Executive Committee and functional employees, the award is predominantly based on Group performance, with the remainder awarded against achievement of personal objectives. For operational employees, any potential award is based upon achieving three measures relating to Group performance, business unit performance, and individual achievement of personal objectives.

All members of the Group Executive Committee participate in the Vesuvius Share Plan and receive awards of Performance Shares, which vest in accordance with measures and targets set against EPS and TSR. The level of awards granted to members of the Group Executive Committee who don't serve on the Board are lower than those payable to the Executive Directors.

For certain senior and middle managers, awards are made under the Vesuvius Medium Term Plan ('MTP'). These managers participate in the MTP at varying percentage levels, and awards are based on the same measures and targets as the Annual Incentive Plan. Senior managers have their MTP awards made over Vesuvius shares, whilst middle managers receive their awards in cash. In each case, awards are granted following the end of the relevant financial year. The MTP share awards vest on the second anniversary of the date of grant, subject to continuing employment.

Consideration of conditions elsewhere in the Group in developing policy

The Company does not consult directly with employees on Executive Directors' remuneration arrangements. However, the Remuneration Committee will take into account the pay and employment conditions of other Group employees when determining Executive Directors' remuneration, particularly when determining base salary increases, when the Committee will consider the salary increases for other Group employees in the same jurisdiction.

Consideration of Shareholder views

Vesuvius is committed to open and transparent dialogue with its shareholders on remuneration as well as other governance matters. As Chairman of the Committee, Jane Hinkley welcomes shareholder engagement and is available for any discussions investors wish to have on remuneration matters. During 2018, remuneration matters were discussed at a number of meetings with investors. The feedback from such meetings is always shared with the Committee and taken into consideration when decisions are made about future remuneration strategy and arrangements.

Shareholding guidelines

The Remuneration Committee encourages Executive Directors to build and hold a shareholding in the Company. The required holding of the Chief Executive is to be equivalent in value to at least 2x salary and that required of other Executive Directors is to be equivalent in value to at least 1x salary.

Compliance with the shareholding policy is tested at the end of each year for application in the following year using the average of the closing prices of a Vesuvius ordinary share for the trading days in that December.

General

The Committee may make minor amendments to the policy set out in this Policy Report (for regulatory, exchange control, tax or administrative purposes or to take account of a change in legislation) without obtaining shareholder approval for that amendment.

Directors' Remuneration Report

Annual Report on Directors' Remuneration

Directors' Remuneration at a glance

Our remuneration for Executive Directors

The table below sets out the phasing of receipt of the various elements of Executive Director remuneration for 2019.

	2019	2020	2021	2022	2023	2024	Description and link to strategy
Base salary							Salaries are set at an appropriate level to enable the Company to recruit and retain key employees, and reflect the individual's experience, role and contribution within the Company.
Benefits							Provides normal market practice benefits.
Pension							The pension benefit helps to recruit and retain key employees and ensures income in retirement.
Annual Incentive							The Annual Incentive incentivises the Executive Directors to achieve key short-term financial and strategic targets of the Group.
Deferred Incentive							The deferral of a portion of the Annual Incentive increases alignment with shareholders.
Vesuvius Share Plan					Holding Period		Awards under the Vesuvius Share Plan align Executive Directors' interests with those of shareholders through the delivery of shares and assist in the retention of the Executive Directors. The VSP rewards the Executive Directors for achieving the strategic objectives of growth in shareholder value and earnings.

2019 Directors' Remuneration

The table below sets out how the Remuneration Policy will be applied to the Executive Directors' remuneration for 2019. Further details about each of the elements of remuneration are set out in the Remuneration Policy and the Annual Report on Directors' Remuneration.

Remuneration element	Remuneration structure
Base salary	Current salaries as follows: > Patrick André – £600,000 (2018: £525,000) > Guy Young – £350,000 (2018: £350,000) The 2019 salaries shown above include a salary increase effective from 1 January 2019 of 14% for Patrick André. In line with the Group's Remuneration Policy, Guy Young has not received an increase in 2019.
Benefits	Benefits for Executive Directors include car allowance, private medical care, relocation expenses, tax advice and tax reimbursement, commuting costs, school fees and Directors' spouse's travel and administrative expenses.
Pension	Pension allowances of 25% of base salary. This allowance can be used to participate in Vesuvius' pension arrangements, be invested in their own pension arrangements or be taken as a cash supplement (or any combination of these alternatives).
Annual Incentive	For 2019 the maximum Annual Incentive potential for the Executive Directors will be 125% of base salary with target Annual Incentive potential being 62.5% of base salary. Their incentives are based 60% on Group headline earnings per share, 20% on the Group's working capital to sales ratio (based on the 12-month moving average) and 20% on specified personal objectives. 33% of any Annual Incentive earned will be deferred into awards over shares, to be held for a period of three years.
Vesuvius Share Plan	Performance Share awards with a maximum value of 200% of salary will be awarded to Patrick André and 150% for Guy Young. Vesting of 50% of shares awarded will be based upon the Company's TSR performance relative to that of the constituent companies of the FTSE 250 (excluding investment trusts), and 50% on headline EPS growth. Performance will be measured over three years with awards vesting after three years.There will then be a further two-year holding period applicable to the awards.

Annual Report on Directors' Remuneration continued

Remuneration Committee structure

The current members of the Remuneration Committee are all the independent Non-executive Directors of the Company. The Committee Chairman is Jane Hinkley. Jane Hinkley, Hock Goh, Douglas Hurt and Holly Koeppel have all served on the Committee throughout 2018. All continue in office as at the date of this report. The Committee complies with the requirements of the UK Corporate Governance Code for the composition of remuneration committees. Each of the members brings a broad experience of international businesses and an understanding of their challenges to the work of the Committee. The Company Secretary is Secretary to the Committee. Members' biographies are on pages 74 and 75.

Meetings

The Committee met five times during the year. The Group's Chairman, Chief Executive and Chief HR Officer (initially Ryan van der Aa, and subsequently Agnieszka Tomczak), were invited to each meeting, together with Christer Gardell, our non-independent Non-executive Director, though none of them participated in discussions regarding their own remuneration. In addition, a representative from Deloitte, the Remuneration Committee adviser, attended the majority of meetings. The attendees supported the work of the Committee, giving critical insight into the operational demands of the business and their application to the overall remuneration strategy within the Group. In receiving views on remuneration matters from the Executive Directors and senior management, the Committee recognised the potential for conflicts of interest to arise and considered the advice accordingly. The Chairman of the Committee reported the outcomes of all meetings to the Board.

The Committee operates under formal terms of reference which were reviewed during the year and a recommendation was made to the Board about appropriate amendments to align them with the new 2018 UK Corporate Governance Code. The terms of reference are available on the Group website www.vesuvius.com. The Committee members are permitted to obtain outside legal advice at the Company's expense in relation to their deliberations. These powers were not exercised during the year. The Committee may also secure the attendance at its meetings of any employee or other parties it considers necessary.

Role and responsibilities

The Committee is responsible for:

> Determining the overall remuneration policy for the Executive Directors including the terms of their service agreements, pension rights and compensation payments

> Setting the appropriate remuneration for the Chairman, the Executive Directors and Senior Management (being the Group Executive Committee)

> Reviewing workforce remuneration and related policies, and the alignment of incentives and rewards with culture, taking these into account when setting the policy for Executive Director remuneration

> Overseeing the operation of the executive share incentive plans

Advice provided to the Remuneration Committee

Deloitte is appointed directly by the Remuneration Committee to provide advice on executive remuneration matters, including remuneration structure and policy, updates on market practice and trends, and guidance on the implementation and operation of share incentive plans. The Committee appointed Deloitte, a signatory to the Remuneration Consultants Group Code of Conduct in relation to Executive Remuneration Consulting in the UK, following a formal tender process in 2014. Deloitte also provides the Remuneration Committee with ongoing calculations of total shareholder return (TSR) to enable the Committee to monitor the performance of long-term share incentive plans. In addition in 2018, within the wider Group, Deloitte was procured in various jurisdictions to provide tax and treasury advisory work. During 2018, Deloitte's fees for advice to the Remuneration Committee, charged on a time spent basis, amounted to £54,147. The Committee conducted a review of the performance of Deloitte as remuneration adviser during the year and concluded that Deloitte continued to provide effective, objective and independent advice to the Committee. No conflict of interest arises as a result of other services provided by Deloitte to the Group.

Activities of the Remuneration Committee

The key matters the Remuneration Committee considered during its five meetings in 2018 included:

> Considering and approving the 2019 salary review proposals for the Chairman, Chief Executive and Senior Management

> Reviewing and approving achievement against performance targets for the 2017 Annual Incentive arrangements

> Setting performance targets and approving the structure of the 2018 Annual Incentive arrangements

> Reviewing and assessing the Company's attainment of performance conditions applicable to the Vesuvius Performance Share awards made in 2015

> Setting the performance measures and targets, and authorising the grant of new awards in 2018 under the Vesuvius Share Plan, the Deferred Share Bonus Plan and Medium Term Incentive Plan

> Considering the Company's ongoing share sourcing requirements to meet obligations under the Company's share plans, and funding of the ESOP

> Approving the 2017 Directors' Remuneration Report and reviewing the 2018 Directors' Remuneration Report

> In light of the publication of the new 2018 UK Corporate Governance Code, the 'New Code', along with advice received from the external advisers and other trends in remuneration practice, discussing the Committee's role and responsibilities going forward. As a result of this the Committee:

  > recommended to the Board appropriate changes to the Committee's terms of reference to incorporate the New Code requirements regarding such items as: the prior experience of the Remuneration Committee Chairman; the Committee's review of workforce remuneration and related policies; and the alignment of incentives and rewards with culture; share incentive plans promoting long-term shareholdings by executive directors; remuneration schemes and policies enabling the use of discretion to override formulaic

outcomes; and post-employment shareholding requirements for executive Directors

> reviewed its activities on understanding workforce related remuneration policies

> resolved to implement an additional two-year holding period for Performance Share awards that are granted under the Vesuvius Share Plan from 2019 onwards, such that these awards will be subject to a three-year vesting period, followed by a two-year holding period

> resolved that share awards granted under the Vesuvius Share Plan from 2019 onwards would also be subject to post-employment termination holding requirements for the duration of the above holding period – noting that a formal policy on this would be developed as part of the Remuneration Policy to be submitted for shareholder approval in 2020

> reviewed the terms of the existing discretion applicable to determination of the vesting of awards under the Vesuvius Share Plan and updated this to align with the principles set out in the New Code and

> reviewed the existing malus and clawback circumstances currently specified by the Company (as set out on page 99 of the Remuneration Policy) and concluded that they remained appropriate.

> As in previous years, the Committee was the subject of an externally moderated performance evaluation in 2018. The performance of the Remuneration Committee was rated highly and it was noted that there had been an improvement in the quality of communication between the Company, the Committee and its advisers, and that this was now rated as good. It was anticipated that with the arrival of the new Chief HR Officer this area would be further developed. It was noted that in 2019, the Committee would be focusing on the formulation of the Company's 2020 Remuneration Policy, which would be tabled for approval at the 2020 AGM.

Regulatory Compliance

The Remuneration Policy, which is set out on pages 97 to 104 was prepared in accordance with the Companies Act 2006 and the Large and Medium-sized Companies and Groups (Accounts and Reports) (Amendment) Regulations 2013. It also meets the requirements of the Financial Conduct Authority's Listing Rules and the Disclosure Guidance and Transparency Rules. This Remuneration Report sets out how the principles of the 2016 UK Corporate Governance Code are applied by the Company in relation to matters of remuneration. We have complied for the year under review with the provisions of the Code.

Share Usage

Under the rules of the Vesuvius Share Plan, the Company has the discretion to satisfy awards either by the transfer of Treasury shares or other existing shares, or by the allotment of newly issued shares. Awards made under the Deferred Share Bonus Plan to satisfy shares awarded to Directors in respect of their Annual Incentive, and awards made to management of the Company over shares pursuant to the Medium Term Incentive Plan, must be satisfied out of Vesuvius shares held for this purpose by the Company's employee share ownership plan trust (ESOP). The decision on how to satisfy awards is taken by the Remuneration Committee which considers the most prudent and appropriate sourcing arrangement for the Company.

At 31 December 2018, the Company held 7,271,174 ordinary shares in Treasury and the ESOP held 2,874,060 ordinary shares. During the year, the trustee of the ESOP purchased an additional 2,313,456 Vesuvius plc shares to hold to satisfy the potential future vesting of awards under the Company's share incentive plans. Subsequent to the year-end the ESOP purchased an additional 71,544 shares to complete a purchase commenced prior to the year-end. The ESOP can be gifted Treasury shares by the Company, can purchase shares in the open market or can subscribe for newly issued shares, as required, to meet obligations to satisfy options and awards that vest.

The Vesuvius Share Plan complies with the current Investment Association guidelines on headroom which provide that overall dilution under all plans over a rolling ten-year period should not exceed 10% of the Company's issued share capital, with a further limitation over a rolling ten-year period of 5% for discretionary share schemes. More than 9.9% of the 10% limit and more than 4.9% of the 5% limit remains available as headroom for the issue of new shares or the transfer of Treasury shares for the Company. No Treasury shares have been transferred or newly issued shares allotted under the Vesuvius Share Plan during the year under review.

Policy Implementation

The following section provides details of how the Company's Remuneration Policy was implemented during the financial year 2018 and how it will be implemented in the financial year 2019.

Annual Report on Directors' Remuneration continued

Directors' Remuneration – Audited

The table below sets out the total remuneration received by Executive Directors in the financial year under review:

	Patrick André[1]		Guy Young	
	2018 (£000)	2017 (£000)	2018 (£000)	2017 (£000)
Total salary[2]	525	175	350	325
Taxable benefits[3]	203	60	29	23
Pension[4]	131	44	88	81
Total fixed pay[5]	**859**	279	**467**	429
Annual Incentive[6]	546	186	351	332
Long-term incentives[7]	546	—	758	—
Total variable pay[8]	1,092	186	1,109	332
Total[9]	**1,951**	465	**1,576**	761

The table below sets out the fees and taxable benefits received by Non-executive Directors in the financial year under review and the total remuneration received by both Executive and Non-executive Directors during the year under review:

	2018			2017		
	Total fees[2] (£000)	Taxable benefits[3] (£000)	Total (£000)	Total fees[2] (£000)	Taxable benefits[3] (£000)	Total (£000)
John McDonough CBE	185	7	192	185	21	206
Christer Gardell	45	8	53	45	7	52
Hock Goh	45	5	50	45	8	53
Jane Hinkley	60	3	63	60	3	63
Douglas Hurt	65	1	66	65	2	67
Holly Koeppel[10]	45	6	51	34	7	41
Total 2018 Non-executive Director remuneration			**475**			
Total 2018 Executive Director remuneration			**3,527**			
Total 2018 Director remuneration			**4,002**			

Note:

1. Patrick André joined the Board on 1 September 2017. Figures for 2017 in the table relate to salary, benefits and Annual Incentive earned in respect of the period 1 September – 31 December 2017.
2. Base salary (or fees, as appropriate) earned in relation to services as a Director during the financial year.
3. The UK regulations require the inclusion of benefits for Directors where these would be taxable in the UK on the assumption that the Director is tax resident in the UK. The figures in the table therefore include expense reimbursement and associated tax relating to travel, accommodation and subsistence for the Director (and, where appropriate, their spouse) in connection with attendance at Board meetings and other Corporate business during the year, which are considered by HMRC to be taxable in the UK. Standard benefits for the Executive Directors include car allowance and private medical care. As an expatriate, Patrick André also receives relocation benefits under Vesuvius' applicable expatriate localisation policy. As detailed in the 18 July 2017 RNS announcement of Mr André's appointment, those relocation benefits (totalling £140,925 in 2018) comprised commuting and housing costs, a one-off resettlement allowance of one month's salary, tax advice and school fees. Patrick André's benefits figure also includes the reimbursement by the Company of £25,306 in relation to double taxation suffered by Mr André in respect of his remuneration arrangements as the Belgian-based President of the Flow Control business unit prior to his appointment as Chief Executive.
   The taxable benefit numbers for 2017 have been restated for Messrs André and Young to reflect additional taxable benefits incurred in respect of the year.
4. Patrick André and Guy Young receive a pension allowance of 25% of base salary. The figures in the table represent the value of all cash allowances and contributions received in respect of pension benefits.
5. The sum of total salary, taxable benefits and pension.
6. This figure includes the Annual Incentive payments to be made to the Executive Directors in relation to the year under review. 33% of these Annual Incentive payments will be deferred into awards over shares, to be held for a period of three years. See pages 109 to 111 for more details.
7. This represents the Performance Share awards granted to Patrick André and Guy Young in 2016 under the Vesuvius Share Plan, that are due to vest in 2019. See Note 1 of the Vesuvius Performance Share Awards Allocations table on page 112. At an average Vesuvius mid-market closing share price (from 1 October 2018-31 December 2018) of 537 pence, the total value of the awards that are due to vest, along with the cash payment for the dividend that has accrued on these vested shares is £1,303,827.
8. The sum of the value of the Annual Incentive and the long-term incentives where the performance period ended during the financial year.
9. The sum of base salary, benefits, pension, Annual Incentive and long-term incentives where the performance period ended during the financial year.
10. Holly Koeppel joined the Board on 3 April 2017.

Additional note:

11. Total 2017 Director remuneration for the Directors who served during 2017 was £3.383m. This included total fixed pay of £667k and variable pay of £1,008k paid to François Wanecq in 2017. François Wanecq retired from the Board on 31 August 2017.

Base Salary and Fees

In the year under review, the Chief Financial Officer received a base salary of £350,000 per annum and the Chief Executive received a base salary of £525,000 per annum. The Non-executive Directors' fees were set at £45,000 per annum. Supplementary fees of £15,000 per annum were paid to the Chairmen of the Audit and Remuneration Committees. A supplementary annual fee of £5,000 was also paid to the Senior Independent Director. The Chairman was paid an annual fee of £185,000. Neither the Chairman nor the other Non-executive Directors are members of the Group's pension plans, nor do they participate in the Group's incentive schemes.

The Group currently operates a longer-term policy whereby salaries of Executive Directors and senior Executives are reviewed every two to three years rather than annually. In line with this policy, Guy Young's salary, which was reviewed and increased by 7.7% in 2018, has not been reviewed or adjusted further in 2019.

The Remuneration Committee has scope to step outside this policy where it is commercially appropriate – this is the case for Patrick André. As outlined at the time of appointment and in last year's Remuneration Report, Mr André was appointed Chief Executive in September 2017 on a salary of £525,000 per annum (11% lower than his predecessor's salary of £590,000) with a commitment to review his salary annually for the first three years of his appointment (January 2019, 2020 and 2021). This approach was intended to provide the Remuneration Committee with flexibility to adjust Mr André's salary to the appropriate level for an established Chief Executive as and when the Board was satisfied with his development in the role.

At the end of 2018, the Board discussed Mr André's performance to date as Chief Executive. The overwhelming consensus was that he had developed quickly into a highly effective and high-performing Chief Executive. In light of this, the Remuneration Committee felt it was the appropriate time to adjust his salary on a commensurate basis. Accordingly, Mr André's salary was increased by 14% to £600,000 per annum with effect from 1 January 2019.

In 2018 the Remuneration Committee also reviewed the Chairman's fee and the Board reviewed the fees paid to Non-executive Directors. These fees were set on demerger and were last reviewed in 2015 when no changes were made. Having considered the Directors' performance and recognising the increasing time commitment of these roles, the Remuneration Committee approved an 11% increase in the Chairman's fee to £205,000 with effect from 1 January 2019, and the Board approved a 10% increase in the Non-executive Directors' fees to £50,000. No changes were made to the supplementary fees, which remain at £15,000 per annum for the Chairmen of the Audit and Remuneration Committees, and £5,000 for the Senior Independent Director.

Pension Arrangements – Audited

In accordance with their service agreements, Patrick André and Guy Young are entitled to pension allowances of 25% of base salary. This allowance can be used to participate in Vesuvius' pension arrangements, be invested in their own pension arrangements or be taken as a cash supplement (or any combination of these alternatives).

Annual Incentive

The Executive Directors are eligible to receive an Annual Incentive calculated as a percentage of base salary, based on achievement against specified financial targets and personal objectives. Each year the Remuneration Committee establishes the performance criteria for the forthcoming year. The financial targets are set by reference to the Company's financial budget. The target range is set to ensure that Annual Incentives are only paid out at maximum for significantly exceeding performance expectations. The Remuneration Committee considers that the setting and attainment of these targets is important in the context of achievement of the Company's longer-term strategic goals.

The Annual Incentive has a threshold level of performance below which no award is paid, a target level and a maximum performance level at which a maximum award is earned.

2018 Annual Incentive

For 2018 the maximum Annual Incentive potential for the Executive Directors was 125% of base salary and their target Annual Incentive potential was 62.5% of base salary.

For the financial year 2018 the Executive Directors' Annual Incentives were based 60% on Group headline earnings per share, 20% on the Group's working capital to sales ratio (based on the 12-month moving average) and 20% on specified personal objectives.

Financial Targets

The 2018 Vesuvius Group headline earnings per share performance targets set out below were set at the December 2017 full-year average foreign exchange rates, being the rates used for the 2018 budget process and then adjusted following the Board's decision to recognise the utilisation of the US Deferred Tax Asset through headline trading profit:

Threshold:	On-target:	Maximum:
38.7 pence	40.9 pence	43.0 pence

The 2018 Group's working capital to sales ratio targets were set as follows:

Threshold:	On-target:	Maximum:
24.5%	23.5%	22.5%

In assessing the Group's performance against these targets, the Committee uses a constant currency approach. Thus, the 2018 full-year EPS performance was retranslated at December 2017 full-year average foreign exchange rates to establish performance. This is consistent with practice in previous years.

Annual Report on Directors' Remuneration continued

In 2018, Vesuvius' retranslated EPS performance was 52.6 pence, and working capital to sales ratio was 23.9%. Consequently EPS performance was above maximum and the Group's working capital to sales was between threshold and target. Payments of 75% and 7.5% of base salary respectively, 82.5% in total were therefore due to the Executive Directors under the Annual Incentive in respect of the financial performance metrics.

Personal Objectives

In 2018, a proportion (20%) of the Annual Incentive for Executive Directors (representing 25% out of the maximum 125% bonus entitlement) was based on the achievement of personal objectives. A summary of the objectives set and performance achieved is set out below.

Patrick André

Summary of objective	Summary outcome
Drive Group performance	> Improved Group safety performance and developed internal control structures > Elaborated and implemented further formal restructuring plans to drive Group cost efficiency > Delivered against most key financial KPIs
Progress senior executive talent management and succession	> Introduced new high potential managers in key 'P&L' positions and business unit president direct reports > Strengthened 'bench' below the direct reports of the business unit presidents > Increased the strength of the Group's corporate human resources organisation
Focus on Group strategy evolution	> Conducted strategy review, and implemented plan for accelerated delivery of longer-term growth > Developed organic and inorganic growth opportunities

In summary, after considering performance as outlined above, the Committee approved an Annual Incentive pay-out of 21.53% of base salary, out of the 25%, in respect of the personal objectives of Patrick André.

Guy Young

Summary of objective	Summary outcome
Improve the Group financial control process	> Shortened monthly reporting timeframe to support business analysis > Improved quality of MD&A on monthly results > Strengthened financial control team
Improve the performance of Shared Services	> Continued the implementation of delivery of the European Shared Service Centre > Enhanced management and reporting lines for global shared services structure
Improve working capital management	> Improved quality of internal working capital reporting > Delivered increased consistency of internal KPIs to drive performance
Improve efficiency and performance of IT output	> Delivered restructured IT team > Increased efficiency in response to IT issues
Performance of tax department	> Streamlined existing internal tax processes to deliver improved performance

In summary, after considering performance as outlined above, the Committee approved an Annual Incentive pay-out of 17.65% of base salary out of the 25%, in respect of the personal objectives of Guy Young.

The total Annual Incentive awards payable to Patrick André and Guy Young in respect of their services as a Director during 2018 are therefore 104.03% and 100.15% of salary respectively. 33% of these Annual Incentive payments will be deferred into awards over shares, to be held for a period of three years.

2019 Annual Incentive

The Remuneration Committee has determined that for 2019 the structure of the Annual Incentive will remain the same as for 2018: 60% of the Executive Directors' Annual Incentives will therefore be based on Group headline earnings per share, 20% on the Group's working capital to sales ratio (based on the 12-month moving average) and 20% on the achievement of personal objectives. The Company will not be disclosing the targets set until after the relevant performance period has ended because of commercial sensitivities. The personal objectives for 2019 are all non-financial or job-specific in nature and track performance against key strategic, organisational and operational goals. The maximum Annual Incentive potential for 2019 will be 125% of base salary, with potential payouts of 62.5% of base salary for the achievement of target performance in all three elements. Payouts will commence and increase incrementally from 0% once the threshold performance for any of the three elements has been met. 33% of any Annual Incentive earned will be deferred into awards over shares, to be held for a period of three years.

Deferred Share Bonus Plan allocations – audited

In 2018, 33% of the cash Annual Incentives earned by Patrick André and Guy Young in respect of their periods of service as Directors of Vesuvius plc during 2017, were deferred into shares under the Company's Deferred Share Bonus Plan. The following table sets out details of these awards:

Grant and type of award	Total share allocations as at 31 Dec 2017	Additional shares allocated during the year	Allocations lapsed during the year	Shares vested during the year	**Total share allocations as at 31 Dec 2018**	Market price of the shares on the day before award (p)	Earliest vesting date
Patrick André							
15 March 2018[1]							
Deferred Bonus Shares	—	10,128	—	—	**10,128**	605.5	15 Mar 2021
Total	—	10,128	—	—	**10,128**		
Guy Young							
15 March 2018[1]							
Deferred Bonus Shares	—	18,118	—	—	**18,118**	605.5	15 Mar 2021
Total	—	18,118	—	—	**18,118**		

Note:
1. In 2018, Patrick André and Guy Young were awarded Annual Incentive bonuses in respect of their service as Directors of Vesuvius plc of £185,544 and £331,906 respectively. 33% of these bonuses were paid in deferred shares under the Deferred Share Bonus Plan. The allocations of shares were made on 15 March 2018 and were calculated based upon the average closing mid-market price of Vesuvius' shares on the five dealing days before the award was made, being £6.045. The total value of these awards based on this share price on the date of grant was £61,229 and £109,529 respectively. These shares will vest on the third anniversary of their award date.

Additional note:
2. The mid-market closing price of Vesuvius' shares during 2018 ranged between 473.2 pence and 662 pence per share and on 31 December 2018, the last dealing day of the year, was 506.5 pence per share.

Longer-term Pay ('LTIPs') – audited

Performance Share awards are allocated to the Executive Directors under the Vesuvius Share Plan (VSP). In accordance with the Remuneration Policy and the rules of the VSP, they are eligible to receive, on an annual basis, a Performance Share award with a face value of up to 200% of salary. Vesting of 50% of shares awarded is based upon the Company's three-year TSR performance relative to that of the constituent companies of the FTSE 250 (excluding investment trusts), and 50% on headline EPS growth. The level of compound headline EPS growth specified in the targets is set by the Remuneration Committee each year, taking into account the Group's prospects and the broader global economic environment. The schedule of EPS targets is designed at the maximum level to be highly challenging, whilst remaining an effective incentive for the management team. The EPS and TSR measures operate independently. The use of these performance measures is intended to align executive remuneration with shareholders' interests. UK Executives receive awards in the form of nil-cost options with a flexible exercise date and non-UK Executives receive conditional awards which are exercised on the date of vesting.

Performance Share awards vest after three years and commencing with awards made in 2019, they will then be subject to a further two-year holding period.

On 15 March 2018, Patrick André and Guy Young received allocations of Performance Shares worth 200% and 150% of their base salaries, respectively. The Remuneration Committee has determined that Patrick André will again receive a Performance Share award in 2019 equivalent in value to 200% of his base salary and Guy Young an award equivalent in value to 150% of his base salary.

The performance period applicable to the awards made in 2016 ended on 31 December 2018. The TSR performance during this three-year performance period was assessed against the comparator group and it was determined that the Company's performance was above upper quintile. As a result, 50% of Performance Share awards will vest under the TSR performance element. The Group's annual compound headline EPS growth over the performance period was 26.5% exceeding the maximum annual compound headline EPS growth target of 15%. Following the Board's decision to recognise the utilisation of the US Deferred Tax Asset through headline trading profit, the Group's EPS for the base year of the performance period was adjusted accordingly. As a result, 50% of Performance Share awards will also vest under the EPS element, giving a total vesting of 100%. These awards will vest in April 2019.

As described in the Remuneration Policy prior to the vesting of Performance Shares the Remuneration Committee reviews the underlying financial performance of the Company over the performance period to ensure the vesting is justified, and to consider whether to exercise its discretion to make any amendments. For future grants of Performance Shares under the VSP, this discretion has been extended to include consideration of certain non-financial matters the occurrence of which may make full or partial vesting inappropriate.

Annual Report on Directors' Remuneration continued

Targets for the Performance Share Awards granted in 2016, 2017, 2018 and to be granted in 2019– Audited

TSR ranking relative to FTSE 250 excluding investment trusts	Vesting percentage	Annual compound headline EPS growth	Vesting percentage
Below median	0%	Less than 3%	0%
Median	12.50%	3%	12.50%
Between median and upper quintile	Pro rata between 12.50% and 50%	Between 3% and 6%	Pro rata between 12.50% and 25%
Upper quintile and above	50%	6%	25%
		Between 6% and 15%	Pro rata between 25% and 50%
		15% or more	50%

Vesuvius Performance Share Award Allocations – Audited

The following table sets out the Performance Share awards that were allocated in 2016, 2017 and 2018 under the Vesuvius Share Plan:

Grant and type of award	Total share allocations as at 31 Dec 2017	Additional shares allocated during the year	Allocations lapsed during the year	Shares vested during the year	Total share allocations as at 31 Dec 2018	Market price of the shares on the day before award (p)	Performance period	Earliest vesting date
Patrick André								
8 April 2016[1]							1 Jan 16 – 31 Dec 18	
Performance Shares	92,746	—	—	—	**92,746**	291.7		8 Apr 2019
16 March 2017[2,3]							1 Jan 17 – 31 Dec 19	
Performance Shares	60,413	—	—	—	**60,413**	524.5		16 Mar 2020
1 September 2017[4]							1 Jan 17 – 31 Dec 19	
Performance Shares	42,257	—	—	—	**42,257**	578		1 Sep 2020
15 March 2018[5]							1 Jan 18 – 31 Dec 20	
Performance Shares	—	173,697	—	-	**173,697**	605.5		15 Mar 2021
Total	195,416	173,697	—	—	**369,113**			
Guy Young								
8 April 2016[1]							1 Jan 16 – 31 Dec 18	
Performance Shares	128,739	—	—	—	**128,739**	291.7		8 Apr 2019
16 March 2017[2]							1 Jan 17 – 31 Dec 19	
Performance Shares	93,355	—	—	—	**93,355**	524.5		16 Mar 2020
15 March 2018[5]							1 Jan 18 – 31 Dec 20	
Performance Shares	—	86,848	—	—	**86,848**	605.5		15 Mar 2021
Total	222,094	86,848	—	—	**308,942**			

Note:
1. In 2016, Guy Young received an allocation of Performance Shares worth 125% of his base salary, being 128,739 shares. In addition, prior to his appointment as Chief Executive, Patrick André received an award of 92,746 shares in respect of his role as President, Flow Control. Performance Shares that were allocated in 2016 had performance conditions to be tested over the financial years 2016, 2017 and 2018. In accordance with the Company's achievement of the specified performance conditions, 100% of Patrick André and Guy Young's Performance Shares, being 92,746 shares and 128,739 shares respectively, are due to vest on 8 April 2019. In addition, the Remuneration Committee has determined that Messrs André and Young will be given cash payments of £47,926 and £66,526 respectively, equivalent to the value of the dividends that would have been paid on the number of shares that are due to vest in respect of dividend record dates occurring during the period between the award date and the date of vesting.
2. On 16 March 2017, Guy Young received an allocation of Performance Shares worth 150% of his base salary, being 93,355 shares. In addition, prior to his appointment as Chief Executive, Patrick André received an award of 60,413 shares in respect of his role as President, Flow Control.
3. Patrick André's March 2017 Performance Share award is subject to Flow Control performance conditions. Under these, 7,552 of the 60,413 shares awarded were deemed to have met the performance condition applicable in the first year, and 7,552 shares are deemed to have met the performance condition applicable in the second year. The achievement of the performance condition will be reassessed at the end of 2019.
4. Following his promotion to Chief Executive on 1 September 2017, Patrick André received an additional award of 42,257 Performance Shares in the form of a conditional award. This award brought his total award of Performance Shares in 2017 to 200% of his salary on a pro-rated basis, which is the maximum annual award for the Chief Executive as determined by the Vesuvius Remuneration Policy.
5. On 15 March 2018, Patrick André and Guy Young received allocations of Performance Shares worth 200% and 150% of their base salaries, being 173,697 shares and 88,848 shares respectively. These allocations were calculated based upon the average closing mid-market price of Vesuvius' shares on the five dealing days before the award was made, being £6.045. The total value of these awards based on this share price on the date of grant was £1,049,998 and £524,996 respectively.

Additional notes:

6. All of Guy Young's awards have been made in the form of nil-cost options with no exercise price. Patrick André's 2016 and 2017 awards were made in the form of conditional awards and his 2018 award in the form of a nil-cost option.
7. If the respective performance conditions for Patrick André and Guy Young's awards are not met then the awards will lapse. If the threshold level of either of the two performance conditions applicable to the awards is met, then 12.50% of the awards will vest.
8. The Remuneration Committee also has the discretion to award cash or shares equivalent in value to the dividend that would have been paid during the vesting period on the number of shares that vest.
9. The mid-market closing prices of Vesuvius' shares during 2018 ranged between 473.2 pence and 662 pence per share and on 31 December 2018, the last dealing day of the year, was 506.5 pence per share.

Malus/Clawback arrangements in 2019

Vesuvius has malus and clawback arrangements in respect of Executive Directors' variable remuneration. The structure of those arrangements is outlined in our Remuneration Policy.

Statement of Directors' Shareholding – Audited

The interests of Directors and their closely associated persons in ordinary shares as at 31 December 2018, including any interests in share options and shares provisionally awarded under the Vesuvius Share Plan are set out below:

		Outstanding incentive awards	
	Beneficial holding	With performance conditions[1]	Without performance conditions[2]
Executive Directors			
Patrick André	—	369,113	10,128
Guy Young	14,811	308,942	18,118
Non-executive Directors			
John Mc Donough CBE (Chairman)	100,000		—
Christer Gardell[3]	—		—
Hock Goh	5,000		—
Jane Hinkley	12,000		—
Douglas Hurt	18,000		—
Holly Koeppel	27,500		—

Note:

1. Patrick André holds conditional awards over 195,416 shares, and 173,697 nil-cost options, Guy Young holds 308,942 nil-cost options respectively, these have all been granted as Performance Shares under the Vesuvius Share Plan. The awards were all granted subject to performance conditions although 15,104 shares granted to Patrick André in March 2017 have satisfied their performance condition and their vesting is now only subject to his continued employment until the vesting date.
2. Patrick André and Guy Young hold conditional awards over 10,128 shares and 18,118 shares respectively, granted under the Deferred Share Bonus Plan. These awards are not subject to any additional performance conditions.
3. Christer Gardell is Managing Partner of, and has a financial interest in, Cevian Capital which held 21.11% of Vesuvius' issued share capital as at 31 December 2018 and at the date of this report.

Additional notes:

4. None of the other Directors, nor their spouses, nor their minor children, held non-beneficial interests in the ordinary shares of the Company during the year.
5. There were no changes in the interests of the Directors in the ordinary shares of the Company in the period from 1 January 2019 to the date of this Report.
6. All awards under the Vesuvius Share Plan are subject to performance conditions and continued employment until the relevant vesting date as set out on pages 111 and 112.
7. Full details of Directors' shareholdings and incentive awards are given in the Company's Register of Directors' Interests, which is open to inspection at the Company's registered office during normal business hours.

Payments to past Directors and loss of office payments– audited

Other than the payments disclosed in the 2017 Annual Report in respect of François Wanecq's retirement from the Company, there were no other payments made to any Director for loss of office during the year ended 31 December 2018, and no payments were made to any other past Directors of the Company during the year ended 31 December 2018.

Shareholding guidelines

The Remuneration Committee encourages Executive Directors to build and hold a shareholding in the Company. The required holding of the Chief Executive is to be equivalent in value to at least 2x salary and that required of other Executive Directors is to be equivalent in value to at least 1x salary. To this end, Executive Directors are required to retain at least 50% (measured as the value after tax) of any shares received through the operation of share schemes; in addition, permission to sell shares held – whether acquired through the operation of share schemes or otherwise – will not be given, other than in exceptional circumstances, if, following the disposal, the shareholding requirements have not been achieved or are not maintained.

Compliance with the shareholding policy is tested at the end of each year for application in the following year using the average of the closing prices of a Vesuvius ordinary share for the trading days in that December.

Annual Report on Directors' Remuneration continued

Executive Directors' Shareholdings – Audited

As at 31 December 2018, the Executive Directors' shareholdings against the current shareholding guidelines (using the Company's share price averaged over the trading days of the period 1 December to 31 December 2018, of 497 pence per share) were as follows:

Director	Actual share ownership as a percentage of salary at 31 Dec 2018	Policy share ownership as a percentage of salary	Policy met?
Patrick André	0%	200%	In the build-up period
Guy Young	21%	100%	In the build-up period

Annual changes in Chief Executive pay vs employee pay

The table below shows the percentage change in the remuneration of the Chief Executive – comprising salary, taxable benefits and Annual Incentive – and comparable data for UK salaried employees. The UK salaried employee workforce was chosen as a fair representation of a suitable comparator group as both the former Chief Executive François Wanecq and the incumbent Chief Executive Patrick André are based in the UK (albeit with a global role and responsibilities) and levels of pay vary widely across the Group depending on geography and local market conditions.

	Chief Executive			UK salaried employee workforce (average per capita)
	2018 (£000)	2017[1] (£000)	% change	% change
Salary	**525**	568	(7.57)	3.28
Taxable benefits	**203**	216	(6.02)	(5.87)
Annual bonus	**546**	585	(6.67)	25.48

Note:
1. Salary, taxable benefits and Annual bonus amounts in respect of the Chief Executive for 2017 reflect the sum of amounts payable to François Wanecq in respect of service from 1 January 2017 to 31 August 2017, and amounts payable to Patrick André in respect of service from 1 September 2017 to 31 December 2017.

CEO pay ratios

	25th Percentile	50th Percentile (Median)	75th Percentile
CEO pay ratio	58:1	43:1	28:1

The table above shows the Chief Executive Pay ratios, versus our UK employees for 2018. The pay ratios compare amounts disclosed in the single total figure table for the Group Chief Executive to the annual full time equivalent remuneration of our UK employees for 2018. The data has been calculated in accordance with 'Option' A in The Companies (Miscellaneous Reporting) Regulations 2018.

Annual spend on employee pay[1] vs Shareholders' distributions[2]

The charts below show the annual spend on all employees (including Executive Directors) compared with distributions made and proposed to be made to shareholders for 2017 and 2018:

	(£m) 2018	(£m) 2017	Change
Employee Pay[1]	**414.3**	418.0	(0.89)%
Dividends[2] (based on final proposed dividend)	**53.2**	48.6	9.47%

Note:
1. Employee pay includes wages and salaries, social security, share-based payments and pension costs, and other post-retirement benefits. See Note 8 of the Notes to the Group Financial Statements.
2. Shareholder Distributions/Dividends includes interim and final dividends paid in respect of each financial year. See Note 25 of the Notes to the Group Financial Statements.

TSR Performance and Chief Executive Pay

The TSR performance graph compares Vesuvius TSR performance with that of the same investment in the FTSE 250 Index (excluding investment trusts). This index has been chosen as the comparator index to reflect the size, international scope and diversity of the Company. TSR is the measure of the returns that a company has provided for its shareholders, reflecting share price movements and assuming reinvestment of dividends. The demerger of Vesuvius plc was effective on 19 December 2012 and therefore the graph shows the period from 19 December 2012 to 31 December 2018.

Vesuvius' total shareholder return compared against total shareholder return of the FTSE 250 index (excluding investment trusts) since demerger

				François Wanecq[1]		Patrick André[2]	
Chief Executive pay – financial year ending	31/12/12	31/12/13	31/12/14	31/12/15	31/12/16	31/12/17	**31/12/18**
Total remuneration (single figure (£000))	£1,227	£2,447	£1,519	£752	£1,173	£1,675[1] £465[2]	**£1,951**
Annual variable pay (% of maximum)	0%	100%	64%	0%	63%	101%[1] 106%[2]	**104%**
Long-term variable pay (% of maximum)	67%	28%	27%	0%	0%	43.7%[1] n/a[2]	**100%**

Note:
1. Amounts shown in respect of François Wanecq for 2017 reflect payments in respect of his service as Chief Executive from 1 January 2017 to 31 August 2017 and the full value of his Vesuvius Share Plan award in relation to the performance period 2015–2017.
2. Amounts shown in respect of Patrick André for 2017 reflect payments in respect of his service as Chief Executive from 1 September 2017 to 31 December 2017.

Statement on Shareholder Voting

At the last AGM (which was held on 10 May 2018) the resolution concerning the advisory vote on the Directors' Remuneration Report for 2018 received 234,780,528 votes (98.65%) in favour and 3,204,210 votes against (1.35%); 778,850 votes were withheld. At the 2017 AGM, when the Company's Remuneration Policy was last put to the vote, the resolution received 238,743,173 (98.86%) in favour and 2,762,888 votes (1.14%) against; 1,454,874 votes were withheld. At the AGM to be held on 15 May 2019, shareholders will again be invited to participate in an advisory vote on the Directors' Remuneration Report.

The Directors' Remuneration Report has been approved by the Board and is signed on its behalf by

Jane Hinkley
Chairman, Remuneration Committee
27 February 2019

Directors' Report

Directors' Report

The Directors submit their Annual Report together with the audited accounts of the Group and of the Company, Vesuvius plc, registered in England and Wales No. 8217766, for the year ended 31 December 2018.

The Companies Act 2006 requires the Company to provide a Directors' Report for Vesuvius plc for the year ended 31 December 2018. The information that fulfils this requirement and which is incorporated by reference into, and forms part of, this report is included in the following sections of the Annual Report:

> The Non-financial information section

> The Governance section, including the Corporate Governance Statement

> Financial Instruments: the information on financial risk management objectives and policies contained in Note 26 to the Group Financial Statements

This Directors' Report and the Strategic Report contained on pages 1 to 71 together represent the management report for the purpose of compliance with DTR 4.1.8R of the UK Listing Authority's Disclosure and Transparency Rules. The Company does not have any overseas branches within the meaning of the Companies Act 2006.

Going concern

Information on the business environment in which the Group operates, including the factors that are likely to impact the future prospects of the Group, is included in the Strategic Report. The principal risks and uncertainties that the Group faces throughout its global operations are shown on pages 32 and 33. The financial position of the Group, its cash flows, liquidity position and debt facilities are also described in the Strategic Report. In addition, the Group's Viability statement is set out within the Strategic Report on page 31. Note 26 to the Group Financial Statements sets out the Group's objectives, policies and processes for managing its capital; financial risks; financial instruments and hedging activities; and its exposures to credit, market (both currency and interest rate related) and liquidity risk. Further details of the Group's cash balances and borrowings are included in Notes 13, 14 and 26 to the Group Financial Statements.

The Directors have prepared profit and loss, balance sheet and cash flow forecasts for the Group for a period in excess of 12 months from the date of approval of the 2018 financial statements. On the basis of the exercise described above, the Directors have prepared a going concern statement which can be found on page 31.

Research and development

The Group's investment in research and development (R&D) during the year under review amounted to £33.6m (representing approximately 2% (2017: 2%) of Group revenue. Further details of the Group's R&D activities can be found in the Innovation section of the Strategic Report.

Future developments

A full description of the activities of the Group, including performance, significant events affecting the Group in the year, and indicative information in respect of the likely future developments in the Group's business, can be found in the Strategic Report.

Dividends

An interim dividend of 6.00 pence (2017: 5.50 pence) per Vesuvius ordinary share was paid on 21 September 2018 to Vesuvius shareholders. The Board is recommending a final dividend in respect of 2018 of 13.8 pence (2017: 12.50 pence) per ordinary share which, if approved, will be paid on 24 May 2019 to shareholders on the register at 23 April 2019.

Post Balance Sheet event

On 27 February 2019 the Group signed an agreement to acquire the entire issued share capital of CCPI Inc ("CCPI"), a specialty refractory producer focused on tundish (steel continuous casting) applications (65% of sales) and aluminium (35% of sales). CCPI is based in Ohio, USA, and will become part of the Group's Advanced Refractories business unit. The transaction values CCPI at US$43.4 million (£33.1 million) on a cash and debt free basis. The acquisition is expected to close within the coming week.

Accountability and audit

A responsibility statement of the Directors and a statement by the auditor about its reporting responsibilities can be found on pages 120 and 121 to 126 respectively. The Directors fulfil the responsibilities set out in their statement within the context of an overall control environment of central strategic direction and delegated operating responsibility. As at the date of this report, so far as each Director of the Company is aware, there is no relevant audit information of which the Company's auditor is unaware and each Director hereby confirms that they have taken all the steps that they ought to have taken as a Director in order to make themselves aware of any relevant audit information and to establish that the Company's auditor is aware of that information.

Auditors reappointment

PricewaterhouseCoopers LLP (PwC) were reappointed as external Auditors for Vesuvius plc for the year ended 31 December 2018, at the 2018 AGM. PwC have been Vesuvius' external Auditors since 2017 and have expressed their willingness to continue in office as Auditors of the Company for the year ending 31 December 2019. Consequently, resolutions for the reappointment of PwC as auditor of the Company and to authorise the Directors to determine their remuneration are to be proposed at the 2019 AGM.

Directors

The Directors of the Company are Patrick André, Christer Gardell, Hock Goh, Jane Hinkley, Douglas Hurt, Holly Koeppel, John McDonough CBE and Guy Young. All the Directors will retire at the 2019 AGM and offer themselves for re-election at the AGM. Biographical information for the Directors is given on pages 74 and 75. Further information on the remuneration of, and contractual arrangements for, the Executive and Non-executive Directors is given on pages 95 to 115 in the Directors' Remuneration Report. The Non-executive Directors do not have service agreements.

Directors' indemnities

The Directors have been granted qualifying third-party indemnity provisions by the Company and the Directors of the Group's UK Pension Plans Trustee Board (none of whom is a Director of Vesuvius plc) have been granted qualifying pension scheme indemnity provisions by Vesuvius Pension Plans Trustees Ltd. The indemnities for Directors of Vesuvius plc have been in force since the date of their appointment. The Pension Trustee indemnities were in force throughout the last financial year and remain in force.

Annual General Meeting

The Annual General Meeting of the Company will be held at The Lincoln Centre, 18 Lincoln's Inn Fields, London WC2A 3ED on Wednesday 15 May 2019 at 11.00 am.

Amendments of articles of association

The Company may make amendments to the Articles by way of special resolution in accordance with the Companies Act.

Greenhouse gas emissions

Information on our reporting of greenhouse gas emissions, and the methodology used to record these, is set out on page 64 of the Strategic Report.

Donations

In accordance with Company policy, no political donations were made in 2018 (2017: nil), and no charitable donations of more than £2,000 were made in 2018 (2017: nil).

Change of control provisions

The terms of the Group's committed bank facility and US Private Placement Loan Notes contain provisions entitling the counterparties to exercise termination or other rights in the event of a change of control on takeover of the Company. A number of the arrangements to which the Company and its subsidiaries are party, such as other debt arrangements and share incentive plans, may also alter or terminate on a change of control in the event of a takeover. In the context of the Group as a whole, these other arrangements are not considered to be significant.

Share capital

As at the date of this report, the Company had an issued share capital of 278,485,071 ordinary shares of 10 pence each; 7,271,174 of these ordinary shares are held in Treasury. Therefore, the total number of Vesuvius plc shares with voting rights is 271,213,897.

Further information relating to the Company's issued share capital can be found in Note 8 to the Company Financial Statements.

The Company's Articles specify that, subject to the authorisation of an appropriate resolution passed at a General Meeting of the Company, Directors can allot relevant securities under Section 551 of the Companies Act up to the aggregate nominal amount specified by the relevant resolution. In addition, the Articles state that the Directors can seek the authority of shareholders in a General Meeting to allot equity securities for cash, without first being required to offer such shares to existing ordinary shareholders in proportion to their existing holdings under Section 561 of the Companies Act, in connection with a rights issue and in other circumstances up to the aggregate nominal amount specified by the relevant resolution.

At the AGM on 10 May 2018, the Directors were authorised to issue relevant securities up to an aggregate nominal amount of £9,040,463, and, in connection with a rights issue, to issue relevant securities up to a further nominal value of £9,040,463. In addition, the Directors were empowered to allot equity securities, or sell Treasury Shares, for cash on a non pre-emptive basis up to an aggregate nominal amount of £1,356,069, and for the purposes of financing (or refinancing, if the authority is to be used within six months after the original transaction) a transaction which the Board of the Company determines to be an acquisition or other capital investment, to allot equity securities, or sell Treasury Shares, for cash on a non pre-emptive basis up to an additional nominal amount of £1,356,069. Each of the authorities given in these resolutions expires on 30 June 2019 or the date of the AGM to be held in 2019, whichever is the earlier. The resolutions were all tabled in accordance with the terms of the Pre-Emption Group's Statement of Principles. The Directors propose to renew these authorities at the 2019 AGM for a further year. In the year ahead, other than in respect of Vesuvius' ability to satisfy rights granted to employees under its various share-based incentive arrangements, the Directors have no present intention of issuing any share capital of Vesuvius plc.

Authority for purchase of own shares

Subject to the provisions of company law and any other applicable regulations, the Company may purchase its own shares. At the AGM on 10 May 2018, Vesuvius shareholders gave authority to the Company to make market purchases of up to 27,121,389 Vesuvius ordinary shares, representing 10% of the Company's issued ordinary share capital as at the latest practicable day prior to the publication of the Notice of AGM. This authority expires on 30 June 2019 or the date of the AGM to be held in 2019, whichever is the earlier. The Directors will seek renewal of this authority at the 2019 AGM.

In 2013 the Company acquired 7,271,174 ordinary shares, representing a nominal value of £727,117 and 2.6% of the entire called-up share capital of the Company prior to the purchase. These shares were purchased pursuant to the Board's commitment to return the majority of the net proceeds of the disposal of the Precious Metals Processing division to shareholders. These shares are currently held as Treasury shares. The Company has not subsequently disposed of any of the repurchased shares. During the year, the Company did not make any further acquisitions of shares nor did it dispose of any shares previously acquired. The Company does not have a lien over any of its shares.

Directors' Report continued

Share Plans

Vesuvius operates a number of share-based incentive plans. Under these plans the Group can satisfy entitlements by the acquisition of existing shares, the transfer of Treasury shares or by the issue of new shares. Existing shares are held in an employee share ownership plan trust ('ESOP'). The Trustee of the ESOP purchases shares in the open market as required to enable the Group to meet liabilities for the issue of shares to satisfy awards that vest. The Trustee does not register votes in respect of these shares and has waived the right to receive any dividends.

At 31 December 2018, the ESOP held 2,874,060 ordinary shares. During the year, the trustee of the ESOP purchased 2,313,456 ordinary shares of 10p each in Vesuvius with a nominal value of £0.2m at a total cost, including transaction costs of £13.0m, to hold to satisfy the future vesting of awards under the Company's share incentive plans. Subsequent to the year end the ESOP purchased an additional 71,544 ordinary shares, at a total cost, including transaction costs, of £0.4m, to complete a purchase order commenced prior to the year end. The total purchases during the year represented 1% of the Company's called up share capital.

Restrictions on transfer of shares and voting

The Company's Articles of Association ('Articles') do not contain any specific restrictions on the size of a holding or on the transfer of shares. The Directors are not aware of any agreements between holders of the Company's shares that may result in restrictions on the transfer of securities or voting rights.

No person has any special rights with regard to the control of the Company's share capital and all issued shares are fully paid. This is a summary only and the relevant provisions of the Articles should be consulted if further information is required.

Interests in the Company's shares

The Company has been notified in accordance with DTR 5 of the Disclosure and Transparency Rules of the following interests of 3%, or more, of its issued ordinary shares:

	As at 31 Dec 2018	As at 27 Feb 2019
Cevian Capital	21.11	21.11
Standard Life Aberdeen	13.59	14.06
Aberforth Partners	4.93	4.93
Phoenix Asset Management	3.10	3.10

The interests of Directors and their connected persons in the ordinary shares of the Company as disclosed in accordance with the Listing Rules of the Financial Conduct Authority are as set out on page 113 of the Directors' Remuneration Report and details of the Directors' Deferred Share Bonus Plan and long-term incentive awards are set out on pages 111 and 112.

Equal opportunities employment

Vesuvius is an equal opportunities employer, and decisions on recruitment, development, training and promotion, and other employment-related issues are made solely on the grounds of individual ability, achievement, expertise and conduct. These principles are operated on a non-discriminatory basis, without regard to race, colour, nationality, culture, ethnic origin, religion, belief, gender, sexual orientation, age, disability or any other reason not related to job performance or prohibited by applicable law. In cases where employees are injured or disabled during employment with the Group, support, including appropriate training, is provided to those employees and workplace adjustments are made as appropriate in respect of their duties and working environment, supporting recovery and continued employment.

Employee involvement

Vesuvius adopts an open and honest approach to employee communications, supported by regular updates from senior management across businesses and operations within the Group. The Board and senior management visit operations throughout the year, touring the sites and meeting with employees. Other regular communications include direct email updates on the financial performance of the Company, the industrial environment in which Vesuvius operates, and other significant operational developments. The Company operates an employee intranet which distributes Company news and events, an employee "App" for information dissemination, as well as local initiatives for employee engagement on a site-by-site basis. The HR department is the primary point of contact for employees on employment and workplace matters, operating with an open-door policy and advising employees of any local legal, tax, pension or other employment changes. There are numerous employee-sponsored and led representative bodies within Vesuvius which differ with respect to jurisdiction and geography. Senior management, supported and facilitated by the HR department, encourages open dialogue and seeks opportunities to consult with these employee representative bodies as appropriate.

All members of the Group Executive Committee participate in the Vesuvius Share Plan and receive awards of Performance Shares, which vest in accordance with measures and targets set against EPS and TSR. For certain senior managers, awards are made under the Vesuvius Medium Term Plan ('MTP'). These managers participate in the MTP at varying percentage levels, and awards are made in shares and based on the same measures and targets as the Annual Incentive Plan.

Pensions

In each country in which the Group operates, the pension arrangements in place are considered to be consistent with good employment practice in that particular area. Independent advisers are used to ensure that the plans are operated in accordance with local legislation and the rules of each plan. Group policy prohibits direct investment of pension fund assets in the Company's shares. Outside the UK, the US, Germany and Belgium, the majority of pension plans in the Group are of a defined contribution nature.

In 2016 the main German defined benefit plan was closed for new entrants and existing members were offered a buy-out of their benefits under this plan. Those who accepted this buy-out then joined the new defined contribution plan. The Group's UK defined benefits plan (the 'UK Plan') and the main US defined benefits plans are closed to new entrants and have ceased providing future benefits accrual, with all eligible employees instead being provided with benefits through defined contribution arrangements.

For the Group's closed UK Plan, a Trustee Board exists comprising employees, former employees and an independent trustee. The Board currently comprises six trustee Directors, of whom two are member-nominated. The administration of the UK Plan is outsourced. The Company is mindful of its obligations under the Pensions Act 2004 and of the need to comply with the guidance issued by the Pensions Regulator. Regular dialogue is maintained between the Company and the Trustee Board of the UK Plan to ensure that both the Company and Trustee Board are apprised of the same financial and other information about the Group and the UK Plan. This is pertinent to each being able to contribute to the effective functioning of the UK Plan.

Vesuvius continues to seek ways to de-risk its existing pension plans through a combination of asset matching, buy-in opportunities and, where prudent, voluntary cash contributions.

The Group's worldwide net pension deficit at 31 December 2018 was £15.3m (31 December 2017: £16.5m). The principal reasons for the improvement of £1.2m were driven by £5.1m from changes to actuarial assumptions (attributable to increasing discount rates; updated mortality assumptions and pension membership data) and £8.5m from cash contributions and payments of unfunded benefits; offset by additional accrual and administrative expenditure paid for the year of £9.8m and foreign exchange movements of £2.6m.

The following disclosures are made in compliance with the Financial Conduct Authority's Listing Rule 9.8.4C R:

Disclosure requirement under LR 9.8.4R	Reference/Location
(1) Interest capitalised by the Group during the year	None
(2) Publication of unaudited financial information	Not applicable
(3) Details of any long-term incentive schemes	Pages 98 and 99
(4) Director waiver of emoluments	Not applicable
(5) Director waiver of future emoluments	Not applicable
(6) Allotment for cash of equity securities made during the year	Not applicable
(7) Allotment for cash of equity securities made by a major unlisted subsidiary during the year	Not applicable
(8) Details of participation of parent undertaking in any placing made during the year	Not applicable
(9) Details of relevant material contracts in which a Director or controlling shareholder was interested during the year	Not applicable
(10) Contracts for the provision of services by a controlling shareholder during the year	Not applicable
(11) Details of any arrangement under which a shareholder has waived or agreed to waive any dividends	Vesuvius plc holds 7,271,174 of its 10 pence ordinary shares as Treasury shares. No dividends are payable on these shares. Cookson Investments (Jersey) Limited, the Trustee of the Company's ESOP, has agreed to waive, on an ongoing basis, any dividends payable on shares it holds on trust for use under the Company's Employee Share Plans, details of which can be found on pages 107, 111 and 112
(12) Details of where a shareholder has agreed to waive future dividends	See above
(13) Statements relating to controlling shareholders and ensuring company independence	Not applicable

The Directors' Report has been approved by the Board and is signed, by order of the Board, by the Secretary of the Company.

Henry Knowles
Company Secretary
27 February 2019

Statement of Directors' Responsibilities in respect of the Annual Report and Financial Statements

The Directors are responsible for preparing the Annual Report and the Financial Statements in accordance with applicable law and regulation.

Company law requires the Directors to prepare financial statements for each financial year. Under that law the Directors have prepared the Group financial statements in accordance with International Financial Reporting Standards (IFRSs) as adopted by the European Union and Company financial statements in accordance with United Kingdom Generally Accepted Accounting Practice (United Kingdom Accounting Standards, comprising FRS 101 "Reduced Disclosure Framework", and applicable law). Under company law the Directors must not approve the financial statements unless they are satisfied that they give a true and fair view of the state of affairs of the Group and Company and of the profit or loss of the Group and Company for that period. In preparing the financial statements, the Directors are required to:

> select suitable accounting policies and then apply them consistently;

> state whether applicable IFRSs as adopted by the European Union have been followed for the Group financial statements and United Kingdom Accounting Standards, comprising FRS 101, have been followed for the Company financial statements, subject to any material departures disclosed and explained in the financial statements;

> make judgements and accounting estimates that are reasonable and prudent; and

> prepare the financial statements on the going concern basis unless it is inappropriate to presume that the Group and Company will continue in business.

The Directors are also responsible for safeguarding the assets of the Group and Company and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities.

The Directors are responsible for keeping adequate accounting records that are sufficient to show and explain the Group and Company's transactions and disclose with reasonable accuracy at any time the financial position of the Group and Company and enable them to ensure that the financial statements and the Directors' Remuneration Report comply with the Companies Act 2006 and, as regards the Group financial statements, Article 4 of the IAS Regulation.

The Directors are responsible for the maintenance and integrity of the Company's website. Legislation in the United Kingdom governing the preparation and dissemination of financial statements may differ from legislation in other jurisdictions.

Directors' confirmations

The Directors consider that the Annual Report and Financial Statements, taken as a whole, is fair, balanced and understandable and provides the information necessary for shareholders to assess the Group and Company's position and performance, business model and strategy.

Each of the Directors, whose names and functions are listed in the Statement of Directors' Responsibilities confirm that, to the best of their knowledge:

> the Company financial statements, which have been prepared in accordance with United Kingdom Generally Accepted Accounting Practice (United Kingdom Accounting Standards, comprising FRS 101 "Reduced Disclosure Framework", and applicable law), give a true and fair view of the assets, liabilities, financial position and profit of the Company;

> the Group financial statements, which have been prepared in accordance with IFRSs as adopted by the European Union, give a true and fair view of the assets, liabilities, financial position and profit of the Group; and

> the Strategic Report includes a fair review of the development and performance of the business and the position of the Group and Company, together with a description of the principal risks and uncertainties that it faces.

The Directors of Vesuvius plc who were in office during the year and up to the date of signing the financial statements were:

John McDonough CBE	Chairman
Patrick André	Chief Executive
Guy Young	Chief Financial Officer
Christer Gardell	Non-executive Director
Hock Goh	Non-executive Director
Jane Hinkley	Non-executive Director and Chairman of the Remuneration Committee
Douglas Hurt	Non-executive Director, Senior Independent Director and Chairman of the Audit Committee
Holly Koeppel	Non-executive Director

On behalf of the Board

Guy Young
Chief Financial Officer

27 February 2019

Independent Auditors' Report To the Members of Vesuvius plc

Report on the audit of the financial statements

Opinion

In our opinion:

- Vesuvius plc's group financial statements and company financial statements (the "financial statements") give a true and fair view of the state of the group's and of the company's affairs as at 31 December 2018 and of the group's profit and cash flows for the year then ended;
- the group financial statements have been properly prepared in accordance with International Financial Reporting Standards (IFRSs) as adopted by the European Union;
- the company financial statements have been properly prepared in accordance with United Kingdom Generally Accepted Accounting Practice (United Kingdom Accounting Standards, comprising FRS 101 "Reduced Disclosure Framework", and applicable law); and
- the financial statements have been prepared in accordance with the requirements of the Companies Act 2006 and, as regards the group financial statements, Article 4 of the IAS Regulation.

We have audited the financial statements, included within the Annual Report and Financial Statements (the "Annual Report"), which comprise: the Group and Company Balance Sheets as at 31 December 2018; the Group Income Statement and Group Statement of Comprehensive Income, the Group Statement of Cash Flows, and the Group and Company Statements of Changes in Equity for the year then ended; and the notes to the financial statements, which include a description of the significant accounting policies.

Our opinion is consistent with our reporting to the Audit Committee.

Basis for opinion

We conducted our audit in accordance with International Standards on Auditing (UK) ("ISAs (UK)") and applicable law. Our responsibilities under ISAs (UK) are further described in the Auditors' responsibilities for the audit of the financial statements section of our report. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Independence

We remained independent of the group in accordance with the ethical requirements that are relevant to our audit of the financial statements in the UK, which includes the FRC's Ethical Standard, as applicable to listed public interest entities, and we have fulfilled our other ethical responsibilities in accordance with these requirements.

To the best of our knowledge and belief, we declare that non-audit services prohibited by the FRC's Ethical Standard were not provided to the group or the company.

Other than those disclosed in Note 6 to the financial statements, we have provided no non-audit services to the group or the company in the period from 1 January 2018 to 31 December 2018.

Our Audit Approach – Overview

Materiality

Audit scope

Key audit matters

Materiality

- Overall group materiality: £9.4 million (2017: £7.6 million), based on 5% of profit before tax and separately reported items ('Headline profit before tax').
- Overall company materiality: £9.4 million (2017: £7.6 million), based on 1% of total assets, capped to the level of group materiality.

Audit scope

- Our audit included full scope audits of 20 components and specified procedures on certain balances and transactions for 8 additional components.
- Taken together, the components at which either full scope audit work or specified audit procedures were performed enabled us to get coverage on 68% of revenue and 78% of Headline profit before tax.

Key audit matters

- Provisions for exposures (Group).
- Provisions for income tax uncertainties (Group).
- Recognition of deferred tax assets for tax losses (Group).
- Impairment of investment in subsidiaries (Company).

The scope of our audit

As part of designing our audit, we determined materiality and assessed the risks of material misstatement in the financial statements.

Capability of the audit in detecting irregularities, including fraud

Based on our understanding of the group and industry, we identified that the principal risks of non-compliance with laws and regulations related to tax, health and safety and anti-bribery, and we considered the extent to which non-compliance might have a material effect on the financial statements. We also considered those laws and regulations that have a direct impact on the preparation of the financial statements such as the Companies Act 2006. We evaluated management's incentives and opportunities for fraudulent manipulation of the financial statements (including the risk of override of controls), and determined that the principal risks were related to posting inappropriate journal entries to revenue and management bias in accounting estimates. The group engagement team shared this risk assessment with the component auditors so that they could include appropriate audit procedures in response to such risks in their work. Audit procedures performed by the group

Independent Auditors' Report
To the Members of Vesuvius plc continued

engagement team and/or component auditors included:

> enquiries of group and local management, internal audit and the group's legal counsel (internal and, where relevant, external), including consideration of known or suspected instances of fraud and non-compliance with laws and regulations;

> understanding and evaluating the design and implementation of management's controls designed to prevent and detect irregularities, including whistleblowing arrangements;

> inspecting management reports and Board minutes in relation to health and safety matters; challenging assumptions and judgements made by management in their critical accounting estimates, in particular in relation to provisions for exposures and uncertain tax positions (see related key audit matters below); and

> identifying and testing journal entries, in particular any journal entries posted with unusual account combinations, postings by unusual users or with unusual descriptions.

There are inherent limitations in the audit procedures described above and the further removed non-compliance with laws and regulations is from the events and transactions reflected in the financial statements, the less likely we would become aware of it. Also, the risk of not detecting a material misstatement due to fraud is higher than the risk of not detecting one resulting from error, as fraud may involve deliberate concealment by, for example, forgery or intentional misrepresentations, or through collusion.

Key audit matters

Key audit matters are those matters that, in the auditors' professional judgement, were of most significance in the audit of the financial statements of the current period and include the most significant assessed risks of material misstatement (whether or not due to fraud) identified by the auditors, including those which had the greatest effect on: the overall audit strategy; the allocation of resources in the audit; and directing the efforts of the engagement team. These matters, and any comments we make on the results of our procedures thereon, were addressed in the context of our audit of the financial statements as a whole, and in forming our opinion thereon, and we do not provide a separate opinion on these matters. This is not a complete list of all risks identified by our audit.

Key audit matter	How our audit addressed the key audit matter
Provisions for exposures The group holds a number of provisions for exposures including those resulting from restructuring commitments, and disposal and closure costs, including litigation matters. Refer to Restructuring Charges (Note 7 on page 141) Provisions (Note 31 on page 168) Critical Accounting Judgements and Estimates (Note 3 on page 135) and Significant issues and material judgements in the Audit Committee Report (page 88). Determining the quantum of provisions requires the directors to use judgement and estimation, and for certain provisions, obtain specialist knowledge. We focused on this area due to the judgement and estimates involved and the disclosures required. (Group)	We obtained an understanding for the basis of each significant estimate and the key assumptions used for provisions and, in certain cases, the related insurance assets. Restructuring costs related to the group's rationalisation of its operational and support functions. The costs predominantly included redundancies and severance payments, plant closure costs, professional advisor fees and other impairment charges for obsolete inventories and property, plant and equipment. > We have tested a sample of restructuring costs to determine that these are directly attributable to the group's restructuring activities. > For costs which are provided for at the year end we have verified for a sample of transactions that a legal or constructive obligation exists. > From our procedures we concluded that restructuring costs were appropriately recognised and classified within the financial statements. For provisions for disposal and closure costs, including litigation matters: > We obtained supporting computations for the estimated costs and tested the mathematical accuracy of these. > We discussed obligations arising with in-house and external legal counsel and inspected supporting evidence of the history of claims arising where these were used as inputs into client models used to estimate the provisions, with the support of an internal expert. > We also inspected evidence of available insurance cover and that this was appropriately presented gross of the associated provisions (within 'Other receivables') and considered the financial condition of insurance providers. > We considered whether there is a material range of different possible outcomes and/or costs involved in respect of each provision. Where appropriate, we verified that disclosure is included within the Annual Report of this. From our procedures, we concluded the quantum of each provision held was appropriate. We also considered the impact of the provisions for exposures on the reporting and disclosure of separately reported items and Alternate Performance Measures in the financial statements and verified that appropriate disclosures are made in the Annual Report.

Key audit matter	How our audit addressed the key audit matter
Provisions for income tax uncertainties The group holds a number of provisions for income tax exposures arising from tax structuring, transfer pricing and local authority reviews. Refer to Income Tax (Note 10 on page 143) Critical Accounting Judgements and Estimates (Note 3 on page 135 and Significant issues and material judgements in the Audit Committee Report (page 88). Determining the quantum of these provisions requires the directors to make judgements and estimates, and for certain provisions, obtain specialist knowledge. (Group)	We utilised our tax specialists to provide a view of material judgements made. Our audit procedures included: > Obtaining relevant computations and correspondence in respect of each material element of the provision for Income tax uncertainty, including knowledge gained from our component teams. > Understanding the key assumptions made by management in recognising the provision and forming an independent view on the reasonableness of the assumptions. > Assessing the consistency of approach used to determine provisions compared to prior periods, and considering whether such consistency remains appropriate. > Considering the range of possible outcomes in respect of the estimate and that the Annual Report discloses the nature of the estimation uncertainty. From our procedures we concluded that the estimates are reasonable and that appropriate disclosures have been included within the Annual Report.
Recognition of deferred tax assets for tax losses In certain territories such as the US, the group has a material quantum of historical tax losses (and other temporary differences). The determination of whether deferred tax assets should be recognised involves an estimation of future taxable profits and an assessment of the probability that these would result in future utilisation of temporary differences. In addition, other factors such as the expiry dates of temporary differences and any complexities in legislation are also considered in estimating the quantum to recognise as a deferred tax asset. Refer to Income Tax (Note 10 on page 143) Critical Accounting Judgements and Estimates (Note 3 on page 135) and Significant issues and material judgements in the Audit Committee Report (page 88). (Group)	We utilised our tax specialists to support with the audit testing of the quantum of tax losses and other temporary differences in the US and that this is accurately determined, including taking into account any ongoing interpretations in respect of major changes from US tax reform in December 2017. We concluded the tax losses and other temporary differences are accurately determined. In addition to testing the quantum of temporary differences: > We tested management's forecasts of future taxable profits, which supported the amounts recognised as a deferred tax asset, and considered the likelihood of these forecasts being achieved. > We considered temporary differences not recognised and that the rationale for these was supported by expiry dates, tax legislation and the forecasts. We concluded that the deferred tax asset appropriately reflects expected levels of future utilisation. > We assessed the disclosure of deferred tax asset recognised in 2018 within Separately reported items and agreed that with regard to the quantum of the amount recognised this year that this was appropriate. We also considered the disclosure of the utilisation of the deferred tax asset which is included in Headline performance and that the accounting policies adequately explain this treatment. In addition to our testing of the US deferred tax asset recognised we also tested the recognition (or non-recognition) in respect of temporary differences in other locations. Based on the supporting evidence and rationales obtained we concurred with the specific treatments for each location tested. From our procedures we concluded that the estimate of the deferred tax asset recognised is appropriate and that relevant disclosures have been included within the Annual Report.
Impairment of investment in subsidiaries IAS 36 Impairment of assets requires management to consider whether there are any indicators of impairment at the year end. The company holds investments in subsidiaries with a total carrying amount of £1,778m at 31 December 2018. We did not consider the valuation of these investments to be a significant risk of misstatement, however, due to the quantum of the carrying amount this was an area of significance in the audit of the company. Judgement is required to determine whether impairment indicators exist which, if identified, would require an impairment test to be performed. Refer to Investment in Subsidiaries, Associates and Joint Ventures (Note 6 on page 179). (Company)	We focused on this area due to the material quantum of the carrying value of investments. We considered management's assessment of indicators of impairment and whether there were any new developments in 2018 which may indicate an impairment to the carrying value of the investment in subsidiaries. Factors considered were: > The results of the Value in use model used for the impairment test over goodwill. > Performance of the group in 2018 against the budget and the Board's outlook for the group. > Market capitalisation of the group, adjusted for net debt. > We concluded that no indicators of impairment of the company's carrying value of investments in its subsidiaries had arisen.

Independent Auditors' Report
To the Members of Vesuvius plc continued

How we tailored the audit scope

We tailored the scope of our audit to ensure that we performed enough work to be able to give an opinion on the financial statements as a whole, taking into account the structure of the group and the company, the accounting processes and controls, and the industry in which they operate.

Vesuvius has operations in 41 countries and has 59 production sites. The group consolidates financial information through reporting from its components which include divisions and functions at these sites.

Our audit scope was determined by considering the significance of the component's contribution to revenue and contribution to individual financial statement line items, with specific consideration to obtaining sufficient coverage over areas of high risk and locations and entities where we identified significant or inherent risks.

We identified one significant component being the group's German operations which comprise 12% of the group's revenue. As the group's remaining revenue is spread across 53 financial reporting components there were no other individually financially significant components. The audit scope, including Germany, comprised 20 components for which we determined that full scope audits would need to be performed and 8 components for which specific audit procedures on certain balances and transactions were performed. This collectively gave us coverage of 68% of the group's revenue and 78% of the group's Headline profit before tax. This, together with the additional procedures performed at the group level, including testing the consolidation process, gave us the evidence we needed for our opinion on the financial statements as a whole.

In establishing the overall approach to the group audit, we determined the type of work that needed to be performed at the components by us, as the group engagement team, or by component auditors of other PwC network firms. Where the work was performed by component auditors, we determined the level of involvement and oversight we needed to have in the audit work at those reporting units to be able to conclude whether sufficient appropriate audit evidence had been obtained as a basis for our opinion on the financial statements as a whole. This was achieved through regular communications with the component auditors, including visits to 10 of the 20 full scope components by senior members of the group audit team.

Materiality

The scope of our audit was influenced by our application of materiality. We set certain quantitative thresholds for materiality. These, together with qualitative considerations, helped us to determine the scope of our audit and the nature, timing and extent of our audit procedures on the individual financial statement line items and disclosures and in evaluating the effect of misstatements, both individually and in aggregate on the financial statements as a whole.

Based on our professional judgement, we determined materiality for the financial statements as a whole as follows:

	Group financial statements	Company financial statements
Overall materiality	£9.4 million (2017: £7.6 million)	£9.4 million (2017: £7.6 million)
How we determined it	5% of profit before tax and separately reported items ('Headline profit before tax')	1% of total assets, capped to the level of group materiality
Rationale for benchmark applied	We believe that profit before tax and separately reported items ('Headline profit before tax') provides us with an appropriate basis for determining our overall group materiality given it is a key measure used by users of the financial statements both internally and externally. Headline profit before tax is an Alternative Performance Measure presented and defined in the Annual Report and Financial Statements.	We believe that total assets is an appropriate basis for determining materiality for the parent company, given this entity is an investment holding company and this is an accepted auditing benchmark. The materiality was capped to the level of group overall materiality. The company is not an in-scope component in our group audit.

For each component in the scope of our group audit, we allocated a materiality that is less than our overall group materiality. The range of materiality allocated across components was between £0.5 million and £6.0 million. Certain components were audited to a local statutory audit materiality that was also less than our overall group materiality.

We agreed with the Audit Committee that we would report to them misstatements identified during our audit above £0.5 million (Group audit) (2017: £0.4 million) and £0.5 million (Company audit) (2017: £0.4 million) as well as misstatements below those amounts that, in our view, warranted reporting for qualitative reasons.

Going concern

In accordance with ISAs (UK) we report as follows:

Reporting obligation	Outcome
We are required to report if we have anything material to add or draw attention to in respect of the directors' statement in the financial statements about whether the directors considered it appropriate to adopt the going concern basis of accounting in preparing the financial statements and the directors' identification of any material uncertainties to the group's and the company's ability to continue as a going concern over a period of at least twelve months from the date of approval of the financial statements.	We have nothing material to add or to draw attention to. However, because not all future events or conditions can be predicted, this statement is not a guarantee as to the group's and company's ability to continue as a going concern. For example, the terms on which the United Kingdom may withdraw from the European Union, which is currently due to occur on 29 March 2019, are not clear, and it is difficult to evaluate all of the potential implications on the group and company's trade, customers, suppliers and the wider economy.
We are required to report if the directors' statement relating to Going Concern in accordance with Listing Rule 9.8.6R(3) is materially inconsistent with our knowledge obtained in the audit.	We have nothing to report.

Reporting on other information

The other information comprises all of the information in the Annual Report other than the financial statements and our auditors' report thereon. The directors are responsible for the other information. Our opinion on the financial statements does not cover the other information and, accordingly, we do not express an audit opinion or, except to the extent otherwise explicitly stated in this report, any form of assurance thereon.

In connection with our audit of the financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit, or otherwise appears to be materially misstated. If we identify an apparent material inconsistency or material misstatement, we are required to perform procedures to conclude whether there is a material misstatement of the financial statements or a material misstatement of the other information. If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report based on these responsibilities.

With respect to the Strategic Report and Directors' Report, we also considered whether the disclosures required by the UK Companies Act 2006 have been included.

Based on the responsibilities described above and our work undertaken in the course of the audit, the Companies Act 2006 (CA06), ISAs (UK) and the Listing Rules of the Financial Conduct Authority (FCA) require us also to report certain opinions and matters as described below (required by ISAs (UK) unless otherwise stated).

Strategic Report and Directors' Report

In our opinion, based on the work undertaken in the course of the audit, the information given in the Strategic Report and Directors' Report for the year ended 31 December 2018 is consistent with the financial statements and has been prepared in accordance with applicable legal requirements. *(CA06)*

In light of the knowledge and understanding of the group and company and their environment obtained in the course of the audit, we did not identify any material misstatements in the Strategic Report and Directors' Report. *(CA06)*

The directors' assessment of the prospects of the group and of the principal risks that would threaten the solvency or liquidity of the group

We have nothing material to add or draw attention to regarding:

> The directors' confirmation on page 31 of the Annual Report that they have carried out a robust assessment of the principal risks facing the group, including those that would threaten its business model, future performance, solvency or liquidity.

> The disclosures in the Annual Report that describe those risks and explain how they are being managed or mitigated.

> The directors' explanation on page 31 of the Annual Report as to how they have assessed the prospects of the group, over what period they have done so and why they consider that period to be appropriate, and their statement as to whether they have a reasonable expectation that the group will be able to continue in operation and meet its liabilities as they fall due over the period of their assessment, including any related disclosures drawing attention to any necessary qualifications or assumptions.

We have nothing to report having performed a review of the directors' statement that they have carried out a robust assessment of the principal risks facing the group and statement in relation to the longer-term viability of the group. Our review was substantially less in scope than an audit and only consisted of making inquiries and considering the directors' process supporting their statements; checking that the statements are in alignment with the relevant provisions of the UK Corporate Governance Code (the "Code"); and considering whether the statements are consistent with the knowledge and understanding of the group and company and their environment obtained in the course of the audit. *(Listing Rules)*

Independent Auditors' Report To the Members of Vesuvius plc continued

Other Code Provisions

We have nothing to report in respect of our responsibility to report when:

> The statement given by the directors, on page 120 that they consider the Annual Report taken as a whole to be fair, balanced and understandable, and provides the information necessary for the members to assess the group's and company's position and performance, business model and strategy is materially inconsistent with our knowledge of the group and company obtained in the course of performing our audit.

> The section of the Annual Report on page 88 describing the work of the Audit Committee does not appropriately address matters communicated by us to the Audit Committee.

> The directors' statement relating to the company's compliance with the Code does not properly disclose a departure from a relevant provision of the Code specified, under the Listing Rules, for review by the auditors.

Directors' Remuneration

In our opinion, the part of the Directors' Remuneration Report to be audited has been properly prepared in accordance with the Companies Act 2006. *(CA06)*

Responsibilities for the Financial Statements and the Audit

Responsibilities of the Directors for the Financial Statements

As explained more fully in the Statement of Directors' Responsibilities set out on page 120, the directors are responsible for the preparation of the financial statements in accordance with the applicable framework and for being satisfied that they give a true and fair view. The directors are also responsible for such internal control as they determine is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the directors are responsible for assessing the group's and the company's ability to continue as a going concern, disclosing as applicable, matters related to going concern and using the going concern basis of accounting unless the directors either intend to liquidate the group or the company or to cease operations, or have no realistic alternative but to do so.

Auditors' Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditors' report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with ISAs (UK) will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

A further description of our responsibilities for the audit of the financial statements is located on the FRC's website at: www.frc.org.uk/auditorsresponsibilities. This description forms part of our auditors' report.

Use of this report

This report, including the opinions, has been prepared for and only for the company's members as a body in accordance with Chapter 3 of Part 16 of the Companies Act 2006 and for no other purpose. We do not, in giving these opinions, accept or assume responsibility for any other purpose or to any other person to whom this report is shown or into whose hands it may come save where expressly agreed by our prior consent in writing.

Other required reporting

Companies Act 2006 exception reporting

Under the Companies Act 2006 we are required to report to you if, in our opinion:

> we have not received all the information and explanations we require for our audit; or

> adequate accounting records have not been kept by the company, or returns adequate for our audit have not been received from branches not visited by us; or

> certain disclosures of directors' remuneration specified by law are not made; or

> the company financial statements and the part of the Directors' Remuneration Report to be audited are not in agreement with the accounting records and returns.

We have no exceptions to report arising from this responsibility.

Appointment

Following the recommendation of the Audit Committee, we were appointed by the members on 10 May 2017 to audit the financial statements for the year ended 31 December 2017 and subsequent financial periods. The period of total uninterrupted engagement is 2 years, covering the years ended 31 December 2017 to 31 December 2018.

Julian Jenkins (Senior Statutory Auditor)
for and on behalf of PricewaterhouseCoopers LLP
Chartered Accountants and Statutory Auditors
London
27 February 2019

SECTION FIVE

FINANCIAL STATEMENTS

In this section:

Group Income Statement

For the year ended 31 December 2018

	Notes	2018 [1]Headline performance £m	2018 [1]Separately reported items £m	2018 Total £m	2017 [1]Headline performance £m	2017 [1]Separately reported items £m	2017 Total £m
Continuing operations							
Revenue	4, 5	1,798.0	—	1,798.0	1,683.9	—	1,683.9
Manufacturing costs		(1,291.2)	—	(1,291.2)	(1,219.8)	—	(1,219.8)
Administration, selling and distribution costs		(309.6)	—	(309.6)	(298.6)	—	(298.6)
Trading profit	5	197.2	—	197.2	165.5	—	165.5
Amortisation of acquired intangible assets	16	—	(12.9)	(12.9)	—	(19.5)	(19.5)
Restructuring charges	7	—	(15.3)	(15.3)	—	(36.3)	(36.3)
GMP equalisation charge	27	—	(4.5)	(4.5)	—	—	—
Operating profit/(loss)		197.2	(32.7)	164.5	165.5	(55.8)	109.7
Finance expense		(16.7)	—	(16.7)	(17.5)	—	(17.5)
Finance income		5.6	—	5.6	3.6	—	3.6
Net finance costs	9	(11.1)	—	(11.1)	(13.9)	—	(13.9)
Share of post-tax profit of joint ventures	34	2.8	—	2.8	1.3	—	1.3
Profit/(loss) before tax		188.9	(32.7)	156.2	152.9	(55.8)	97.1
Income tax (charge)/credits	10	(48.4)	36.8	(11.6)	(36.4)	(18.0)	(54.4)
Profit/(loss) from:							
Continuing operations		140.5	4.1	144.6	116.5	(73.8)	42.7
Discontinued operations	21	—	0.5	0.5	—	1.7	1.7
Profit/(loss)		140.5	4.6	145.1	116.5	(72.1)	44.4
Profit/(loss) attributable to:							
Owners of the parent		133.7	4.6	138.3	110.1	(72.1)	38.0
Non-controlling interests		6.8	—	6.8	6.4	—	6.4
Profit/(loss)		140.5	4.6	145.1	116.5	(72.1)	44.4
Earnings per share — pence	11						
Continuing operations — basic				51.1			13.4
— diluted				50.8			13.4
Total operations — basic				51.3			14.1
— diluted				51.0			14.0

[1] Headline performance is defined in Note 4.1 and separately reported items are defined in Note 2.5.

Group Statement of Comprehensive Income

For the year ended 31 December 2018

	Notes	2018 £m	2017 £m
Profit		**145.1**	44.4
Items that will not subsequently be reclassified to income statement			
Remeasurement of defined benefit liabilities/assets	27.6	**5.1**	8.4
Income tax relating to items not reclassified	10.4	**6.0**	(2.4)
Items that may subsequently be reclassified to income statement			
Exchange differences on translation of the net assets of foreign operations		**11.1**	(38.3)
Exchange differences on translation of net investment hedges	24	**(11.5)**	9.8
Income tax relating to items that may be reclassified		—	(0.7)
Other comprehensive income/(loss), net of income tax		**10.7**	(23.2)
Total comprehensive income		**155.8**	21.2
Total comprehensive income attributable to:			
Owners of the parent		**149.3**	15.3
Non-controlling interests		**6.5**	5.9
Total comprehensive income		**155.8**	21.2
Total comprehensive income attributable to owners of the parent arises from:			
Continuing operations		**148.8**	13.6
Discontinued operations		**0.5**	1.7
Total comprehensive income attributable to owners of the parent		**149.3**	15.3

Group Statement of Cash Flows

For the year ended 31 December 2018

	Notes	2018 £m	2017 £m
Cash flows from operating activities			
Cash generated from operations	12	**195.2**	175.8
Interest paid		**(16.3)**	(15.6)
Interest received		**4.8**	3.5
Net interest paid		**(11.5)**	(12.1)
Income taxes paid		**(41.8)**	(38.2)
Net cash inflow from operating activities		**141.9**	125.5
Cash flows from investing activities			
Capital expenditure		**(41.2)**	(39.0)
Proceeds from the sale of property, plant and equipment		**2.6**	1.8
Acquisition of subsidiaries and joint ventures, net of cash acquired		**(1.0)**	—
Dividends received from joint ventures		**1.2**	1.7
Net cash outflow from investing activities		**(38.4)**	(35.5)
Net cash inflow before financing activities		**103.5**	90.0
Cash flows from financing activities			
Proceeds from borrowings	14	**34.9**	103.5
Repayment of borrowings	14	**(1.6)**	(92.2)
Borrowing facility arrangement costs	14	**—**	(1.0)
Settlement of forward foreign exchange contracts		**1.8**	(10.4)
Purchase of ESOP shares	23	**(13.4)**	—
Dividends paid to equity shareholders	25	**(50.0)**	(45.6)
Dividends paid to non-controlling shareholders		**(1.9)**	(2.5)
Net cash outflow from financing activities		**(30.2)**	(48.2)
Net increase in cash and cash equivalents	14	**73.3**	41.8
Cash and cash equivalents at 1 January		**140.0**	101.0
Effect of exchange rate fluctuations on cash and cash equivalents	14	**0.1**	(2.8)
Cash and cash equivalents at 31 December	13	**213.4**	140.0

Alternative performance measure (non-statutory):

	Continuing operations £m	Discontinued operations £m	2018 total £m	Continuing operations £m	Discontinued operations £m	2017 total £m
Free cash flow (Note 4.10)						
Net cash inflow/(outflow) from operating activities	**142.0**	**(0.1)**	**141.9**	126.3	(0.8)	125.5
Net retirement benefit obligations	**3.4**	**—**	**3.4**	4.8	—	4.8
Capital expenditure	**(41.2)**	**—**	**(41.2)**	(39.0)	—	(39.0)
Proceeds from the sale of property, plant and equipment	**2.6**	**—**	**2.6**	1.8	—	1.8
Dividends received from joint ventures	**1.2**	**—**	**1.2**	1.7	—	1.7
Dividends paid to non-controlling shareholders	**(1.9)**	**—**	**(1.9)**	(2.5)	—	(2.5)
Free cash flow (Note 4.10)	**106.1**	**(0.1)**	**106.0**	93.1	(0.8)	92.3

Group Balance Sheet

As at 31 December 2018

	Notes	2018 £m	2017 £m
Assets			
Property, plant and equipment	15	**313.9**	311.3
Intangible assets	16	**741.4**	743.0
Employee benefits – surpluses	27	**90.8**	92.4
Interests in joint ventures and associates	34	**19.1**	17.5
Investments		**1.0**	1.4
Income tax receivable	10	**—**	0.4
Deferred tax assets	10	**94.5**	61.0
Other receivables		**30.1**	30.9
Derivative financial instruments	26	**0.7**	0.2
Total non-current assets		**1,291.5**	1,258.1
Cash and short-term deposits	13	**236.9**	161.9
Inventories	19	**244.3**	222.8
Trade and other receivables	18	**440.4**	422.2
Income tax receivable	10	**2.8**	5.2
Derivative financial instruments	26	**0.1**	0.1
Assets classified as held for sale		**1.7**	—
Total current assets		**926.2**	812.2
Total assets		**2,217.7**	2,070.3
Equity			
Issued share capital	22	**27.8**	27.8
Retained earnings	23	**2,460.0**	2,370.3
Other reserves	24	**(1,369.5)**	(1,369.4)
Equity attributable to the owners of the parent		**1,118.3**	1,028.7
Non-controlling interests		**50.0**	45.4
Total equity		**1,168.3**	1,074.1
Liabilities			
Interest-bearing borrowings	26	**455.5**	410.5
Employee benefits – liabilities	27	**106.1**	108.9
Other payables	29	**16.1**	17.3
Provisions	31	**38.8**	34.4
Deferred tax liabilities	10	**38.7**	42.7
Total non-current liabilities		**655.2**	613.8
Interest-bearing borrowings	26	**29.4**	25.7
Trade and other payables	29	**311.8**	292.6
Income tax payable	10	**29.3**	34.3
Provisions	31	**23.1**	29.8
Derivative financial instruments	26	**0.6**	—
Total current liabilities		**394.2**	382.4
Total liabilities		**1,049.4**	996.2
Total equity and liabilities		**2,217.7**	2,070.3

Company number 8217766

The financial statements on pages 128 to 175 were approved and authorised for issue by the Directors on 27 February 2019 and signed on their behalf by:

Patrick André
Chief Executive

Guy Young
Chief Financial Officer

Group Statement of Changes in Equity

For the year ended 31 December 2018

	Issued share capital £m	Other reserves £m	Retained earnings £m	Owners of the parent £m	Non-controlling interests £m	Total equity £m
As at 1 January 2017	27.8	(1,341.4)	2,370.0	1,056.4	42.1	1,098.5
Profit	—	—	38.0	38.0	6.4	44.4
Remeasurement of defined benefit liabilities/assets	—	—	8.4	8.4	—	8.4
Income tax relating to items not reclassified	—	—	(2.4)	(2.4)	—	(2.4)
Exchange differences on translation of the net assets of foreign operations	—	(37.8)	—	(37.8)	(0.5)	(38.3)
Exchange differences on translation of net investment hedges	—	9.8	—	9.8	—	9.8
Income tax relating to items that may be reclassified	—	—	(0.7)	(0.7)	—	(0.7)
Other comprehensive income/(loss), net of income tax	—	(28.0)	5.3	(22.7)	(0.5)	(23.2)
Total comprehensive income/(loss)	—	(28.0)	43.3	15.3	5.9	21.2
Recognition of share-based payments	—	—	2.6	2.6	—	2.6
Dividends paid (Note 25)	—	—	(45.6)	(45.6)	(2.6)	(48.2)
Total transactions with owners	—	—	(43.0)	(43.0)	(2.6)	(45.6)
As at 1 January 2018	**27.8**	**(1,369.4)**	**2,370.3**	**1,028.7**	**45.4**	**1,074.1**
Profit	**—**	**—**	**138.3**	**138.3**	**6.8**	**145.1**
Remeasurement of defined benefit liabilities/assets	—	—	**5.1**	**5.1**	—	**5.1**
Income tax relating to items not reclassified	—	—	**6.0**	**6.0**	—	**6.0**
Exchange differences on translation of the net assets of foreign operations	—	**11.4**	—	**11.4**	**(0.3)**	**11.1**
Exchange differences on translation of net investment hedges	—	**(11.5)**	—	**(11.5)**	—	**(11.5)**
Income tax relating to items that may be reclassified	—	—	—	—	—	—
Other comprehensive income/(loss) net of income tax	—	**(0.1)**	**11.1**	**11.0**	**(0.3)**	**10.7**
Total comprehensive income/(loss)	—	**(0.1)**	**149.4**	**149.3**	**6.5**	**155.8**
Recognition of share-based payments	—	—	**3.7**	**3.7**	—	**3.7**
Purchase of ESOP shares	—	—	**(13.4)**	**(13.4)**	—	**(13.4)**
Dividends paid (Note 25)	—	—	**(50.0)**	**(50.0)**	**(1.9)**	**(51.9)**
Total transactions with owners	—	—	**(59.7)**	**(59.7)**	**(1.9)**	**(61.6)**
As at 31 December 2018	**27.8**	**(1,369.5)**	**2,460.0**	**1,118.3**	**50.0**	**1,168.3**

Notes to the Group Financial Statements

1. General Information

Vesuvius plc ('Vesuvius' or 'the Company') is a public company limited by shares. It is incorporated and domiciled in England and Wales and listed on the London Stock Exchange. The nature of the operations and principal activities of the Company and its subsidiary and joint venture companies ('the Group') is set out in the Strategic Report on pages 1 to 71 and its registered address is shown on page 184.

2. Basis of Preparation

2.1 Basis of accounting

The Group Financial Statements have been prepared in accordance with International Financial Reporting Standards (IFRS) and interpretations issued by the IFRS Interpretations Committee (IFRS IC) as adopted by the European Union and with the Companies Act 2006 applicable to companies reporting under IFRS. The financial statements have been prepared under the historical cost convention, with the exception of fair value measurement applied to defined benefit pension plans, certain provisions, investments and derivative financial instruments.

2.2 Basis of consolidation

The Group Financial Statements incorporate the financial statements of the Company and entities controlled directly and indirectly by the Company (its 'subsidiaries'). Control exists when the Company has the power to direct the relevant activities of an entity that significantly affect the entity's return so as to have rights to the variable return from its activities. In assessing whether control exists, potential voting rights that are currently exercisable are taken into account. The results of subsidiaries acquired or disposed of during the year are included in the Group Income Statement from the effective date of acquisition or up to the effective date of disposal, as appropriate.

The principal accounting policies applied in the preparation of these Group Financial Statements are set out in the Notes. These policies have been consistently applied to all of the years presented, unless otherwise stated. Where necessary, adjustments are made to the financial statements of subsidiaries to bring their accounting policies into line with those detailed herein to ensure that the Group Financial Statements are prepared on a consistent basis. All intra-Group transactions, balances, income and expenses are eliminated on consolidation.

Non-controlling interests in the net assets of consolidated subsidiaries are identified separately from the Group's interest therein. Non-controlling interests consist of the amount of those interests at the date of the original business combination together with the non-controlling interests' share of profit or loss, each component of other comprehensive income, and dividends paid since the date of the combination. Total comprehensive income is attributed to the non-controlling interests even if this results in the non-controlling interests having a deficit balance.

2.3 Going concern

The Directors have prepared cash flow forecasts for the Group for a period in excess of 12 months from the date of approval of the financial statements. These forecasts reflect an assessment of current and future end-market conditions and their impact on the Group's future trading performance. The forecasts show that the Group will be able to operate within the current committed debt facilities and show continued compliance with the Company's financial covenants. On the basis of the exercise described above and the Group's available committed debt facilities, the Directors consider that the Group and Company have adequate resources to continue in operational existence for a period of at least 12 months from the date of signing of these Financial Statements. Accordingly, they continue to adopt a going concern basis in preparing the financial statements of the Group and the Company.

2.4 Functional and presentation currency

The financial statements are presented in millions of pounds sterling, which is the functional currency of the Company, and rounded to one decimal place. Foreign operations are included in accordance with the policies set out in Note 26.1.

2.5 Disclosure of 'separately reported items'

IAS 1 Presentation of Financial Statements provides no definitive guidance as to the format of the income statement, but states key lines which should be disclosed. It also encourages the disclosure of additional line items and the reordering of items presented on the face of the income statement when appropriate for a proper understanding of the entity's financial performance.
In accordance with IAS 1, the Company has adopted a columnar presentation for its Group Income Statement, to separately identify headline performance results, as the Directors consider that this gives a better view of the underlying results of the ongoing business. As part of this presentation format, the Company has adopted a policy of disclosing separately on the face of its Group Income Statement, within the column entitled 'Separately reported items', the effect of any components of financial performance for which the Directors consider separate disclosure would assist both in a better understanding of the financial performance achieved for a given year and in making projections of future results.

Both materiality and the nature of the components of income and expense are considered in deciding upon such presentation. Such items may include, inter alia, the financial effect of exceptional items which occur infrequently, such as major restructuring activity, (which may require more than one year to complete), and significant movement in the Group's deferred tax balances such as was, for example, caused by the impact of US tax reform in 2017, together with items reported separately for consistency, such as amortisation charges relating to acquired intangible assets, profits or losses arising on the disposal of continuing or discontinued operations and the taxation impact of the aforementioned exceptional items and other items reported separately.

Notes to the Group Financial Statements continued

2. Basis of Preparation continued

2.5 Disclosure of 'separately reported items' continued

Following a period of sustained profitability of the Group's US business, the Board has decided to substantially increase the amount reflected on the Group's balance sheet in respect of the previously unrecognised value of US tax losses and other temporary differences. Further details of the 2018 movements are shown in Note 10.

In light of the fact that the tax value of the US tax losses and other temporary differences is now substantially recognised on the Group's balance sheet, the Board has decided that it is now more appropriate to reflect the normal utilisation of the deferred tax assets which offset the Group's US taxable headline profits, as part of the Group's headline tax charge. In previous years this utilisation was shown as part of the tax charge on separately reported items in the Group Income Statement. The Group's prior year headline tax charge has not been restated on the grounds that the impact is not material. See Note 10.1 for more details on the impact in 2018.

Utilisation of the deferred tax assets recognised in the Group Statement of Other Comprehensive Income will continue to be reflected in that Statement, as was previously the case.

The amortisation charge in respect of intangible assets recognised on business combinations is excluded from the trading results of the Group since they are non-cash charges and are not considered reflective of the core trading performance of the Group. Restructuring charges are excluded from the trading results of the Group due to the material nature of these non-recurring transformational initiatives. In its adoption of this policy, the Company applies an even-handed approach to both gains and losses and aims to be both consistent and clear in its accounting and disclosure of such items.

A UK High Court judgement was made on 26 October 2018 in respect of the gender equalisation of guaranteed minimum pensions ('GMPs') for occupational pension schemes. The increase in pension liabilities resulting from this judgement has been treated for IAS 19 purposes as a plan amendment and has resulted in an increase in the pension deficit in the balance sheet and a corresponding past service cost in the income statement. This has been treated as a separately reported item so that there has been no impact upon Headline performance. We are working with the trustees of our UK pension plan and our actuarial and legal advisers to understand the extent to which the judgement crystallises additional liabilities for the UK pension plan. We have estimated the impact of GMP equalisation as at 31 December 2018 to be £4.5m.

2.6 Changes in accounting policies

Initial adoption of IFRS 15 Revenue from Contracts with Customers

The Group adopted IFRS 15 Revenue from Contracts with Customers with the date of initial application to the Group of 1 January 2018 using the modified retrospective method.

IFRS 15 replaces all existing revenue requirements in IFRS and applies to all revenue arising from contracts with customers unless the contracts are within the scope of other standards such as IAS 17 Leases. The standard establishes a comprehensive framework for determining whether, how much and when revenue is recognised. The impact of adopting IFRS 15 on the Group Financial Statements was not material and there was no adjustment to retained earnings on application at 1 January 2018. The Group has not restated the comparative results on adoption and the required additional disclosures are included in Note 5.

Details of the change in the Group's accounting policy in respect of revenue recognition are set out in Note 5.

Initial adoption of IFRS 9 Financial Instruments

Effective 1 January 2018, the Group adopted IFRS 9 Financial Instruments. IFRS 9 addresses the classification, measurement and derecognition of financial instruments, and introduces new rules for hedge accounting and a new impairment model for financial assets. It replaces IAS 39 Financial Instruments: Recognition and Measurement, and comprehensive updates have been made to IFRS 7 Financial Instruments: Disclosures and IAS 32 Financial Instruments: Presentation. The adoption of IFRS 9 has had no material impact on the Group Financial Statements. The Group has not restated the comparative results on adoption and the required additional disclosures are included in Note 26.

2.7 New and revised IFRS

Certain new accounting standards and interpretations have been published that are not mandatory for 31 December 2018 reporting periods and have not been early adopted by the Group. The Group's assessment of the impact of these new standards and interpretations is set out below. Other new or amended standards or interpretations are not expected to have a significant impact on the Group's financial statements.

IFRS 16 Leases (effective for financial years beginning on or after 1 January 2019)

IFRS 16 Leases, replaces the existing standard on accounting for leases, IAS 17, and the related interpretations. The Group will apply the standard from 1 January 2019. The Group will transition to IFRS 16 in accordance with the simplified approach; the prior year figures will not be adjusted. The Group has non-cancellable operating lease commitments of £39.3m, see Note 30.2. It is expected that the application of this standard will have a material impact on the Group's Financial Statements to bring these obligations and an associated asset on Balance Sheet.

Balance sheet: IFRS 16 requires lessees to adopt a uniform approach to the presentation of leases. In future, assets must be recognised for the right of use received and liabilities must be recognised for the discounted payment obligations entered into for all leases. The Group will make use of the relief options provided for leases of low-value assets and short-term leases (shorter than 12 months). For leases that have been classified to date as operating leases in accordance with IAS 17, the lease liability will be recognised at the present value of the remaining lease payments, discounted using the interest rate implicit in the lease, if that rate can be readily determined. If that rate cannot be readily determined, the lessee's incremental borrowing rate will be used. The right of use asset will generally be measured at the amount of the lease liability plus initial direct costs. Advance payments and liabilities from the previous financial year will also be accounted for. If IFRS 16 had been applied for the 2018 Annual Report and Financial Statements, fixed assets and liabilities would both have been approximately £33m higher.

Income statement: In contrast to the presentation to date of operating lease expenses within operating profit, in future, depreciation charges on right of use assets and the interest expense from unwinding of the discount on the lease liabilities will be recognised. If IFRS 16 had been applied for the 2018 Annual Report and Financial Statements, operating profit and interest expense would both have been approximately £1m higher.

Cash flow statement: If IFRS 16 had been applied for the 2018 Annual Report and Financial Statements, operating cash flow would be approximately £9m higher (impacts of depreciation and interest) and financing cash flow would be approximately £9m lower, with no net impact on total cash flow.

IFRIC 23 Uncertainty over Income Tax Treatments

IFRIC 23 Uncertainty over Income Tax Treatments (effective from 1 January 2019, for the year ending 2019, not yet endorsed), clarifies how to recognise and measure deferred and current income tax assets and liabilities where there is uncertainty over tax treatment under IAS 12. The Group has assessed the potential impact on its Group Financial Statements resulting from the application of IFRIC 23 and has concluded that it will not have a material impact on the amount of provisions held for uncertain tax positions as at 31 December 2018.

3. Critical Accounting Judgements and Estimates

Determining the carrying amount of some assets and liabilities requires judgement and/or estimation of the effect of uncertain future events. The major sources of judgement and estimation uncertainty that have a significant risk of resulting in a material adjustment to the carrying amounts of assets or liabilities are noted below. All other accounting policies are included within the respective Notes to the financial statements.

3.1 Provisions

Vesuvius has extensive international operations and is subject to various legal and regulatory regimes, including those covering taxation and environmental matters. Several of the Group's subsidiaries are parties to legacy matter legal proceedings, certain of which are insured claims arising in the ordinary course of the operations of the company involved, and are aware of a number of issues which are, or may be, the subject of dispute with tax authorities. Provisions are made for the expected amounts payable in respect of known or probable costs resulting both from legal claims or other regulatory requirements or from third-party claims, as described in Note 31. As the settlement of many of the potential obligations for which provision is made is subject to legal or other regulatory process it requires estimation of the timing, quantum and amount of associated outflows, which are subject to some uncertainty. The Directors use their judgement and experience to make appropriate estimates of provisions in the financial statements for amounts relating to such matters. Associated assets for insurance recoverable are subject to the same estimation uncertainty as their quantum varies in line with the expected provision.

3.2 Taxation

(a) Current tax

Tax credits and assets are not recognised unless it is probable that they will result in future economic benefits to the Group. In assessing the amount of the benefit to be recognised in the financial statements, the Directors exercise their judgement in considering the effect of negotiations, litigation and any other matters that they consider may impact upon the potential settlement. The Group operates internationally and is subject to tax in many different jurisdictions. As a consequence, the Group is routinely subject to tax audits and local enquiries which, by their very nature, can take a considerable period of time to conclude. Provisions are made for known issues based on all substantively enacted legislation, the Directors' interpretation of country-specific tax law and their assessment of the likely outcome, taking into consideration the Group's experience in agreeing tax liabilities with tax authorities and appropriate external advice. As indicated in Note 10.5, provisions for uncertain tax positions amount to £20.2m at the end of 2018 (2017: £23.2m). Further discussion of these provisions is contained in that Note. All income tax liabilities, provisions and assets are treated as income tax payable and recoverable in accordance with IAS 12.

(b) Deferred tax

The Group has recognised deferred tax assets in respect of unutilised losses and other temporary differences arising in a number of the Group's businesses, further details of which are given in Note 10.4. Account has been taken of future forecasts of taxable profit in arriving at the values at which these assets are recognised. If these forecast profits do not materialise or change, or there are changes in tax rates or to the period over which the losses or temporary differences might be recognised, then the value of the deferred tax assets will need to be revised in a future period.

Notes to the Group Financial Statements continued

3. Critical Accounting Judgements and Estimates continued

3.2 Taxation continued

The Group also has losses and other temporary differences, also analysed in Note 10.4, for which no deferred tax assets have been recognised in these financial statements, relating either to loss-making subsidiaries where the future economic benefit of the temporary difference is not probable or to where the timing difference is of such a nature that its value is dependent on certain types of profit being earned, such as capital profits. If trading or other appropriate profits are earned in the future in these companies, these losses and other temporary differences may yield benefit to the Group in the form of a reduced tax charge.

As explained in Note 10.2, the US Tax Cuts and Jobs Act ('TCJA') enacted in late December 2017 had a material impact on the Group's deferred tax position. Further clarifications as to the operation of the TCJA have been issued throughout 2018. Vesuvius has adjusted its US provisions and deferred tax calculations to reflect those clarifications and will continue to review and monitor these rules and any future clarifications.

As explained in Note 2.5, following a period of sustained profitability of the Group's US business, the Board has decided to substantially increase the amount reflected on the Group's balance sheet in respect of the previously unrecognised value of US tax losses and other temporary differences. Further details of the 2018 movements are shown in Note 10.1.

In light of the fact that the tax value of the US tax losses and other temporary differences is now substantially recognised on the Group's balance sheet, the Board has further decided that it is now more appropriate to reflect the normal utilisation of the deferred tax assets which offset the Group's US taxable headline profits, as part of the Group's headline tax charge. In previous years this utilisation was shown as part of the tax charge on separately reported items in the Group Income Statement.
The Group's prior year headline tax charge has not been restated on the grounds that the impact is not material.

Utilisation of the deferred tax assets recognised in the Group Statement of Other Comprehensive Income will continue to be reflected in that Statement, as was previously the case.

4. Alternative Performance Measures

The Company uses a number of alternative performance measures (APMs) in addition to those reported in accordance with IFRS. The Directors believe that these APMs, listed below, are important when assessing the underlying financial and operating performance of the Group and its divisions, providing management with key insights and metrics in support of the ongoing management of the Group's performance and cash flow. A number of these align with KPIs and other key metrics used in the business and therefore are considered useful to also disclose to the users of the financial statements. The following APMs do not have standardised meaning prescribed by IFRS and therefore may not be directly comparable with similar measures presented by other companies.

4.1 Headline

Headline performance, reported separately on the face of the Group Income Statement, is from continuing operations and before items reported separately on the face of the Group Income Statement.

4.2 Underlying revenue, underlying trading profit and underlying return on sales

Underlying revenue, underlying trading profit and underlying return on sales are the headline equivalents of these measures after adjustments to exclude the effects of changes in exchange rates, business acquisitions and disposals. Reconciliations of underlying revenue and underlying trading profit can be found in the Financial Review. Underlying revenue growth is one of the Group's key performance indicators and provides an important measure of organic growth of Group businesses between reporting periods, by eliminating the impact of exchange rates, acquisitions, disposals and significant business closures.

4.3 Return on sales (ROS)

ROS is calculated as trading profit divided by revenue. It is one of the Group's key performance indicators and is used to assess the trading performance of Group businesses. A reconciliation of ROS is included in Note 5.3.

4.4 Trading profit

Trading profit, reported separately on the face of the Group Income Statement, is defined as operating profit before separately reported items. It is one of the Group's key performance indicators and is used to assess the trading performance of Group businesses. It is also used as one of the targets against which the annual bonuses of certain employees are measured.

4.5 Headline profit before tax

Headline profit before tax, reported separately on the face of the Group Income Statement, is calculated as the net total of trading profit, plus the Group's share of post-tax profit of joint ventures and total net finance costs associated with headline performance. It is one of the Group's key performance indicators and is used to assess the financial performance of the Group as a whole.

4.6 Effective tax rate (ETR)

The Group's ETR is calculated on the income tax costs associated with headline performance, divided by headline profit before tax and before the Group's share of post-tax profit of joint ventures.

4.7 Headline earnings per share

Headline earnings per share is calculated by dividing headline profit before tax less associated income tax costs, attributable to owners of the parent by the weighted average number of ordinary shares in issue during the year. It is one of the Group's key performance indicators and is used to assess the underlying earnings performance of the Group as a whole. It is also used as one of the targets against which the annual bonuses of certain employees are measured. Headline earnings per share is disclosed in Note 11.

4.8 Operating cash flow

Operating cash flow is cash generated from continuing operations before restructuring and net retirement benefit obligations but after deducting capital expenditure net of asset disposals. It is used in calculating the Group's cash conversion. A reconciliation of cash generated from operations to operating cash flow can be found in the Financial Review.

4.9 Cash conversion

Cash conversion is calculated as operating cash flow from continuing operations divided by trading profit. It is useful for measuring the rate at which cash is generated from trading profit. It is also used as one of the targets against which the annual bonuses of certain employees are measured. The calculation of cash conversion is detailed in the Financial Review.

4.10 Free cash flow

Free cash flow is defined as net cash flow from operating activities after net outlays for the purchase and sale of property, plant and equipment, dividends from joint ventures and dividends paid to non-controlling shareholders, but before additional funding contributions to Group pension plans. It is one of the Group's key performance indicators and is used to assess the underlying cash generation of the Group and is one of the measures used in monitoring the Group's capital. A reconciliation of free cash flow is included underneath the Group Statement of Cash Flows.

4.11 Average trade working capital to sales ratio

The average trade working capital to sales ratio is calculated as the percentage of average trade working capital balances to the total revenue for the year, at constant currency. Average trade working capital (comprising inventories, trade receivables and trade payables) is calculated as the average of the 12 previous month-end balances. It is one of the Group's key performance indicators and is useful for measuring the level of working capital used in the business and is one of the measures used in monitoring the Group's capital.

4.12 Earnings before interest, tax, depreciation and amortisation (EBITDA)

EBITDA is calculated as the total of trading profit before depreciation and amortisation of non-acquired intangible assets. It is used in the calculation of the Group's interest cover and net debt to EBITDA ratios. A reconciliation of EBITDA is included in Note 12.

4.13 Net interest

Net interest is calculated as interest payable on borrowings less interest receivable, excluding any item separately reported. It is used in the calculation of the Group's interest cover ratio.

4.14 Interest cover

Interest cover is the ratio of EBITDA to net interest. It is one of the Group's key performance indicators and is used to assess the financial position of the Group and its ability to fund future growth. This measure is also a component of the Group's covenant calculations.

4.15 Net debt

Net debt comprises the net total of current and non-current interest-bearing borrowings and cash and short-term deposits. Net debt is a measure of the Group's net indebtedness to banks and other external financial institutions. A reconciliation of the movement in net debt is included in Note 14.

4.16 Net debt to EBITDA

Net debt to EBITDA is the ratio of net debt at the year-end to EBITDA for that year. It is one of the Group's key performance indicators and is used to assess the financial position of the Group and its ability to fund future growth and is one of the measures used in monitoring the Group's capital.

4.17 Return on net assets (RONA)

RONA is calculated as trading profit plus share of post-tax profit of joint ventures, divided by average net operating assets, at constant currency (being the average over the previous 12 months of property, plant and equipment, trade working capital, interests in joint ventures and associates, investments and other operating receivables, payables and provisions). It is one of the Group's key performance indicators and is used to assess the financial performance and asset management of the Group and is one of the measures used in monitoring the Group's capital.

4.18 Constant currency

Figures presented at constant currency represent 2017 amounts retranslated to average 2018 exchange rates.

Notes to the Group Financial Statements continued

5 Segment Information

The segment information contained in this Note refers to several alternative performance measures, definitions of which can be found in Note 4.

5.1 Business segments

Operating segments for continuing operations

Operating segments are reported in a manner consistent with the internal reporting provided to the Executive Directors of the Board, who make the key operating decisions and are responsible for allocating resources and assessing performance of the operating segments. Reflecting the Group's management and internal reporting structure, segmental information is presented in respect of the two main business segments: Steel and Foundry. The Steel segment aggregates the Flow Control, Advanced Refractories and Digital Services business units which are subject to a similar risk profile and return. The adoption of the revenue standard ('IFRS 15') does not have any impact on the assessment of operating segments of the Group and the disaggregation of revenue between Steel and Foundry remains appropriate. The principal activities of each of these segments are described in the Strategic Report.

Segment revenue represents revenue from external customers (inter-segment revenue is not material). Trading profit includes items directly attributable to a segment as well as those items that can be allocated on a reasonable basis.

5.2 Accounting policy – revenue recognition

Revenue comprises the fair value of the consideration received or receivable for goods supplied and services rendered to customers after deducting rebates, discounts and value-added taxes, and after eliminating sales within the Group. Revenue from contracts with customers is recognised when control of the goods or services are transferred to the customer, upon the completion of specified performance obligations, at an amount that reflects the considerations to which the Group expects to be entitled to in exchange for these consumable products and associated services.

The identification of performance obligations includes a determination of whether the goods or services (or bundle of goods or services) are distinct. Where contracts contain the provision of multiple elements such as refractory consumables, technical assistance and equipment, management applies judgement in determining whether the bundle of goods and/or services are distinct. Where the provision of goods and/or services is distinct, revenue is recognised separately for each performance obligation. If the elements in the contract are not distinct, a distinct bundle of goods/services is identified, and revenue is recognised for this bundle of items.

The transaction price is allocated to each performance obligation based on the relative standalone selling prices of the goods or services provided. If a standalone selling price is not available, the Group will estimate the selling price with reference to the price that would be charged for the goods or services if they were sold separately.

An assessment of the timing of revenue recognition is made for each performance obligation. Revenue is recognised at a point in time for all standard revenue transactions when control of the goods provided is transferred to the customer. Revenue is also recognised at a point in time for contracts that contain multiple elements ('service contracts') when the agreed output is produced by the customer unless there are specific performance obligations to deliver other services over time. The Group recognises revenue over time for contracts that are longer term in nature by measuring the progress of completion of each performance obligation using an output method of completion. For fixed-price contracts, the customer will pay the amounts as agreed in the payment schedule and contract asset or liability balances are recognised in accordance with the timing of completion of the identified performance obligations.

Variable consideration

If the consideration in a contract includes a variable amount, the Group estimates the amount of consideration to which it will be entitled in exchange for transferring the goods or services to the customer.

> Rights of return

Certain contracts provide a customer a right to return goods within a specific period. The Group recognises a separate liability representing the estimated amount of consideration that an entity does not expect to receive as it will be refunded to the customer.

> Warranty obligations

The Group usually provides warranties for goods where they can be returned if they are faulty. These assurance type warranties are accounted for under IAS 37 Provisions, Contingent Liabilities and Contingent Assets.

Contract balances

> Contract assets

A contract asset is a right to payment in exchange for goods or services that have been transferred to a customer when that right is conditional on something other than the passage of time.

> Receivable

A receivable is a company's right to payment that is unconditional. A right to consideration is unconditional if only the passage of time is required before payment of that consideration is due. Once the consideration due to the Group is "unconditional", the contract asset should be reclassified as a receivable.

> Contract liability

A contract liability is an obligation to transfer goods or services to a customer for which the consideration has been received (or an amount of consideration is due) from the customer.

The revenue recognition policy applicable to the comparative period (i.e 2017) was disclosed in the 2017 Annual Report and Financial Statements.

5.3 Segmental analysis

The operating segment results from continuing operations for 2018 and 2017 are presented below.

	2018		
	Steel £m	**Foundry £m**	**Continuing operations £m**
Segment revenue	**1,236.7**	**561.3**	**1,798.0**
Segment EBITDA	**155.3**	**82.9**	**238.2**
Segment depreciation	**(27.0)**	**(14.0)**	**(41.0)**
Segment trading profit	**128.3**	**68.9**	**197.2**
Return on sales margin	*10.4%*	*12.3%*	*11.0%*
Amortisation of acquired intangible assets			**(12.9)**
Restructuring charges			**(15.3)**
GMP equalisation charge			**(4.5)**
Operating profit			**164.5**
Net finance costs			**(11.1)**
Share of post-tax profit of joint ventures			**2.8**
Profit before tax			**156.2**
Capital expenditure additions	**34.4**	**14.0**	**48.4**

	2017		
	Steel £m	Foundry £m	Continuing operations £m
Segment revenue	1,148.7	535.2	1,683.9
Segment EBITDA	128.9	80.3	209.2
Segment depreciation	(28.5)	(15.2)	(43.7)
Segment trading profit	100.4	65.1	165.5
Return on sales margin	*8.7%*	*12.2%*	*9.8%*
Amortisation of acquired intangible assets			(19.5)
Restructuring charges			(36.3)
Operating profit			109.7
Net finance costs			(13.9)
Share of post-tax profit of joint ventures			1.3
Profit before tax			97.1
Capital expenditure additions	34.0	10.3	44.3

Notes to the Group Financial Statements continued

5. Segment Information continued

5.4 Geographical analysis

	External revenue		Non-current assets	
	2018 £m	2017 £m	2018 £m	2017 £m
US	**291.6**	279.4	**297.0**	288.2
Germany	**227.0**	232.1	**109.6**	101.0
China	**146.3**	127.6	**90.7**	86.9
India	**129.9**	136.5	**41.6**	42.7
Brazil	**99.0**	90.5	**59.6**	65.1
UK	**72.3**	64.0	**99.9**	107.2
France	**59.9**	55.4	**30.3**	26.1
Spain	**52.6**	49.4	**32.4**	31.9
Rest of the world	**719.4**	649.0	**345.1**	355.6
Continuing operations	**1,798.0**	1,683.9	**1,106.2**	1,104.7

External revenue disclosed in the table above is based upon the geographical location of the operation. Non-current assets exclude employee benefits net surpluses and deferred tax assets. Information relating to the Group's products and services is given in the Strategic Report. The Group is not dependent on any single customer for its revenue and no single customer, for either of the years presented in the table above, accounts for more than 10% of the Group's total external revenue.

The Chief Operating Decision Maker does not review non-current assets at a segmental level so these disclosures are not included.

5.5 Revenue from contracts with customers

Performance obligations

The Group enters into contracts to provide one or multiple items to customers in the Global Steel and Foundry industries. Management applies judgement in determining the number of performance obligations that apply to each contract. Information about the Group's performance obligations is summarised below.

Where the Group provides consumable items only to the Global Steel and Foundry industries, one performance obligation is present. The performance obligation to deliver consumables to the customer is satisfied upon delivery of these items. Following the satisfaction of the performance obligation, an invoice is raised and payment is due within the timeframe as noted on the invoice. Revenue is recognised at a point in time.

The Group also enters into contracts with customers in the Global Steel industry to primarily provide consumable items to facilitate the steel production process. These contracts often include the supply of equipment and/or technical assistance. The Group applies judgement in determining the number of performance obligations in each contract and invoices are raised in accordance with contractual terms with payment due within the timeframe as noted on the invoice. Revenue is recognised at a point in time unless there are specific performance obligations to deliver other services. Revenue related to these other services may be recognised over time.

Revenue is also earned from the installation of product or equipment at customer sites. The Group applies judgement in determining the number of performance obligations in each contract and invoices are raised in accordance with contractual terms with payment due within the timeframe as noted on the invoice or as agreed on a payment schedule. Revenue is recognised over time by measuring the progress of completion of each performance obligation.

Of the £1,798.0m revenue reported in 2018, £11.0m (2017: £10.2m) relates to revenue recognised over time for contracts in the Steel industry.

Contract balances

The following table provides information about receivables, contract assets and contract liabilities from contracts with customers.

	2018 £m	2017 £m
Receivables, which are included in 'Trade and other receivables'	**372.7**	366.1
Contract assets, which are included in 'Trade and other receivables'	**0.8**	0.5
Contract liabilities, which are included in 'Trade and other payables'	**2.6**	1.9

Contract liabilities of £2.6m (2017: £1.9m) include advances received from a customer that precedes the satisfaction of performance obligations by the Group. The increase in contract liabilities in the year is attributed to an increase in the number of customers making advance payments and an overall increase in contract activity.

Where the period between the transfer of the promised goods or services to the customer and payment by the customer is less than one year, the Group does not adjust any of these transaction prices for the time value of money. Balances where the collection date is more than one year from the balance sheet date are adjusted for the time value of money.

The Group applies the practical expedient in paragraph 121 of IFRS 15 and does not disclose information about remaining performance obligations that have original expected durations of one year or less.

6. Operating profit

6.1 Operating profit is stated after charging

	2018 £m	2017 £m
Cost of inventories recognised as an expense (Note 19)	**677.4**	609.6
Research and development	**33.6**	33.2
Employee expenses (Note 8)	**414.3**	418.1
Depreciation (Note 15)	**41.0**	43.7
Amortisation (Note 16)	**12.9**	19.5
Operating lease charges (Note 30)	**20.9**	18.6

6.2 Amounts payable to PricewaterhouseCoopers LLP and their Associates

	2018 £m	2017 £m
Fees payable to the Company's auditors and their associates for the audit of the parent Company and Consolidated Financial Statements	**0.5**	0.4
Fees payable to the Company's auditors and their associates for other services:		
Audit of the Company's subsidiaries	**0.9**	0.8
Audit-related assurance services	**0.1**	0.1
Total auditors' remuneration	**1.5**	1.3

PricewaterhouseCoopers LLP was first appointed as the Group's external auditor for the year ended 31 December 2017.

Total auditors' remuneration of £1.5m in 2018 all related to continuing operations, of which £1.4m related to audit fees and £0.1m of non-audit fees, in respect of the interim review fee (2017: £1.3m, including £1.2m of audit fees and £0.1m of non-audit fees, the latter in respect of the interim review fee). After the reporting period end date, the Group incurred £0.3m in additional audit fees due for the 2017 year end audit.

Mazars LLP was appointed external auditor of the non-material entities within the Group for the year ended 31 December 2017. Total remuneration for the audit of the non-material entities was £0.5m (2017: £0.4m). This amount is not included in the table above.

It is the Group's policy not to use the Group's auditors for non-audit services other than in very limited circumstances and when they are best placed to do so.

7. Restructuring Charges

The 2018 restructuring charges were £15.3m and relate to the new programme first announced in March 2018. Restructuring charges in 2017 of £36.3m predominantly related to the Group-wide restructuring programme initiated in 2015. The charges reflect redundancy costs of £8.3m (2017: £22.8m), plant closure costs of £4.7m (2017: £0.5m), consultancy fees of £0.5m (2017: £6.8m), asset write-offs of £1.7m (2017: £5.5m) and travel of £0.1m (2017: £0.7m).

The net tax credit attributable to the total restructuring charges was £1.8m (2017: £4.3m).

Cash costs of £19.3m (2017: £27.3m) (Note 12) were incurred in the year in respect of the restructuring programme, leaving provisions made but unspent of £17.4m (Note 31) as at 31 December 2018 (2017: £22.9m), of which £4.3m (2017: £2.7m) relates to future costs in respect of leases expiring between one and six years.

Notes to the Group Financial Statements continued

8. Employees

8.1 Employee expenses

	2018 £m	2017 £m
Wages and salaries	**340.0**	344.0
Social security costs	**54.0**	52.2
Share-based payments (Note 28)	**3.7**	2.6
Pension costs — defined contribution pension plans (Note 27)	**11.4**	12.4
— defined benefit pension plans (Note 27)	**4.6**	6.6
Other post-retirement benefits (Note 27)	**0.6**	0.2
Total employee expenses	**414.3**	418.0

8.2 Monthly average number of employees

	2018 no.	2017 no.
Steel	**7,894**	7,868
Foundry	**3,126**	3,106
Continuing operations	**11,020**	10,974
Discontinued operations	**—**	—
Total monthly average number of employees	**11,020**	10,974

As at 31 December 2018, the Group had 10,809 employees (2017: 11,010).

8.3 Remuneration of key management personnel

The remuneration of the Directors, who are the key management personnel of the Group, is set out below in aggregate for each of the categories specified in IAS 24 Related Party Disclosures. Further information about the remuneration of individual Directors is provided in the audited part of the Directors' Remuneration Report on pages 108 to 115.

	2018 £m	2017 £m
Short-term employee benefits	**2.0**	1.9
Post-employment benefits	**0.2**	0.2
Share-based payments	**0.8**	0.7
Total remuneration of key management personnel	**3.0**	2.8

9. Net Finance Costs

	2018 £m	2017 £m
Interest payable on borrowings		
Loans and overdrafts	**14.5**	15.9
Obligations under finance leases	**0.2**	0.2
Amortisation of capitalised arrangement fees	**0.6**	0.6
Total interest payable on borrowings	**15.3**	16.7
Interest on net retirement benefit obligations	**0.1**	0.6
Adjustment to discounts on provisions and other liabilities	**1.3**	0.2
Adjustment to discounts on receivables	**(0.8)**	(0.1)
Finance income	**(4.8)**	(3.5)
Total net finance costs	**11.1**	13.9

10. Income Tax

10.1 Accounting policy

Tax expense represents the sum of current tax and deferred tax. Current and deferred tax are recognised in profit or loss except to the extent that they relate to items charged or credited in the Group Statement of Comprehensive Income or Group Statement of Changes in Equity, in which case the associated tax is also recognised in those statements.

In arriving at its current tax charge, the Group also makes careful assessment of the likely impact of tax law changes. In particular, it has considered the impact of US tax reform enacted in December 2017 in the US Tax Cuts and Jobs Act ('TCJA') and other recently announced tax reform, for example in Belgium.

Current tax

Current tax is based on taxable profit for the year. Taxable profit differs from profit before tax as reported in the Group Income Statement because it excludes items of income or expense that are taxable or deductible in other years and it further excludes items that are never taxable or deductible. The Group's liability for current tax is calculated using tax rates and laws that have been enacted, or substantively enacted, by the balance sheet date.

A provision is recognised when the Group considers it has a present tax obligation as the result of a past event and it is probable that the Group will be required to settle that obligation. Provisions established for such uncertain tax positions are made using a best estimate of the tax expected to be paid, based on a qualitative and quantitative assessment of all relevant information. Such a provision is typically required where the underlying tax issue is subject to interpretation and remains to be agreed, and therefore is uncertain as to outcome. Principally the uncertain tax positions for which a provision is made relate to the interpretation of tax legislation and guidance regarding transfer pricing arrangements that have been entered into in the normal course of business. In accordance with IAS 12, tax provisions are included as income tax payable on the face of the Group Balance Sheet, and movements in tax provisions are included within income tax charges or credits in the Group Income Statement.

In assessing any appropriate provision requirements for uncertain tax items, the Group considers progress made in discussions with the tax authorities, expert advice on the likely outcome and any recent developments in case law. Due to the uncertainty associated with such tax items, it is possible that at a future date, on conclusion of the open matters, the final outcome may vary significantly. Any such variations will affect the financial results in the year in which such a determination is made.

IFRIC 23 Uncertainty over Income Tax Treatments (effective from 1 January 2019, for the year ending 2019), clarifies how to recognise and measure deferred and current income tax assets and liabilities where there is uncertainty over tax treatment under IAS 12. The Group has assessed the potential impact on its Consolidated Financial Statements resulting from the application of IFRIC 23 and has concluded that it will not have a material impact on the amount of provisions held for uncertain tax positions as at 31 December 2018.

Deferred tax

Deferred tax is recognised on differences between the carrying amounts of assets and liabilities in the financial statements and the corresponding tax bases used in the computation of taxable profit and is accounted for using the balance sheet liability method. Deferred tax liabilities are generally recognised for all taxable temporary differences and deferred tax assets are recognised to the extent that it is probable that taxable profits will be available against which deductible temporary differences can be utilised. Such assets and liabilities are not recognised if the temporary difference arises from the initial recognition of goodwill or from the initial recognition (other than in a business combination) of other assets and liabilities in a transaction that affects neither the taxable profit nor the accounting profit. Deferred tax is calculated at the tax rates that are expected to apply in the period when the liability is settled or the asset is realised, based on tax rates and laws that have been enacted, or substantively enacted, by the balance sheet date.

Deferred tax liabilities are recognised for taxable temporary differences arising on investments in subsidiaries and interests in joint ventures, except where the Group is able to control the reversal of the temporary difference and it is probable that the temporary difference will not reverse in the foreseeable future. The carrying amount of deferred tax assets is reviewed at each balance sheet date and reduced to the extent that it is no longer probable that sufficient taxable profits will be available to allow all or part of the asset to be recovered. Deferred tax assets and liabilities are offset when there is a legally enforceable right to set off current tax assets against current tax liabilities and when they relate to income taxes levied by the same taxation authority and the Group intends to settle its current tax assets and liabilities on a net basis.

As explained in Note 2.5, following a period of sustained profitability of the Group's US business, the Board has decided to substantially increase the amount reflected on the Group's Balance Sheet in respect of the previously unrecognised value of US tax losses and other temporary differences. Of the total additional recognition of £39.5m, £32.2m has been reflected in the separately reported items in the Group Income Statement in accordance with the disclosure approach outlined in Note 2.5 above. £7.3m has been reflected in the Group Statement of Comprehensive Income as it relates to deferred tax on pensions costs taken through that statement.

Notes to the Group Financial Statements continued

10. Income Tax continued

10.1 *Accounting policy continued*

Deferred tax continued

In light of the fact that the tax value of the US tax losses and other temporary differences is now substantially recognised on the Group's balance sheet, the Board has decided that it is now more appropriate to reflect the utilisation of the deferred tax assets recognised in the Group Income Statement, and which offset the Group's US taxable headline profits, as part of the Group's headline tax charge, rather than as part of the tax charge on separately reported items in the Group Income Statement, as was the case in previous years. This has increased the headline tax charge in 2018 by £7.8m, increasing the effective rate of tax on headline profit before tax and before the Group's share of post-tax profits from joint ventures by 4.2%.

Utilisation of the deferred tax assets recognised in the Group Statement of Comprehensive Income will continue to be reflected in that statement, as was previously the case.

10.2 Income tax charge

	2018 £m	2017 £m
Current tax		
Overseas taxation	**41.9**	37.1
Adjustments in respect of prior years	**(3.0)**	(1.7)
Total current tax, continuing operations	**38.9**	35.4
Deferred tax		
Origination and reversal of temporary taxable differences	**(28.6)**	19.0
Adjustments in respect of prior years	**1.3**	—
Total deferred tax, continuing operations	**(27.3)**	19.0
Total income tax charge	**11.6**	54.4
Total income tax charge attributable to:		
Continuing operations —headline performance	**48.4**	36.4
—separately reported	**(36.8)**	18.0
Total income tax charge	**11.6**	54.4

Included in the Group's total income tax charge are charges and credits meeting the criteria set out in Note 2.5, to be treated as *separately reported items, as analysed in the following table:*

Separately reported items	2018 £m	2017 £m
Impact of US tax reform	—	24.5
Other utilisation of previously recognised US deferred tax asset	—	4.2
Additional recognition of US deferred tax asset	**(32.2)**	(0.4)
Net movement in US deferred tax asset	**(32.2)**	28.3
Restructuring charges	**(1.8)**	(4.3)
Gain on employee benefit plan	—	—
Amortisation and utilisation of acquired intangibles	**(2.8)**	(6.0)
Total tax charge/(credit) separately reported	**(36.8)**	18.0

As explained in Note 10.1 above, the Group has substantially increased the deferred tax recognised on its balance sheet in respect of its US tax losses and other temporary differences. The substantial part of that additional recognition is reflected in separately reported items in the Group Income Statement, the rest being reflected in the Group Statement of Comprehensive Income (relating to pension costs reflected in that statement). In addition, the Group now presents the normal utilisation of that asset in offsetting the Group's US taxable headline profits as part of its headline tax charge, to the extent it does not relate to deferred tax which was initially recognised in the Group Statement of Comprehensive Income.

The US Tax Cuts and Jobs Act ('TCJA') enacted in the US in December 2017 had a material impact on the value of the deferred tax asset the Group recognised in the US as at December 2017. It reduced the asset by £25.7m, of which £24.5m was charged to the Group Income Statement and £1.2m was charged to the Group Statement of Comprehensive Income, as it related to the effect of the change in the US Federal rate of tax on the value of the deferred tax asset on pension deficits recognised in that statement. The reduction was principally due to the change in Federal tax rate from 35% to 21%, the deemed repatriation tolling charge and the impact of other changes when measuring the value of the asset which was recognised in the Group Balance Sheet.

TCJA also introduced additional provisions which extended US taxing rights over the profits of non-US entities owned by US companies (so-called Global Intangible Low-Taxed Income ('GILTI')). Vesuvius' US companies own interests in non-US Vesuvius subsidiaries, and therefore have been impacted by these new rules. The impact of the GILTI provisions on Vesuvius in 2018 has been to increase the headline tax charge by £2.4m in 2018, increasing the effective rate of tax on headline profit before tax and before the Group's share of post-tax profits from joint ventures by 1.3%.

Further clarifications governing the operation of the TCJA have been issued throughout 2018, Vesuvius has adjusted its US provisions and deferred tax calculations to reflect those clarifications as it is best able, assisted by advisers. Management will continue to review and monitor these rules and any future clarifications.

In 2017, Belgium reduced its prospective tax rate to 29% in 2018 and 25% in 2020. This had the impact of reducing the deferred tax asset in Belgium by £1.4m in 2017. This impact was included in the total deferred tax charge on continuing operations.

The net tax credit reflected in the Group Statement of Comprehensive Income in the year amounted to £6.0m (2017: £3.1m charge), comprising a credit of £7.3m (2017: £nil) for additional recognition of US pension deferred tax asset and a £1.3m charge (2017: £2.4m charge) related to tax on net actuarial gains and losses on the employee benefits plan. In addition, £nil (2017: £0.7m charge) related to UK tax in respect of foreign exchange differences arising on hedged positions.

The Group operates in a number of countries that have differing tax rates, laws and practices. Changes in any of these areas could, adversely or positively, impact the Group's tax charge in the future. Continuing losses, or insufficiency of taxable profit to absorb all expenses, in any subsidiary, could have the effect of increasing tax charges in the future as effective tax relief may not be available for those losses or expenses. Other significant factors affecting the tax charge are described in Notes 2.5, 3.2, 10.1 and 10.6.

10.3 Reconciliation of income tax charge to profit before tax

	2018 £m	2017 £m
Profit before tax	**156.2**	97.1
Tax at the UK corporation tax rate of 19.0% (2017: 19.25%)	**29.7**	18.7
Impact of tax rate change on deferred tax asset	—	19.5
Overseas tax rate differences	**11.1**	9.8
Withholding taxes	**5.0**	4.4
Amortisation of intangibles	**(0.3)**	(0.2)
Expenses not deductible for tax purposes	**1.3**	0.2
Income taxed in advance	**2.4**	3.6
Deferred tax asset not previously recognised – US	**(32.2)**	—
Deferred tax asset not previously recognised – Other	**(1.2)**	(1.4)
Deferred tax assets not recognised	—	3.5
Utilisation of previously unrecognised tax losses	**(2.5)**	(2.0)
Adjustments in respect of prior years	**(1.7)**	(1.7)
Total income tax charge	**11.6**	54.4

10.4 Deferred tax

	Interest £m	Other operating losses £m	Pension costs £m	Intangible assets £m	Other temporary differences £m	Total £m
As at 1 January 2017	26.7	29.9	2.5	(29.3)	13.7	43.5
Exchange adjustments/other	(1.8)	(1.8)	—	0.2	(0.4)	(3.8)
Impact of tax rate change:						
— in Group Income Statement	(6.8)	(8.6)	(0.8)	—	(3.3)	(19.5)
— in Group Statement of Comprehensive Income	—	—	(1.2)	—	—	(1.2)
Other net (charge)/credit charge to Group Statement of Comprehensive Income	—	—	(1.2)	—	—	(1.2)
Other net (charge)/credit to Group Income Statement	—	0.6	0.1	6.2	3.8	10.7
Other net (charge)/credit to Group Income Statement US	(8.2)	(3.0)	0.6	(0.2)	0.6	(10.2)
As at 1 January 2018	**9.9**	**17.1**	—	**(23.1)**	**14.4**	**18.3**
Exchange adjustments/other	**1.6**	**1.0**	**0.5**	**(0.1)**	**1.2**	**4.2**
Other net (charge)/credit charge to Group Statement of Comprehensive Income	—	—	**6.0**	—	—	**6.0**
Other net (charge)/credit to Group Income Statement	—	**1.0**	**0.3**	**2.8**	**(1.1)**	**3.0**
Other net (charge)/credit to Group Income Statement US	**23.2**	**0.4**	**(3.4)**	**(1.5)**	**5.6**	**24.3**
As at 31 December 2018	**34.7**	**19.5**	**3.4**	**(21.9)**	**20.1**	**55.8**

Notes to the Group Financial Statements continued

10. Income Tax continued

10.4 Deferred tax continued

	2018 £m	2017 £m
Recognised in the Group Balance Sheet as:		
Non-current deferred tax assets	**94.5**	61.0
Non-current deferred tax liabilities	**(38.7)**	(42.7)
Net total deferred tax assets	**55.8**	18.3

Included in these deferred tax assets and liabilities are amounts to be expected to be utilised in 2019 as follows:

	2018 £m	2017 £m
Deferred tax assets	**14.7**	11.3
Deferred tax liabilities	**(2.8)**	(7.6)

Included in non-current deferred tax assets is £67.3m (2017: £32.6m) in respect of the partial recognition of temporary differences arising in the US computed in accordance with the policy set out in Note 10.1 above. The Group remains confident of the recovery of this asset. £18.7m (2017: £69.2m) remains unrecognised.

As explained in Note 2.5, significant movement in the Group's US deferred tax assets as a result of US tax reform in 2017 and as a result of the substantial recognition in 2018 due to the Group's US future profit profile is reflected in the separately reported items column in the Group Income Statement. Where such movement relates to items such as certain pension costs which have been reflected in the Group Statement of Comprehensive Income, the movement will be reflected in that statement. Normal utilisation of these deferred tax balances recognised in the Group Income Statement is now reflected in the Group's headline tax charge.

The Directors consider that the separate identification of deferred tax for material temporary differences in this manner assists both in a better understanding of the financial performance achieved, and in making projections of future results of the Group.

Tax loss carry-forwards and other temporary differences with a tax value of £nil (2017: £1.0m) were recognised by subsidiaries reporting a loss. Based on approved business plans of these subsidiaries, the Directors consider it probable that the tax loss carry-forwards and temporary differences can be offset against future taxable profits.

The total deferred tax assets not recognised as at 31 December 2018 were £166.9m (2017: £219.9m), as analysed below. In accordance with the accounting policy in Note 10.1, these items have not been recognised as deferred tax assets on the basis that their future economic benefit is not probable. In total, there was a decrease of £53.0m (2017: £43.2m) in net unrecognised deferred tax assets during the year, principally due to the impact of the substantial increase in the amount of the Group's US deferred tax asset recognised on the Group's balance sheet.

	2018 £m	2017 £m
Operating losses (further described below)	**97.1**	102.3
Unrelieved US interest (may be carried forward indefinitely)	**11.9**	43.2
Capital losses available to offset future UK capital gains (may be carried forward indefinitely)	**28.1**	28.1
UK ACT credits (may be carried forward indefinitely)	**13.1**	13.1
US tax credits	**6.8**	16.7
Other temporary differences	**9.9**	16.5
Total deferred tax assets not recognised	**166.9**	219.9

The Group has significant net operating losses with a tax value of £116.6m (2017: £119.4m), only £19.5m (2017: £17.1m) of which meet the criteria set out in Note 10.1 to be recognised on the Group Balance Sheet.

	Operating losses recognised 2018 £m	Operating losses not recognised 2018 £m	Total 2018 £m	Operating losses recognised 2017 £m	Operating losses not recognised 2017 £m	Total 2017 £m
UK (may be carried forward indefinitely)	**—**	**74.6**	**74.6**	—	73.5	73.5
US (due to expire 2024-2031)	**14.5**	**—**	**14.5**	13.3	3.7	17.0
ROW (may be carried forward indefinitely)	**4.9**	**20.8**	**25.7**	3.5	21.5	25.0
ROW (due to expire within 5 years)	**0.1**	**1.7**	**1.8**	0.3	3.6	3.9
	19.5	**97.1**	**116.6**	17.1	102.3	119.4

The £27.5m (2017: £28.9m) operating losses available to set against future income in the rest of the world arise in a number of countries, reflecting the spread of the Group's operations.

As at 31 December 2018, the Group had unrecognised US tax credits with a value of £6.8m (2017: £16.7m) as follows:

	2018 £m	2017 £m
US research and experimentation credits (due to expire 2018–2033)	—	12.8
US foreign tax credits (due to expire 2022–2024)	6.8	3.9
US tax credits	6.8	16.7

There are no temporary differences associated with investments in subsidiaries and interests in joint ventures for which deferred tax liabilities have not been recognised. The aggregate temporary differences where the exemption not to provide for the deferred taxation liability has been taken is £235.1m (2017: £197.1m).

UK corporation tax rate reductions to 17% from 1 April 2020 were enacted in 2016. Accordingly, the Group's closing UK deferred tax liability has been provided using a tax rate of 17% except where the reversals are expected to arise prior to 1 April 2020.

10.5 Income tax payable and recoverable

	2018 £m	2017 £m
Liabilities for income tax payable	9.1	11.1
Provisions for uncertain tax positions	20.2	23.2
	29.3	34.3
Income tax recoverable within one year	2.8	5.2
Income tax recoverable after more than one year	—	0.4
Total income tax recoverable	2.8	5.6
Net liability	26.5	28.7

Provisions for uncertain tax positions are calculated in accordance with the policy outlined in Note 10.1, and are treated as income tax payable in accordance with IAS 12.

These provisions cover litigated tax matters as well as provisions for other risks where the Group believes it is more likely than not that there would be a successful challenge by a tax authority to positions it has taken in its tax filings. By its nature, litigation can result in sharp fluctuations in cash flow, both in and out, relating to taxes. Currently, management do not expect any material adjustments to these provisions in 2019.

10.6 Key factors impacting the sustainability of the effective tax rate are as follows:

Material changes in the geographic mix of profits

The Group's effective tax rate is sensitive to changes in the geographic mix of profits and level of profits, and reflects a combination of relatively higher rates in certain jurisdictions such as India, Mexico, Germany and Belgium, nil effective tax rate in the UK due to the availability of unutilised tax losses, and rates that lie somewhere in between.

Changes in tax rates, tax reform and its interpretation

Changes in tax rates and laws in the jurisdictions in which the Group operates could have a material effect on the Group's effective tax rate.

It was previously reported that the Base Erosion and Anti-Abuse Tax ('BEAT') introduced by the US Tax Cuts and Jobs Act ('TCJA') in December 2017 was estimated to result in a US cash tax cost from 2018 onwards and thus increase the Group's effective rate of tax on Headline performance (before its share of joint venture income) going forward by 0.7% in 2018, and 1.2% in 2019. Following clarification by the US Treasury in late 2018, management do not expect BEAT to have a material impact on Vesuvius' tax position. However, TCJA also introduced additional provisions which extended US taxing rights over the profits of non-US entities owned by US companies (so-called Global Intangible Low-Taxed Income ('GILTI')). Vesuvius' US companies own interests in non-US Vesuvius subsidiaries, and therefore will continue to be impacted by these new rules. Further clarifications governing the operation of the TCJA have been issued throughout 2018. Vesuvius has adjusted its US provisions and deferred tax calculations to reflect those clarifications as it is best able, assisted by advisers. Management will continue to review and monitor these rules and any future clarifications.

Availability of tax advantaged rates

Vesuvius in China qualifies for a tax advantaged rate of 15% (rather than the headline rate of 25%), on part of its profits due to the high technology nature of its business. Eligibility for this rate is reviewed on a regular basis by the Chinese tax authority and was worth approximately £1.6m in 2018 (2017: £0.9m). Without that benefit, the Group's effective tax rate on headline performance would have been 1.0% higher in 2018 (2017: 0.6%).

Notes to the Group Financial Statements continued

10. Income Tax continued

10.6 Key factors impacting the sustainability of the effective tax rate are as follows: continued

Resolution of tax judgements

At any one time, the Group can be subject to a number of challenges by tax authorities in the jurisdictions in which it operates. The outcome of these challenges is inherently uncertain, potentially resulting in a different tax charge from the amounts initially provided.

Impact of Brexit on Vesuvius' tax position

How Brexit impacts on the corporate income taxes position of Vesuvius will depend on the final terms of Brexit. It is not possible at this stage to provide precise guidance on how it will impact the Group as these exit terms remain unclear. Nevertheless, if the EU Parent Subsidiary and Interest and Royalty directives were no longer to apply to dividend, interest and other payments to Vesuvius in the UK, additional withholding taxes would become payable subject to reliefs available under applicable tax treaties.

11. Earnings per Share (EPS)

11.1 Earnings for EPS

Basic and diluted EPS from continuing operations are based upon the profit attributable to owners of the parent, as reported in the Group Income Statement, of £137.8m (2017: £36.3m), being the profit for the year of £144.6m (2017: £42.7m) less non-controlling interests of £6.8m (2017: £6.4m); basic and diluted EPS from total operations are based on the profit attributable to owners of the parent of £138.3m (2017: £38.0m); headline and diluted headline EPS are based upon headline profit from continuing operations attributable to owners of the parent of £133.7m (2017: £110.1m). The table below reconciles these different profit measures.

	Continuing operations £m	Discontinued operations £m	2018 total £m	Continuing operations £m	Discontinued operations £m	2017 total £m
Profit attributable to owners of the parent	**137.8**	**0.5**	**138.3**	36.3	1.7	38.0
Adjustments for separately reported items:						
Amortisation of acquired intangible assets	**12.9**			19.5		
Restructuring charges	**15.3**			36.3		
GMP equalisation charge	**4.5**			—		
Income tax (credit)/charge	**(36.8)**			18.0		
Headline profit attributable to owners of the parent	**133.7**			110.1		

11.2 Weighted average number of shares

	2018 millions	2017 millions
For calculating basic and headline EPS	**269.8**	270.3
Adjustment for potentially dilutive ordinary shares	**1.4**	1.3
For calculating diluted and diluted headline EPS	**271.2**	271.6

For the purposes of calculating diluted and diluted headline EPS, the weighted average number of ordinary shares is adjusted to include the weighted average number of ordinary shares that would be issued on the conversion of all potentially dilutive ordinary shares expected to vest, relating to the Company's share-based payment plans. Potential ordinary shares are only treated as dilutive when their conversion to ordinary shares would decrease EPS, or increase loss per share.

11.3 Per share amounts

		Continuing operations pence	Discontinued operations pence	2018 total pence	Continuing operations pence	Discontinued operations pence	2017 total pence
Earnings per share	**— basic**	**51.1**	**0.2**	**51.3**	13.4	0.7	14.1
	— headline	**49.6**			40.7		
	— diluted	**50.8**	**0.2**	**51.0**	13.4	0.6	14.0
	— diluted headline	**49.3**			40.5		

12. Cash Generated from Operations

	Continuing operations £m	Discontinued operations £m	2018 total £m	Continuing operations £m	Discontinued operations £m	2017 total £m
Operating profit	164.5	0.5	165.0	109.7	1.7	111.4
Adjustments for:						
Amortisation of acquired intangible assets (Note 16)	12.9	—	12.9	19.5	—	19.5
Restructuring charges	15.3	—	15.3	36.3	—	36.3
GMP equalisation charge	4.5	—	4.5	—	—	—
Depreciation	41.0	—	41.0	43.7	—	43.7
EBITDA (Note 4.12)	238.2	0.5	238.7	209.2	1.7	210.9
Net increase in inventories	(20.7)	—	(20.7)	(19.4)	—	(19.4)
Net increase in trade receivables	(4.9)	—	(4.9)	(36.9)	—	(36.9)
Net increase in trade payables	3.6	—	3.6	44.1	—	44.1
Net decrease/(increase) in other working capital	1.8	(0.6)	1.2	11.7	(2.5)	9.2
Outflow related to restructuring charges	(19.3)	—	(19.3)	(27.3)	—	(27.3)
Net retirement benefit obligations	(3.4)	—	(3.4)	(4.8)	—	(4.8)
Cash generated from operations	195.3	(0.1)	195.2	176.6	(0.8)	175.8

13. Cash and Cash Equivalents

	2018 £m	2017 £m
Cash at bank and in hand	236.9	161.9
Cash and short-term deposits	236.9	161.9
Bank overdrafts	(23.5)	(21.9)
Cash and cash equivalents in the Group Statement of Cash Flows	213.4	140.0

Bank overdrafts that are repayable on demand and form an integral part of the Group's cash management are included as a component of cash and cash equivalents for the purpose of the Group Statement of Cash Flows.

14. Reconciliation of Movement in Net Debt

	Balance as at 1 Jan 2018 £m	Foreign exchange adjustments £m	Non-cash movements £m	Cash flow £m	Balance as at 31 Dec 2018 £m
Cash and cash equivalents					
Cash at bank and in hand	161.9	0.5	—	74.5	236.9
Bank overdrafts	(21.9)	(0.4)	—	(1.2)	(23.5)
	140.0	0.1	—	73.3	213.4
Borrowings, excluding bank overdrafts					
Current	(4.3)	—	—	(2.2)	(6.5)
Non-current	(412.1)	(14.4)	—	(30.2)	(456.7)
	(416.4)	(14.4)	—	(32.4)	(463.2)
Capitalised arrangement fees	2.1	—	0.6	(0.9)	1.8
Net debt	(274.3)	(14.3)	0.6	40.0	(248.0)

Net debt is a measure of the Group's net indebtedness to banks and other external financial institutions and comprises the total of cash and short-term deposits and current and non-current interest-bearing borrowings.

15. Property, Plant and Equipment

15.1 Accounting policy

Freehold land and construction in progress are carried at cost less accumulated impairment losses. Other items of property, plant and equipment are carried at cost less accumulated depreciation and accumulated impairment losses. Costs are capitalised only when it is probable that they will result in future economic benefits flowing to the Group and when they can be measured reliably. Costs are capitalised to construction in progress where an asset is being developed. This is then transferred and depreciated when the asset is ready for use. All other repairs and maintenance expenditures are charged to the Group Income Statement in the period in which they are incurred.

Notes to the Group Financial Statements continued

15. Property, Plant and Equipment continued

15.1 Accounting policy continued

Freehold land is not depreciated, as it has an infinite life. Depreciation on other items of property, plant and equipment begins when the asset is available for use and is charged to the Group Income Statement on a straight-line basis so as to write off the cost less residual value of the asset over its estimated useful life as follows:

Asset category		Estimated useful life
Freehold property		between ten and 50 years
Leasehold property		the term of the lease
Plant and equipment	— motor vehicles and information technology equipment	between one and five years
	— other	between three and 15 years

The depreciation method used, residual values and estimated useful lives are reviewed annually and changed, if appropriate. As described in Note 17.1, an asset's carrying amount is immediately written down to its recoverable amount if its carrying amount is greater than its estimated recoverable amount. Gains and losses arising on disposals are determined by comparing sales proceeds with carrying amount and are recognised in the Group Income Statement.

15.2 Movement in net book value

	Freehold property £m	Leasehold property £m	Plant and equipment £m	Construction in progress £m	Total £m
Cost					
As at 1 January 2017	203.3	2.4	550.0	35.7	791.4
Exchange adjustments	(3.4)	(0.1)	(10.3)	(2.1)	(15.9)
Capital expenditure additions	1.4	—	19.4	23.5	44.3
Disposals	(5.1)	—	(13.5)	—	(18.6)
Reclassifications	5.5	—	9.8	(15.3)	—
As at 1 January 2018	**201.7**	**2.3**	**555.4**	**41.8**	**801.2**
Exchange adjustments	**3.4**	**(0.1)**	**4.9**	**(1.1)**	**7.1**
Capital expenditure additions	**2.0**	**0.1**	**20.2**	**26.1**	**48.4**
Disposals	**(1.2)**	—	**(24.8)**	—	**(26.0)**
Assets classified as held for sale	**(1.7)**	—	—	—	**(1.7)**
Reclassifications	**4.4**	—	**16.4**	**(20.8)**	—
As at 31 December 2018	**208.6**	**2.3**	**572.1**	**46.0**	**829.0**
Accumulated depreciation and impairment losses					
As at 1 January 2017	82.9	1.6	383.3	—	467.8
Exchange adjustments	(2.0)	(0.1)	(7.7)	—	(9.8)
Depreciation charge	6.1	0.3	37.3	—	43.7
Disposals	(1.8)	—	(10.0)	—	(11.8)
Reclassifications	0.3	—	(0.3)	—	—
As at 1 January 2018	**85.5**	**1.8**	**402.6**	—	**489.9**
Exchange adjustments	**1.9**	—	**4.2**	—	**6.1**
Depreciation charge	**5.9**	**0.1**	**35.0**	—	**41.0**
Impairment	**0.3**	—	**0.3**	—	**0.6**
Disposals	**(0.6)**	—	**(21.9)**	—	**(22.5)**
Reclassifications	**(0.1)**	**(0.2)**	**0.3**	—	—
As at 31 December 2018	**92.9**	**1.7**	**420.5**	—	**515.1**
Net book value as at 31 December 2018	**115.7**	**0.6**	**151.6**	**46.0**	**313.9**
Net book value as at 31 December 2017	116.2	0.5	152.8	41.8	311.3
Net book value as at 1 January 2017	120.4	0.8	166.7	35.7	323.6

The net book value of the Group's property, plant and equipment assets held under finance lease contracts was £4.4m (2017: £4.6m). Capital expenditure on customer-installation assets was £7.7m (2017: £10.7m).

16. Intangible Assets

Intangible assets comprise goodwill and other intangible assets that have been acquired through business combinations.

16.1 Accounting policy

(a) Goodwill

Goodwill arising in a business combination is initially recognised as an asset at cost, measured as the excess of the aggregate of the acquisition-date fair value of the consideration transferred and the amount of any non-controlling interest acquired over the net of the acquisition-date fair value amounts of the identifiable assets acquired and liabilities assumed. When the excess is negative, a bargain purchase gain is recognised immediately in profit or loss. Goodwill is subsequently measured at cost less accumulated impairment losses, with impairment testing carried out annually, or more frequently when there is an indication that the cash-generating unit to which the goodwill has been allocated may be impaired. On disposal of a business, the attributable amount of goodwill is included in the calculation of the profit or loss on disposal.

(b) Other intangible assets

Intangible assets other than goodwill are recognised on business combinations if they are separable, or if they arise from contractual or other legal rights, and their value can be measured reliably. They are initially measured at cost, which is equal to the acquisition-date fair value, and subsequently measured at cost less accumulated amortisation charges and accumulated impairment losses. Other intangible assets are subject to impairment testing when there is an indication that an impairment loss may have been incurred and are amortised over their estimated useful lives.

(c) Research and development costs

The Group's research activity involves long-range, 'blue sky' investigation, the findings from which may be used in the future to develop new or substantially improved products. Expenditure on research activities is recognised in the Group Income Statement as an expense in the year in which it is incurred.

Development is the application of research findings for the production of new or substantially improved products, processes and services before the start of commercial production. Development expenditure is capitalised only if the expenditure can be measured reliably, the product or process is technically and commercially feasible, future economic benefits are probable and the Group intends to and has sufficient resources to complete development and to use or sell the asset. Otherwise, it is recognised in the Group Income Statement as an expense in the year in which it is incurred. Capitalised development expenditure, where there is any, is stated at cost less accumulated amortisation and impairment losses.

In determining whether development expenditure is capitalised as an intangible asset, management considers whether the strict intangible asset recognition criteria set out in IAS 38, Intangible Assets, have been met at the time the expenditure is incurred. In making this determination, management recognise that a significant amount of the development expenditure undertaken by the Group is focused on dealing with local customer technical support issues and incremental developments to existing products as opposed to new or substantially improved products, and that at the time the feasibility of the project is determined a significant proportion of the development expenditure for that project has already been incurred. In 2018 and 2017 no projects met the criteria for IAS 38 capitalisation.

16.2 Movement in net book value

	Goodwill £m	Other intangible assets £m	2018 total £m	Goodwill £m	Other intangible assets £m	2017 total £m
Cost						
As at 1 January	**643.2**	**271.2**	**914.4**	662.2	271.9	934.1
Exchange adjustments	**11.3**	**0.3**	**11.6**	(19.3)	(0.7)	(20.0)
Business combinations (Note 20)	**—**	**—**	**—**	0.3	—	0.3
As at 31 December	**654.5**	**271.5**	**926.0**	643.2	271.2	914.4
Accumulated amortisation and impairment losses						
As at 1 January	**—**	**171.4**	**171.4**	—	152.2	152.2
Exchange adjustments	**—**	**0.3**	**0.3**	—	(0.3)	(0.3)
Amortisation charge for the year	**—**	**12.9**	**12.9**	—	19.5	19.5
As at 31 December	**—**	**184.6**	**184.6**	—	171.4	171.4
Net book value as at 31 December	**654.5**	**86.9**	**741.4**	643.2	99.8	743.0

Notes to the Group Financial Statements continued

16. *Intangible Assets continued*

16.3 Analysis of goodwill by cash-generating unit (CGU)

Goodwill acquired in a business combination is allocated to each of the Group's CGUs expected to benefit from the synergies of the combination. For the purposes of impairment testing, the Directors consider that the Group has two CGUs: The Steel division and the Foundry division. These CGUs represent the lowest level within the Group at which goodwill is monitored.

	2018 £m	2017 £m
Steel	**433.5**	426.3
Foundry	**221.0**	216.9
Total goodwill	**654.5**	643.2

16.4 Analysis of other intangible assets

Other intangible assets are amortised on a straight-line basis over their estimated useful lives. The assets acquired and their remaining useful lives are shown below.

	Remaining useful life years	Net book value as at 31 Dec 2018 £m	Net book value as at 31 Dec 2017 £m
Foseco			
— customer relationships (useful life: 20 years)	9.3	**53.4**	58.9
— trade name (useful life: 20 years)	9.3	**33.5**	37.1
— intellectual property rights (useful life: ten years)	—	**—**	2.0
Mould and tundish business of Carboox			
— customer relationships (useful life: two years)	—	**—**	1.7
— trade name (useful life: two years)	—	**—**	0.1
Total		**86.9**	99.8

17. Impairment of Tangible and Intangible Assets

17.1 Accounting policy

The Directors regularly review the performance of the business and the external business environment to determine whether there is any indication that the Group's tangible and intangible assets have suffered an impairment loss. If such indication exists, the higher of the value in use and the fair value less costs to sell off the asset is estimated and compared with the carrying value in order to determine the extent, if any, of the impairment loss. Where it is not feasible to estimate the recoverable amount of an individual asset, the Directors estimate the recoverable amount of the CGU to which the asset belongs. In addition, goodwill is tested for impairment on an annual basis. Goodwill acquired in a business combination is allocated to each of the Group's CGUs expected to benefit from the synergies of the combination and the Directors carry out annual impairment testing of the carrying value of each CGU, to assess the need for any impairment of the carrying value of the associated goodwill and other intangible and tangible assets.

For the purpose of impairment testing, the recoverable amount of an asset or CGU is the higher of (i) its fair value less costs to sell and (ii) its value in use. If the recoverable amount of a CGU is less than its carrying amount, the resulting impairment loss is allocated first to reduce the carrying amount of any goodwill allocated to the CGU and then to the other assets of the CGU pro rata on the basis of the carrying amount of each asset in the CGU. An impairment loss recognised for goodwill is not reversed in a subsequent period. An impairment loss recognised in a prior year for an asset other than goodwill may be reversed where there has been a change in the estimates used to measure the asset's recoverable amount since the impairment loss was recognised.

17.2 Key assumptions and methodology

The key assumptions in determining value in use are projected cash flows, growth rates and discount rates.

Projected cash flows for the next three years have been based on the latest Board approved budget and Group Strategy plan. They reflect management's expectations of revenue, EBITDA growth, capital expenditure, working capital and operating cash flows, based on past experience and future expectations of business performance. Cash flows beyond the Group Strategy plan have been extrapolated using a perpetuity growth rate of 2.5% (2017: 2.5%). The growth rate has been calculated using GDP growth forecasts published by the International Monetary Fund for the Group's end-markets. These GDP growth forecasts have been weighted to reflect the Group's weighted average sales in each end-market during 2018.

The cash flows have been discounted to their current value using pre-tax discount rates, which represent each CGU's weighted average cost of capital (WACC). The assumptions used in the calculation of the WACC for each CGU have been benchmarked to externally available data. These are industry-specific beta coefficients, risk-free rates and equity risk premiums. The pre-tax discount rate used for the Steel CGU was 13.3% (2017: 11.0%) and for the Foundry CGU was 12.5% (2017: 11.6%). The increases in both the Steel and Foundry pre-tax discount rates have primarily been driven by increased beta coefficients, which represent the theoretical volatility of the global Steel and Foundry markets – these changes are not specific to Vesuvius.

The Group carried out its annual goodwill impairment test as at 31 October 2018. The recoverable amount of each CGU significantly exceeded its carrying value, therefore no impairment charges have been recognised. The recoverable amount of each CGU was also checked against its carrying value as at 31 December 2018, no impairment triggers were identified.

There is significant headroom in both the Steel CGU and the Foundry CGU. No reasonably possible changes in the key assumptions would cause the carrying amount of the CGUs to exceed the recoverable amount. A sensitivity analysis was carried out in which the pre-tax discount rate used for each CGU was increased by 3.0% and the perpetuity growth rate was reduced to 0.5%. The recoverable amount of each CGU still significantly exceeded its carrying value. A significant increase in the pre-tax discount rate and decrease in the perpetuity growth rate beyond the scope considered above would need to occur simultaneously to result in impairment. In conclusion, the probability of future impairment remains low.

18. Trade and Other Receivables

18.1 Accounting policy

Trade and other receivables are initially recognised at fair value and subsequently measured at amortised cost, using the effective interest method, less impairment losses.

18.2 Analysis of trade and other receivables

	2018				2017			
	Gross £m	ECL Provision £m	Net £m	ECL Provision Coverage (1)	Gross £m	ECL Provision £m	Net £m	ECL Provision Coverage (1)
Trade receivables — current	**275.2**	**(0.7)**	**274.5**	*0.3%*	269.0	(0.7)	268.3	*0.3%*
— 1 to 30 days past due	**60.5**	**(0.7)**	**59.8**	*1.2%*	59.0	(0.8)	58.2	*1.3%*
— 31 to 60 days past due	**19.4**	**(0.1)**	**19.3**	*0.5%*	18.4	(0.3)	18.1	*1.6%*
— 61 to 90 days past due	**8.9**	**(0.6)**	**8.3**	*6.7%*	8.2	(0.5)	7.7	*6.1%*
— over 90 days past due	**36.9**	**(26.1)**	**10.8**	*70.6%*	43.2	(29.4)	13.8	*68.1%*
Trade receivables	**400.9**	**(28.2)**	**372.7**		397.8	(31.7)	366.1	
Other receivables			**48.1**				40.8	
Prepayments			**19.6**				15.3	
Total trade and other receivables			**440.4**				422.2	

(1) ECL provision coverage is ECL provision divided by gross trade receivables.

The maximum exposure to credit risk at the end of the reporting period is the net carrying amount of these trade and other receivables.

18.3 Impairment of trade and other receivables

Details relating to the impairment of trade receivables are disclosed in Note 26, 'Financial Risk Management'.

19. Inventories

19.1 Accounting policy

Inventories are stated at the lower of cost (using the first in, first out method) and net realisable value. Cost comprises expenditure incurred in purchasing or manufacturing inventories together with all other costs directly incurred in bringing the inventory to its present location and condition and, where appropriate, attributable production overheads based on normal activity levels. Net realisable value represents the estimated selling price less all estimated costs of completion and costs to be incurred in marketing, selling and distribution. The amount of any write-down of inventories to net realisable value is recognised as an expense in the year in which the write-down occurs.

19.2 Analysis of inventories

	2018 £m	2017 £m
Raw materials	**84.2**	80.2
Work-in-progress	**19.8**	20.2
Finished goods	**140.3**	122.4
Total inventories	**244.3**	222.8

The cost of inventories recognised as an expense and included in manufacturing costs of continuing operations in the Group Income Statement during the year was £677.4m (2017: £609.6m).

The net inventories of £244.3m include a provision for obsolete stock of £14.2m (2017: £13.9m) and inventory write-downs from cost to net realisable value of £2.6m (2017: £1.7m).

Notes to the Group Financial Statements continued

20. Acquisition and Disposals of Subsidiaries and Joint Ventures, Net of Cash Acquired

The Group did not acquire any material interests in any companies during the year ended 31 December 2018. Contingent consideration of £1.1m was paid during the year in respect of the previous acquisition of Process Metrix.

As part of the Group's restructuring initiatives in North America, the Group divested the assets of its BMI refractory installation business in October 2018.

21. Discontinued Operations

Discontinued operations income during 2018 of £0.5m (2017: £1.7m) related to a release of provisions no longer required.

21.1 Results of discontinued operations

	2018 £m	2017 £m
Other income	0.5	1.7
Profit before tax — attributable to owners of the parent	0.5	1.7
Earnings per share — pence		
Basic	0.2	0.7
Diluted	0.2	0.6

21.2 Cash flows from discontinued operations

	2018 £m	2017 £m
Net cash outflow from:		
— operating activities	(0.1)	(0.8)
Net cash outflow for the year	(0.1)	(0.8)

22. Issued Share Capital

22.1 Accounting policy

Equity instruments issued by the Company are recorded as the proceeds received, net of direct issue costs.

22.2 Analysis of issued share capital

The issued and fully paid ordinary share capital of the Company as at 31 December 2018 was 278,485,071 shares of 10 pence each (2017: 278,485,071 shares of 10 pence each). Further information relating to the Company's share capital is given in Note 8 attached to the Company's financial statements.

23. Retained Earnings

	Reserve for own shares £m	Share option reserve £m	Other retained earnings £m	Total retained earnings £m
As at 1 January 2017	(35.1)	2.9	2,402.2	2,370.0
Profit for the year	—	—	38.0	38.0
Remeasurement of defined benefit liabilities/assets	—	—	8.4	8.4
Recognition of share-based payments	—	2.6	—	2.6
Release of share option reserve on exercised and lapsed options	0.9	(0.9)	—	—
Income tax on items recognised in other comprehensive income	—	—	(3.1)	(3.1)
Dividends paid (Note 25)	—	—	(45.6)	(45.6)
As at 1 January 2018	**(34.2)**	**4.6**	**2,399.9**	**2,370.3**
Profit for the year	—	—	138.3	138.3
Remeasurement of defined benefit liabilities/assets	—	—	5.1	5.1
Recognition of share-based payments	—	3.7	—	3.7
Release of share option reserve on exercised and lapsed options	1.5	(1.5)	—	—
Purchase of ESOP shares	(13.4)	—	—	(13.4)
Income tax on items recognised in other comprehensive income	—	—	6.0	6.0
Dividends paid (Note 25)	—	—	(50.0)	(50.0)
As at 31 December 2018	**(46.1)**	**6.8**	**2,499.3**	**2,460.0**

During the year, Cookson Investments (Jersey) Limited as Trustee of the Vesuvius Group Employee Share Ownership Plan ('ESOP'), instructed the purchase of 2,385,000 Vesuvius plc ordinary shares for the ESOP for a total consideration of £13.4m.

24. Other Reserves

	Other reserves £m	Translation reserve £m	Total other reserves £m
As at 1 January 2017	(1,499.3)	157.9	(1,341.4)
Exchange differences on translation of the net assets of foreign operations	—	(37.8)	(37.8)
Exchange translation differences arising on net investment hedges	—	9.8	9.8
As at 1 January 2018	**(1,499.3)**	**129.9**	**(1,369.4)**
Exchange differences on translation of the net assets of foreign operations	—	**11.4**	**11.4**
Exchange translation differences arising on net investment hedges	—	**(11.5)**	**(11.5)**
As at 31 December 2018	**(1,499.3)**	**129.8**	**(1,369.5)**

Within other reserves as at 31 December 2018 is £1,499.0m (2017: £1,499.0m) arising from the demerger of Cookson Group plc, being the excess of the Vesuvius plc share capital of £1,777.9m over the total share capital and share premium of Cookson Group plc as at 14 December 2012 of £278.9m.

The translation reserve in the table above comprises all foreign exchange differences attributable to the owners of the parent. These exchange differences arise from the translation of the financial statements of foreign operations and from the translation of financial instruments that hedge the Group's net investment in foreign operations. In addition to foreign exchange differences attributable to the owners of the parent, the Group Statement of Comprehensive Income includes foreign exchange differences attributable to non-controlling interests.

25. Dividends

A final dividend for the year ended 31 December 2017 of £33.8m (2016: £30.8m), equivalent to 12.5 pence (2016: 11.4 pence) per ordinary share, was paid in May 2018 (May 2017) and an interim dividend for the year ended 31 December 2018 of £16.2m (2017: £14.8m), equivalent to 6.0 pence (2017: 5.5 pence) per ordinary share, was paid in September 2018 (September 2017).

A proposed final dividend for the year ended 31 December 2018 of £37.0m, equivalent to 13.8 pence per ordinary share, is subject to approval by shareholders at the Company's Annual General Meeting and has not been included as a liability in these financial statements. If approved by shareholders, the dividend will be paid on 24 May 2019 to ordinary shareholders on the register at 23 April 2019.

Notes to the Group Financial Statements continued

26. Financial Risk Management

26.1 Accounting policy

(a) Non-derivative financial instruments

Loans and borrowings are initially recognised at fair value net of directly attributable transaction costs. After initial recognition they are measured at amortised cost, using the effective interest method.

(b) Foreign currencies

The individual financial statements of each Group entity are prepared in their functional currency, which is the currency of the primary economic environment in which that entity operates. For the purpose of the Consolidated Financial Statements, the results and financial position of each entity are translated into pound sterling, which is the presentational currency of the Group.

Reporting foreign currency transactions in functional currency

Transactions in currencies other than the entity's functional currency (foreign currencies) are initially recorded at the rates of exchange prevailing on the dates of the transactions or at an average rate which is a reasonable approximation of actual. At each subsequent balance sheet date:

(i) Foreign currency monetary items are retranslated at the rates prevailing at the balance sheet date. Exchange differences arising on the settlement or retranslation of monetary items are recognised in the Group Income Statement

(ii) Non-monetary items measured at historical cost in a foreign currency are not retranslated

Translation from functional currency to presentational currency

When the functional currency of a Group entity is different from the Group's presentational currency (pound sterling), its results and financial position are translated into the presentational currency as follows:

(i) Assets and liabilities are translated using exchange rates prevailing at the balance sheet date

(ii) Income and expense items are translated at average exchange rates for the year, except where the use of such average rates does not approximate the exchange rate at the date of a specific transaction, in which case the transaction rate is used

(iii) All resulting exchange differences are recognised in other comprehensive income and presented in the translation reserve in equity and are reclassified to profit or loss in the period in which the foreign operation is disposed of

Net investment in foreign operations

Exchange differences arising on a monetary item that forms part of a reporting entity's net investment in a foreign operation are initially recognised in other comprehensive income and presented in the translation reserve in equity and reclassified to profit or loss on disposal of the net investment.

Financial reporting in hyperinflationary economies

Entities with a functional currency of the Argentine peso are required to apply IAS 29 'Financial reporting in hyper-inflationary economies' in accounting periods ending on or after 1 July 2018.

The results for the year ended 31 December 2018 from Group subsidiaries with a functional currency of the Argentine peso have therefore been restated to current cost using indices prescribed by the Government Board of the Argentine Federation of Professional Councils of Economic Sciences (FACPCE). Comparative figures have not been restated.

Transactions in Argentine pesos have been translated using exchange rates prevailing at the balance sheet date.

(c) Derivative financial instruments

Derivatives are measured at fair value. The fair value of forward foreign currency contracts is calculated using market prices at the balance sheet date.

26.2 Financial risk factors

The Group's Treasury department, acting in accordance with policies approved by the Board, is principally responsible for managing the financial risks faced by the Group. The Group's activities expose it to a variety of financial risks, the most significant of which are market risk and liquidity risk.

(a) Derivative financial instruments

The Group uses derivative financial instruments ('derivatives'), in the form of forward foreign currency contracts to manage the effects of its exposure to foreign exchange risk. Derivatives are only used for economic hedging purposes and not as speculative investments. However, where derivatives do not meet the hedge accounting criteria, they are classified as 'held for trading' for accounting purposes and are accounted for at fair value through profit or loss. They are presented as current assets or liabilities to the extent they are expected to be settled within 12 months after the end of the reporting period.

Analysis of derivative financial instruments

	2018 Assets £m	2018 Liabilities £m	2017 Assets £m	2017 Liabilities £m
Derivatives	0.8	(0.6)	0.3	—
Total derivative financial instruments	0.8	(0.6)	0.3	—

The fair value of Derivatives outstanding at the year-end has been booked through the Income Statement in 2018. All of the fair values shown in the table above are classified under IFRS 13 as Level 2 measurements which have been calculated using quoted prices from active markets, where similar contracts are traded and the quotes reflect actual transactions in similar instruments. All of the derivative assets and liabilities reported in the table above will mature within a year of the balance sheet date.

(b) Market risk

Market risk is the risk that either the fair values or the cash flows of the Group's financial instruments may fluctuate because of changes in market prices. The Group is principally exposed to market risk through fluctuations in exchange rates and interest rates.

Currency risk

The Group Income Statement is exposed to currency risk on monetary items that are denominated in currencies other than the functional currency of the companies in which they are held. The currency profile of borrowings and financial assets is shown in the table below.

	2018 Sterling £m	2018 Euro £m	2018 Chinese Renminbi £m	2018 US Dollar £m	2018 Other £m	2017 Sterling £m	2017 Euro £m	2017 Chinese Renminbi £m	2017 US Dollar £m	2017 Other £m
Trade receivables	(8.4)	95.1	67.2	37.2	32.0	0.2	47.6	61.4	60.2	13.9
Cash at bank	1.2	33.4	25.7	24.2	14.2	(8.8)	22.9	26.8	17.8	9.6
Trade payables	(5.9)	(37.0)	(31.1)	(14.7)	(27.8)	(0.9)	(25.4)	(28.4)	(17.3)	(13.2)
Private Placement Notes	—	(116.9)	—	(156.8)	—	—	(115.4)	—	(148.0)	—
Bank loans & overdrafts	—	(122.6)	—	(6.6)	(0.1)	10.8	(127.7)	—	(7.0)	—
Foreign currency forward contracts										
— Buy foreign currency (Private Placement)	—	89.9	—	—	—	—	88.9	—	—	—
— Buy foreign currency (Other)	—	—	—	3.1	—	—	—	—	0.9	—
— Sell foreign currency	—	(8.3)	—	(4.3)	—	—	(11.8)	—	(4.3)	—
	(13.1)	(66.4)	61.8	(117.9)	18.3	1.3	(120.9)	59.8	(97.7)	10.3

The Group arranges a rolling short dated Euro/Sterling foreign exchange swap in respect of €100m of its Private Placement fixed rate financial liabilities (2017: €100m). This has the effect of reducing the currency exposure of the Group's Net Debt by €100m. At the time of the report there is no intention to change these arrangements.

The tables below show the net unhedged monetary assets and liabilities of Group companies that are not denominated in their functional currency and which could give rise to exchange gains and losses in the Group Income Statement.

	Net unhedged monetary assets/(liabilities) Sterling £m	US dollar £m	Euro £m	Chinese Renminbi £m	Other £m	Total £m
Functional currency						
Sterling	—	0.6	0.5	—	3.6	4.7
US dollar	—	—	2.6	—	(3.5)	(0.9)
Euro	(0.5)	4.2	—	—	—	3.7
Chinese Renminbi	(1.5)	3.4	0.1	—	(0.1)	1.9
Other	(0.1)	14.3	3.3	(0.4)	19.0	36.1
As at 31 December 2018	(2.1)	22.5	6.5	(0.4)	19.0	45.5

Notes to the Group Financial Statements continued

26. Financial Risk Management continued

(b) Market risk continued

	Net unhedged monetary assets/(liabilities)					
	Sterling £m	US dollar £m	Euro £m	Chinese Renminbi £m	Other £m	Total £m
Functional currency						
Sterling	—	(2.5)	(5.3)	0.1	6.1	(1.6)
US dollar	—	—	0.5	—	(2.6)	(2.1)
Euro	(0.5)	7.3	—	—	—	6.8
Chinese Renminbi	(0.7)	15.0	0.4	—	(0.1)	14.6
Other	(0.7)	14.6	(0.7)	(0.2)	11.7	24.7
As at 31 December 2017	(1.9)	34.4	(5.1)	(0.1)	15.1	42.4

The Group finances its operations partly by obtaining funding through external borrowings. Where these borrowings are not in sterling they may be designated as net investment hedges. This enables gains and losses arising on retranslation to be charged to other comprehensive income, providing a partial offset in equity against the gains and losses arising on translation of overseas net assets.

During 2018 €161m and $200m of borrowings were designated as hedges of net investments in €161m and $200m worth of overseas foreign operations.

As the value of the borrowings exactly matches the designated hedged portion of the net investments the relevant Hedge Ratio is 1:1. The net investment hedges are therefore 100% effective with no ineffectiveness.

The total retranslation impact of borrowings designated as net investment hedges was £10.6m (2017: £9.8m).

Interest rate risk

The Group's interest rate risk principally arises in relation to its borrowings. Where borrowings are held at floating rates of interest, fluctuations in interest rates expose the Group to variability in the cash flows associated with its interest payments, and where borrowings are held at fixed rates of interest, fluctuations in interest rates expose the Group to changes in the fair value of its borrowings. The Group's policy is to maintain a mix of fixed and floating rate borrowings, within certain parameters agreed from time to time by the Board, in order to optimise interest cost and reduce volatility in reported earnings.

As at 31 December 2018, the Group had $200.0m and €130.0m (£273.7m in total) of US Private Placement Loan Notes (USPP) outstanding, which carry a fixed rate of interest, representing 56% of the Group's total borrowings outstanding at that date. The interest rate profile of the Group's borrowings and net debt is detailed in the tables below.

	Financial liabilities (gross borrowings)		
	Fixed rate £m	**Floating rate £m**	**Total £m**
Sterling	—	**73.0**	**73.0**
US dollar	**156.8**	**10.4**	**167.2**
Euro	**116.9**	**121.2**	**238.1**
Other	—	**8.4**	**8.4**
Capitalised arrangement fees	**(1.8)**	—	**(1.8)**
As at 31 December 2018	**271.9**	**213.0**	**484.9**

	Financial liabilities (gross borrowings)		
	Fixed rate £m	Floating rate £m	Total £m
Sterling	—	39.7	39.7
US dollar	148.0	11.9	159.9
Euro	115.4	120.2	235.6
Other	—	3.1	3.1
Capitalised arrangement fees	(2.1)	—	(2.1)
As at 31 December 2017	261.3	174.9	436.2

Information in respect of the currency risk management of £89.9m of Euro denominated fixed rate financial liabilities is provided in Note 26 (b).

The floating rate financial liabilities shown in the tables above typically bear interest at the inter-bank offered rate of the appropriate currency, plus a margin. The fixed rate financial liabilities of £273.7m (2017: £261.3m) have a weighted average interest rate of 3.8% (2017: 3.8%) and a weighted average period for which the rate is fixed of 5.8 years (2017: 6.9 years).

The financial assets attract floating rate interest.

(b) Market risk continued

Based upon the interest rate profile of the Group's financial liabilities shown in the tables above, a 1% increase in market interest rates would increase both the finance costs charged in the Group Income Statement and the interest paid in the Group Statement of Cash Flows by £2.1m (2017: £0.1m), and a 1% reduction in market interest rates would decrease both the finance costs charged in the Group Income Statement and the interest paid in the Group Statement of Cash Flows by £2.1m (2017: £0.1m).

(c) Credit risk

Credit risk arises from cash and cash equivalents, favourable derivative financial instruments and deposits with banks and financial institutions, as well as credit exposures to customers, including outstanding receivables.

(i) Risk management

Credit risk is managed on a Group basis. For banks and financial institutions, Group policy is such that only independently rated parties with a minimum rating of 'A' are accepted. If wholesale customers are independently rated, these ratings are used. Otherwise, if there is no independent rating, risk control assesses the credit quality of the customer, taking into account its financial position, past experience and other factors. All the Group's operating companies have policies and procedures in place to assess the creditworthiness of the customers with whom they do business.

(ii) Impairment of financial assets

The Group subjects trade receivables for sales of inventory and from the provision of services to the expected credit loss model. While cash and cash equivalents are also subject to the impairment requirements of IFRS 9, the identified impairment loss was immaterial.

The Group applies the IFRS 9 simplified approach to measuring expected credit losses which uses a lifetime expected loss allowance for all trade receivables and contract assets. The expected loss rates are based on the payment profiles of sales over a period of 60 months before 31 December 2018 and the corresponding historical credit losses experienced within this period. The historical loss rates are adjusted to reflect current and forward-looking information on macroeconomic factors affecting the ability of the customers to settle the receivables. The Group has identified the current state of the economy (such as market interest rates or growth rates) and particular industry issues in the countries in which it sells its goods and services to be the most relevant factors, and accordingly adjusts the historical loss rates based on expected changes in these factors.

Regardless of the analysis above, a significant increase in credit risk is presumed if a debtor is more than 30 days past due in making a contractual payment. Where objective evidence exists that a trade receivable balance may be impaired, provision is made for the difference between its carrying amount and the present value of the estimated cash that will be recovered. Evidence of impairment may include such factors as a change in credit risk profile of the customer, the customer being in default on a contract, or the customer entering bankruptcy or financial reorganisation proceedings. All significant balances are reviewed individually for evidence of impairment.

Trade receivables and contract assets are written off when there is no reasonable expectation of recovery. Indicators that there is no reasonable expectation of recovery include, amongst others, the failure of a debtor to engage in a repayment plan with the Group, and a failure to make contractual payments for a period of greater than 120 days past due. Where loans or receivables have been written off, the company continues to engage in enforcement activity to attempt to recover the receivable due. Where recoveries are made, these are recognised within the Income Statement.

The closing loss allowance for trade receivables as at 31 December 2018 reconciles to the opening loss allowances as follows:

	2018 £m	2017 £m
As at 1 January	**31.7**	33.1
(Decrease)/increase in loss allowance recognised in profit or loss during the year	**(1.1)**	3.7
Receivables written off during the year as uncollectable	**(2.1)**	(4.8)
Exchange adjustments	**(0.3)**	(0.3)
As at 31 December	**28.2**	31.7

The charge for the year shown in the table above is recorded within administration, selling and distribution costs in the Group Income Statement.

The restatement on transition to IFRS 9 as a result of applying the expected credit risk model was immaterial. Historical experience has shown that the Group's trade receivable provisions are maintained at levels that are sufficient to absorb actual bad debt write-offs, without being excessive. The Group considers the credit quality of financial assets that are neither past due nor impaired as good.

(d) Liquidity risk

Liquidity risk is the risk that the Group might have difficulties in meeting its financial obligations. The Group manages this risk by ensuring that it maintains sufficient levels of committed borrowing facilities and cash and cash equivalents to ensure that it can meet its operational cash flow requirements and any maturing financial liabilities, whilst at all times operating within its financial covenants. The level of operational headroom provided by the Group's committed borrowing facilities is reviewed at least annually as part of the Group's three-year planning process. Where this process indicates a need for additional finance, this is addressed on a timely basis by means of either additional committed bank facilities or raising finance in the capital markets.

Notes to the Group Financial Statements continued

26. Financial Risk Management continued

(d) Liquidity risk continued

As at 31 December 2018, the Group had committed borrowing facilities of £573.7m (2017: £563.4m), of which £119.2m (2017: £153.7m) were undrawn. These undrawn facilities are due to expire in June 2022. The Group's borrowing requirements are met by USPP and a multi-currency committed syndicated bank facility of £300.0m (2017: £300.0m). The USPP facility was fully drawn as at 31 December 2018 and amounted to £273.7m ($200.0m and €130.0m), of which $140.0m is repayable in 2020, €15.0m in 2021, $30.0m in 2023, €15.0m in 2025, €50.0m in 2027, $30.0m in 2028 and €50.0m in 2029.

The maturity analysis of the Group's gross borrowings is shown in the tables below.

	Loans & overdrafts		Finance leases		Total	
	2018 £m	2017 £m	2018 £m	2017 £m	2018 £m	2017 £m
Interest-bearing borrowings repayable						
On demand or within one year	**28.2**	20.8	**1.7**	1.6	**29.8**	22.4
Between 1 and 2 years	**109.7**	0.0	**1.2**	1.4	**111.0**	1.4
Between 2 and 5 years	**217.9**	267.0	**1.0**	1.0	**218.9**	268.0
After five years	**127.0**	146.5	—	—	**127.0**	146.5
Capitalised arrangement fees	**(1.8)**	(2.1)	—	—	**(1.8)**	(2.1)
Total interest-bearing borrowings	**481.0**	432.2	**3.9**	4.0	**484.9**	436.2

Capitalised arrangement fees shown in the tables above, which have been recognised as a reduction in borrowings in the financial statements, amounted to £1.8m as at 31 December 2018 (31 December 2017: £2.1m), of which £1.0m (2017: £1.0m) related to the USPP and £0.8m (2017: £1.1m) related to the syndicated bank facility.

26.3 Capital management

The Company considers its capital to be equal to the sum of its total equity, disclosed on the Group Balance Sheet, and net debt (Note 14). It monitors its capital using a number of KPIs, including free cash flow, average working capital to sales ratios, net debt to EBITDA ratios and RONA (Note 4). The Group's objectives when managing its capital are:

> To ensure that the Group and all of its businesses are able to operate as going concerns and ensure that the Group operates within the financial covenants contained within its debt facilities

> To have available the necessary financial resources to allow the Group to invest in areas that may deliver acceptable future returns to investors

> To maintain sufficient financial resources to mitigate against risks and unforeseen events

> To maximise shareholder value through maintaining an appropriate balance between the Group's equity and net debt

The Group operated within the requirements of its debt covenants throughout the year and has sufficient liquidity headroom within its committed debt facilities. Details of the Group's covenant compliance and committed debt facilities can be found in the Strategic Report on page 38.

26.4 Cash pooling arrangements

The Group enters into zero balancing and notional cash pooling arrangements as part of its ongoing Treasury management activities. Certain notional cash pooling arrangements meet the criteria for offsetting as clarified in amendments to IAS 32 Financial Instruments, about a legally enforceable right of set-off both in the ordinary course of business and in the event of default. The following tables set out the amounts of recognised financial assets and liabilities shown as cash and cash borrowings and those amounts which are subject to these agreements.

	Gross amounts of recognised financial assets/ liabilities £m	Gross amounts of recognised financial assets/ liabilities offset in the statement of financial position £m	Net amounts of financial assets/liabilities presented in the statement of financial position £m
Financial assets/liabilities			
Cash deposits	**237.7**	**(0.8)**	**236.9**
Cash borrowings	**(24.3)**	**0.8**	**(23.5)**
As at 31 December 2018	**213.4**	**—**	**213.4**
Financial assets/liabilities			
Cash deposits	172.9	(11.0)	161.9
Cash borrowings	(32.9)	11.0	(21.9)
As at 31 December 2017	140.0	—	140.0

27. Employee Benefits

27.1 Accounting policy

The net surplus or net liability recognised in the Group Balance Sheet for the Group's defined benefit plans is the present value of the defined benefit obligation at the balance sheet date, less the fair value of the plan assets. The defined benefit obligation is calculated by independent actuaries using the projected unit credit method and by discounting the estimated future cash flows using interest rates on high-quality corporate bonds that have terms to maturity approximating the terms of the related pension liability. Any asset recognised in respect of a surplus arising from this calculation is limited to the asset ceiling, where this is the present value of any economic benefits available in the form of refunds or reductions in future contributions in respect of the plans.

The expense for the Group's defined benefit plans is recognised in the Group Income Statement as shown in Note 27.8. Actuarial gains and losses arising on the assets and liabilities of the plans are reported within the Group Statement of Comprehensive Income; and gains and losses arising on settlements and curtailments are recognised in the Group Income Statement in the same line as the item that gave rise to the settlement or curtailment or, if material, separately reported as a component of operating profit.

27.2 Group post-retirement plans

The Group operates a number of pension plans around the world, both defined benefit and defined contribution, and accounts for them in accordance with IAS 19.

The Group's principal defined benefit pension plans are in the UK and the US, the benefits of which are based upon the final pensionable salaries of plan members. The assets of these plans are held separately from the Group in trustee-administered funds. The trustees are required to act in the best interests of the plans' beneficiaries. The principal risks faced by these plans comprise: (i) the risk that the value of the plan assets is not sufficient to meet all plan liabilities as they fall due; (ii) the risk that plan beneficiaries live longer than envisaged, causing liabilities to exceed the available plan assets; and (iii) the risk that the market-based factors used to value plan liabilities and assets change materially adversely to increase plan liabilities over the value of available plan assets. The Group also has defined benefit pension plans in other territories but, except for those in Germany, these are not individually material in relation to the Group.

(a) Defined benefit pension plans – UK

The Group's main defined benefit pension plan in the UK ('the UK Plan') is closed to new members and to future benefit accrual. The existing plan was established under a trust deed and is subject to the Pensions Act 2004 and guidance issued by the UK Pensions Regulator.

A full actuarial valuation of the UK Plan is carried out every three years by an independent actuary for the UK Plan Trustee in line with the requirements of the Pensions Act 2004, and the last full valuation was carried out as at 31 December 2015. At that date, the market value of plan assets was £536.7m and this represented a funding level of 102% of the accrued plan benefits at the time of £526.4m. Calculated on a 'buy-out' basis (using an estimation of the cost of buying out the UK Plan benefits with an insurance company), the liabilities at that date were £687.5m, representing a funding level of 78%.

There is a 'long-term scheme-specific funding standard' in Part 3 of the Pensions Act 2004. In terms of Part 3, the UK plan is subject to a requirement ('the statutory funding objective') that it must have sufficient and appropriate assets to cover its technical provisions. Such technical provisions are determined as part of the triennial valuation. Under the rules of the UK Plan, the Trustees, after consultation with the company, have the power to set the funding contributions taking into account the results of the triennial valuation, and the Pension Act 2004 legislation. Notwithstanding the latest funding valuation surplus, the Company agreed to fund the administration cost relating to the management of the UK Plan.

(b) Defined benefit pension plans – US

The Group has several defined benefit pension plans in the US, providing retirement benefits based on final salary or a fixed benefit. The Group's principal US defined benefit pension plans are closed to new members and to future benefit accrual for existing members. Actuarial valuations of the US defined benefit pension plans are carried out every year and the last full valuation was carried out as at 31 December 2017. At that date the market value of the plan assets was £49.8m, representing a funding level of 70.7% of funded accrued plan benefits at that date (using the projected unit method of valuation) of £70.4m. Funding levels for the Group's US defined benefit pension plans are based upon annual valuations carried out by independent qualified actuaries and are governed by US Government regulations.

The Group's US defined benefit pension plans are subject to the minimum contribution requirements of the Internal Revenue Code Sections 412 and 430. Contributions are determined by trustees, in consultation with the Company, based on the annual valuations which are submitted to the Internal Revenue Service. For the plan year beginning 1 January 2018, the minimum required contribution was £nil as significant company contributions of $4m were made in 2017. However, under these funding laws and based on the plan deficit, minimum annual contributions in the period 2018-2020 are likely to be required and are expected to be in the $3m to $4m range. Contributions of $1.9m were made during 2018.

(c) Defined benefit pension plans – Germany

The Group has several defined benefit pension arrangements in Germany which are unfunded, as is common practice in that country. The main plan was closed to new entrants on 31 December 2016 and replaced by a defined contribution plan for new joiners.

Notes to the Group Financial Statements continued

27. Employee Benefits continued

(d) Defined benefit pension plans – ROW and other post-retirement benefits

The Group has several defined benefit pension arrangements across the rest of the world, the largest of which are in Belgium. The net liability of the ROW plans at 31 December 2018 was £15.6m (2017: £17.9m). The Group also has liabilities relating to medical insurance arrangements and termination plans which provide for benefit to be paid to employees on retirement. The net liability of these other post-retirement benefits at 31 December 2018 was £7.3m (2017: £6.5m).

(e) Defined contribution pension plans

The total expense for the Group's defined contribution plans in the Group Income Statement amounted to £11.4m (2017: £12.6m continuing operations) and represents the contributions payable for the year by the Group to the plans.

(f) Multi-employer plans

Due to collective agreements, Vesuvius in the US participates together with other enterprises in union-run multi-employer pension plans for temporary workers hired on sites. Some of these plans are underfunded and all participating employers are ultimately liable for any deficit. If a participating employer stops contributing to a plan, it is required to make a withdrawal payment to the plan to cover its share of the total deficit in the plan. No reliable basis exists for allocation of the plans' obligations and plan assets to individual employer participants. Deficits in the plans may necessitate increased contributions in the future but the expectation is that this will remain relatively consistent based upon historical trends. These are currently accounted for as defined contribution plans. In 2018 Vesuvius contributed £0.9m (2017: £1.4m) to these plans.

27.3 Post-retirement liability valuation

The main assumptions used in calculating the costs and obligations of the Group's defined benefit pension plans, as detailed below, are set by the Directors after consultation with independent professionally qualified actuaries and include those used to determine regular service costs and the financing elements related to the plans' assets and liabilities. It is the Directors' responsibility to set the assumptions used in determining the key elements of the costs of meeting such future obligations. Whilst the Directors believe that the assumptions used are appropriate, a change in the assumptions used could affect the Group's profit and financial position.

(a) Mortality assumptions

The mortality assumptions used in the actuarial valuations of the Group's UK, US and German defined benefit pension liabilities are summarised in the table below and have been selected to reflect the characteristics and experience of the membership of those plans.

For the UK Plan, the assumptions used have been derived from the Self-Administered Pension Schemes ('SAPS') All table, with future longevity improvements in line with the 'core' mortality improvement tables published in 2017 by the Continuous Mortality Investigation ('CMI'), with a long-term rate of improvement of 1.25% per annum. For the Group's US plans, the assumptions used have been based on the RP-2014 mortality tables and MP-2018 projection scale. The Group's major plans in Germany have been valued using the modified Heubeck Richttafeln 2018G mortality tables. In respect of the life expectancy tables below, current pensioners are assumed to be 65 years old, while future pensioners are assumed to be 45 years old.

		2018			2017		
Life expectancy of pension plan members		UK years	US years	Germany years	UK years	US years	Germany years
Age to which current pensioners are expected to live	— Men	**86.2**	**85.6**	**85.0**	86.3	85.7	84.3
	— Women	**88.8**	**87.6**	**88.6**	88.9	87.7	88.3
Age to which future pensioners are expected to live	— Men	**87.6**	**87.3**	**87.8**	87.7	87.3	86.9
	— Women	**90.4**	**89.2**	**90.8**	90.4	89.2	90.8

(b) Other main actuarial valuation assumptions

	2018			2017		
	UK %p.a.	US %p.a.	Germany %p.a.	UK %p.a.	US %p.a.	Germany %p.a.
Discount rate	**2.85**	**4.00**	**2.00**	2.50	3.40	1.60
Price inflation — using RPI for UK	**3.25**	**2.25**	**1.70**	3.25	2.25	1.80
— using CPI for UK	**2.15**	**n/a**	**n/a**	2.15	n/a	n/a
Rate of increase in pensionable salaries	**n/a**	**n/a**	**2.45**	n/a	n/a	2.55
Rate of increase to pensions in payment	**3.15**	**n/a**	**1.55**	3.10	n/a	1.65

The discount rate used to determine the liabilities of the UK Plan for IAS 19 accounting purposes is required to be determined by reference to market yields on high-quality corporate bonds. The UK discount rate in the above table is based on analysis using the expected future cashflows of the Vesuvius Pension Plan and the AON Hewitt AA yield curve; the US discount rate is based on the FTSE (formerly Citigroup) pension discount curve; and the Germany discount rate is based on AA corporate bond yields included in the iBoxx Euro AA corporate bond indices.

The assumptions for UK price inflation are set by reference to the difference between yields on longer-term conventional government bonds and index-linked bonds, except for CPI, for which no appropriate bonds exist, which is assumed to be 1.1 points lower (2017: 1.1 points lower) than RPI-based inflation.

(c) **Sensitivity analysis of the impact of changes in significant IAS 19 actuarial assumptions**

The UK Plan Trustee has entered into a pension insurance buy-in agreement with the Pension Insurance Corporation ('PIC'). The US pensions are not inflation linked. The rate of increase in pensionable salaries and of pensions in payment is therefore not significant to the valuation of the Group's overall pension liabilities.

The sensitivity of the defined benefit obligation to changes in the weighted principal assumptions is:

Assumption	Change in assumption	UK	US	Germany
Discount rate	Increase/decrease by 0.1%			
	— impact on plan liabilities	Decrease/increase by £7.1m	Decrease/increase by £0.9m	Decrease/increase by £0.9m
	— impact on plan assets	Decrease/increase by £3.0m	n/a	n/a
Price inflation	Increase/decrease by 0.1%			
	— impact on plan liabilities	Increase/decrease by £4.8m	n/a	Increase/decrease by £0.3m
	— impact on plan assets	Increase/decrease by £2.0m	n/a	n/a
Mortality	Increase by one year			
	— impact on plan liabilities	Increase by £19.6m	Increase by £2.7m	Increase by £1.7m
	— impact on plan assets	Increase by £13.9m	n/a	n/a

27.4 Defined benefit obligation

The average duration of the obligations to which the liabilities of the Group's principal pension plans relate is 17 years for the UK, 18 years for Germany and 10 years for the US.

	Defined benefit pension plans					Other post-retirement benefit plans	
	UK £m	US £m	Germany £m	ROW £m	Total £m	£m	Total £m
Present value as at 1 January 2018	**490.8**	**82.0**	**49.4**	**44.6**	**666.8**	**6.5**	**673.3**
Exchange differences	**—**	**4.5**	**0.6**	**0.6**	**5.7**	**0.2**	**5.9**
Current service cost	**—**	**0.6**	**1.5**	**3.2**	**5.3**	**0.6**	**5.9**
Past service cost	**4.5**	**(0.9)**	**—**	**(1.0)**	**2.6**	**—**	**2.6**
Interest cost	**11.9**	**2.7**	**0.8**	**0.7**	**16.1**	**0.3**	**16.4**
Settlements	**—**	**—**	**—**	**—**	**—**	**—**	**—**
Remeasurement of liabilities:							
— demographic changes	**(3.2)**	**(0.3)**	**0.8**	**2.0**	**(0.7)**	**—**	**(0.7)**
— financial assumptions	**(22.1)**	**(5.3)**	**(4.6)**	**(1.7)**	**(33.7)**	**0.2**	**(33.5)**
— experience losses/(gains)	**2.0**	**0.1**	**0.9**	**(1.6)**	**1.4**	**0.1**	**1.5**
Benefits paid	**(28.0)**	**(3.9)**	**(1.6)**	**(2.2)**	**(35.7)**	**(0.6)**	**(36.3)**
Present value as at 31 December 2018	**455.9**	**79.5**	**47.8**	**44.6**	**627.8**	**7.3**	**635.1**

	Defined benefit pension plans					Other post-retirement benefit plans	
	UK £m	US £m	Germany £m	ROW £m	Total £m	£m	Total £m
Present value as at 1 January 2017	527.4	86.8	45.3	41.0	700.5	6.9	707.4
Exchange differences	—	(7.6)	1.9	1.3	(4.4)	0.1	(4.3)
Current service cost	—	0.5	1.5	3.2	5.2	0.2	5.4
Past service cost	—	—	—	0.1	0.1	—	0.1
Interest cost	14.0	3.1	0.8	0.7	18.6	0.2	18.8
Settlements	—	—	—	—	—	—	—
Remeasurement of liabilities:							
— demographic changes	(5.4)	(0.7)	—	0.1	(6.0)	—	(6.0)
— financial assumptions	11.3	3.8	1.6	0.5	17.2	0.3	17.5
— experience losses/(gains)*	(9.7)	0.1	(0.1)	0.1	(9.6)	(0.1)	(9.7)
Benefits paid	(46.8)	(4.0)	(1.6)	(2.4)	(54.8)	(1.1)	(55.9)
Present value as at 31 December 2017	490.8	82.0	49.4	44.6	666.8	6.5	673.3

Notes to the Group Financial Statements continued

27. Employee Benefits continued

27.5 Fair value of plan assets

	2018				2017			
	UK £m	US £m	ROW £m	Total £m	UK £m	US £m	ROW £m	Total £m
As at 1 January	**580.3**	**49.8**	**26.7**	**656.8**	604.1	49.1	24.8	678.0
Exchange differences	**—**	**2.7**	**0.6**	**3.3**	—	(4.5)	0.5	(4.0)
Interest income	**14.2**	**1.6**	**0.5**	**16.3**	16.1	1.7	0.4	18.2
Settlements	**—**	**—**	**—**	**—**	—	—	—	—
Acquisitions	**—**	**—**	**—**	**—**	—	—	—	—
Remeasurement of assets	**(23.0)**	**(5.0)**	**0.4**	**(27.6)**	5.7	3.8	0.7	10.2
Contributions from employer	**0.8**	**1.4**	**2.3**	**4.5**	2.0	3.1	2.3	7.4
Contributions from members	**—**	**—**	**—**	**—**	—	—	—	—
Administration expenses paid	**(0.6)**	**(0.6)**	**—**	**(1.2)**	(0.8)	(0.5)	—	(1.3)
Benefits paid	**(27.9)**	**(2.9)**	**(1.5)**	**(32.3)**	(46.8)	(2.9)	(2.0)	(51.7)
As at 31 December	**543.8**	**47.0**	**29.0**	**619.8**	580.3	49.8	26.7	656.8

The Group's pension plans in Germany are unfunded, as is common practice in that country, and accordingly there are no assets associated with these plans.

27.6 Remeasurement of defined benefit liabilities/assets

	2018 total £m	2017 total £m
Remeasurement of liabilities:		
— demographic changes	**0.7**	6.0
— financial assumptions	**33.5**	(17.5)
— experience (losses)/gains	**(1.5)**	9.7
Remeasurement of assets	**(27.6)**	10.2
Total movement	**5.1**	8.4

The remeasurement of defined benefit liabilities and assets of £5.1m (2017: £8.4m) is recognised in the Group Statement of Comprehensive Income.

27.7 Balance sheet recognition

The amount recognised in the Group Balance Sheet in respect of the Group's defined benefit pension plans and other post-retirement benefit plans is analysed in the following tables, which all relate to continuing operations. All equity securities and bonds have quoted prices in active markets.

	Defined benefit pension plans					Other post-retirement benefit plans £m	2018 total £m
	UK £m	US £m	Germany £m	ROW £m	Total £m		
Equities	**49.7**	**5.1**	**—**	**2.3**	**57.1**	**—**	**57.1**
Bonds	**213.0**	**40.6**	**—**	**2.9**	**256.5**	**—**	**256.5**
Annuity insurance contracts	**264.1**	**—**	**—**	**19.8**	**283.9**	**—**	**283.9**
Other assets	**17.0**	**1.3**	**—**	**4.0**	**22.3**	**—**	**22.3**
Fair value of plan assets	**543.8**	**47.0**	**—**	**29.0**	**619.8**	**—**	**619.8**
Present value of funded obligations	**(454.1)**	**(68.2)**	**—**	**(40.3)**	**(562.6)**	**—**	**(562.6)**
	89.7	**(21.2)**	**—**	**(11.3)**	**57.2**	**—**	**57.2**
Present value of unfunded obligations	**(1.8)**	**(11.3)**	**(47.8)**	**(4.3)**	**(65.2)**	**(7.3)**	**(72.5)**
Total net surpluses/(liabilities)	**87.9**	**(32.5)**	**(47.8)**	**(15.6)**	**(8.0)**	**(7.3)**	**(15.3)**
Recognised in the Group Balance Sheet as:							
Net surpluses	**89.7**	**—**	**—**	**1.1**	**90.8**	**—**	**90.8**
Net liabilities	**(1.8)**	**(32.5)**	**(47.8)**	**(16.7)**	**(98.8)**	**(7.3)**	**(106.1)**
Total net surpluses/(liabilities)	**87.9**	**(32.5)**	**(47.8)**	**(15.6)**	**(8.0)**	**(7.3)**	**(15.3)**

	Defined benefit pension plans					Other post-retirement benefit plans	
	UK £m	US £m	Germany £m	ROW £m	Total £m	£m	2017 total £m
Equities	68.9	9.7	—	2.9	81.5	—	81.5
Bonds	191.8	38.5	—	2.0	232.3	—	232.3
Annuity insurance contracts	276.1	—	—	17.8	293.9	—	293.9
Other assets	43.5	1.6	—	4.0	49.1	—	49.1
Fair value of plan assets	580.3	49.8	—	26.7	656.8	—	656.8
Present value of funded obligations	(488.9)	(70.4)	—	(40.0)	(599.3)	—	(599.3)
	91.4	(20.6)	—	(13.3)	57.5	—	57.5
Present value of unfunded obligations	(1.9)	(11.6)	(49.4)	(4.6)	(67.5)	(6.5)	(74.0)
Total net surpluses/(liabilities)	89.5	(32.2)	(49.4)	(17.9)	(10.0)	(6.5)	(16.5)
Recognised in the Group Balance Sheet as:							
Net surpluses	91.4	—	—	1.0	92.4	—	92.4
Net liabilities	(1.9)	(32.2)	(49.4)	(18.9)	(102.4)	(6.5)	(108.9)
Total net surpluses/(liabilities)	89.5	(32.2)	(49.4)	(17.9)	(10.0)	(6.5)	(16.5)

(a) UK Plan asset allocation

As at 31 December 2018, of the UK Plan's total assets, 48.6% (2017: 47.6%) were represented by the annuity insurance contracts covering the UK Plan's pension liabilities; 9.1% (2017: 11.9%) were allocated to equities; 39.2% (2017:33.0%) to fixed income securities; 0.4% (2017: 5.1%) to cash; and 2.7% (2017: 2.4%) to other assets. The fixed income asset class of the UK Plan includes a liability-driven investment portfolio of financial derivative contracts which reduces the risk that the UK Plan's assets would fall materially, relative to the value of its economic liabilities.

The UK Plan Trustee has entered into a pension insurance buy-in agreement with the Pension Insurance Corporation ('PIC'), whereby the UK Plan Trustee has paid insurance premiums to PIC to insure a significant portion of the UK Plan's liabilities. Under this arrangement, the value of the PIC insurance contract matches the value of the liabilities because the inflation, interest rate, investment and longevity risk for Vesuvius in respect of these liabilities are eliminated. As at 31 December 2018, the IAS 19 valuation of the PIC insurance contract value associated with the bought-in liabilities was £264.1m (2017: £276.1m). The buy-in agreement ensures that the UK pension plan obligations in respect of all its retired members and their approved dependants are insured. The policy and the associated valuation are updated annually to reflect retirements and mortality. In the current year, the agreement based on specific membership data covers 58.1% (2017: 56.5%) of UK pension plan obligations, removing substantially all financial risks associated with this tranche of the liability.

(b) Defined benefit contributions in 2019

In 2019, the Group is expected to make contributions into its defined benefit pension and other post-retirement benefits plans of around £5.4m with specific contributions of approximately £2.0m and £0.7m anticipated for the US Plan and UK Plan respectively.

27.8 Income statement recognition

The expense recognised in the Group Income Statement in respect of the Group's defined benefit retirement plans and other post-retirement benefit plans is shown below.

	2018			2017		
	Defined benefit pension plans £m	Other post-retirement benefit plans £m	Total £m	Defined benefit pension plans £m	Other post-retirement benefit plans £m	Total £m
Current service cost	**5.3**	**0.6**	**5.9**	5.2	0.2	5.4
Past service cost	**2.6**	—	**2.6**	0.1	—	0.1
Settlements	—	—	—	—	—	—
Administration expenses	**1.2**	—	**1.2**	1.3	—	1.3
Net interest cost/(gain)	**(0.2)**	**0.3**	**0.1**	0.4	0.2	0.6
Total net charge	**8.9**	**0.9**	**9.8**	7.0	0.4	7.4

A UK High Court judgement was made on 26 October 2018 in respect of the gender equalisation of guaranteed minimum pensions ('GMPs') for occupational pension schemes. The increase in pension liabilities resulting from this judgement has been treated for IAS 19 purposes as a plan amendment and has resulted in an increase in the pension deficit in the balance sheet and a corresponding past service cost in the income statement. This has been treated as a separately reported item so that there has been no impact upon headline performance. We are working with the trustees of our UK pension plan and our actuarial and legal advisers to understand the extent to which the judgement crystallises additional liabilities for the UK pension plan. We have estimated the impact of GMP equalisation as at 31 December 2018 to be £4.5m.

Notes to the Group Financial Statements continued

27. Employee Benefits continued

27.8 Income statement recognition continued

The total net charge of £9.8m (2017: £7.4m) recognised in the Group Income Statement in respect of the Group's defined benefit pension plans and other post-retirement benefits plans is recognised in the following table:

		2018 £m	2017 £m
In arriving at trading profit	— within other manufacturing costs	1.5	2.4
	— within administration, selling and distribution costs	3.7	4.4
In arriving at profit before tax	— Guaranteed minimum pension equalisation charge	4.5	—
	— within net finance costs	0.1	0.6
Total net charge		9.8	7.4

28. Share-based Payments

28.1 Accounting policy

The Group operates equity-settled share-based payment arrangement for its employees. Equity-settled share-based payments are measured at fair value at the date of grant. The fair value determined at the grant date takes account of the effect of market-based conditions, such as total shareholder return target upon which vesting for some awards is conditional, and is expensed on a straight-line basis over the vesting period with a corresponding increase in equity. The cumulative expense recognised is adjusted for the best estimate of the shares that will eventually vest and for the effect of other non-market-based conditions, such as growth in headline earnings per share, which are not included in the fair value determined at the date of grant. For grants with market-based conditions attached to them, fair value is measured using a form of stochastic option pricing model. For all other grants, fair value is measured using the Black-Scholes option pricing model.

28.2 Income statement recognition

The total expense recognised in the Group Income Statement is shown below.

	2018 £m	2017 £m
Long Term Incentive Plan	2.7	1.8
Other plans	1.0	0.8
Total expense	3.7	2.6

The Group operates a number of different share-based payment plans, the most significant of which is the Long Term Incentive Plan (LTIP), details of which can be found in the Directors' Remuneration Report. The Group's other share-based payment plans are not considered significant in the context of the Group's results or financial position.

28.3 Details of outstanding options

	Outstanding awards				
	As at 1 Jan 2018 no.	Granted no.	Exercised no.	Forfeited/ lapsed no.	As at 31 Dec 2018 no.
LTIP	2,280,093	647,188	(247,688)	(319,115)	2,360,478
Weighted average exercise price	nil	nil	nil	nil	nil
Other plans	152,437	228,855	(77,577)	(4,825)	298,890
Weighted average exercise price	nil	nil	nil	nil	nil

For the options exercised during 2018, the share price at the date of exercise ranged from 569 pence to 619 pence.

	Outstanding awards				
	As at 1 Jan 2017 no.	Granted no.	Exercised no.	Forfeited/ lapsed no.	As at 31 Dec 2017 no.
LTIP	2,398,185	825,653	—	(943,745)	2,280,093
Weighted average exercise price	nil	nil	nil	nil	nil
Other plans	219,479	118,722	(180,104)	(5,660)	152,437
Weighted average exercise price	nil	nil	nil	nil	nil

For the options exercised during 2017, the share price at the date of exercise ranged from 402 pence to 592 pence.

Details of market performance conditions are included in the Directors' Remuneration Report.

	2018			2017		
	Awards exercisable as at 31 Dec 2018 no.	Weighted average outstanding contractual life of awards years	Range of exercise prices pence	Awards exercisable as at 31 Dec 2017 no.	Weighted average outstanding contractual life of awards years	Range of exercise prices pence
LTIP	—	5.5		—	4.8	
Weighted average exercise price	—		n/a	—		n/a
Other plans	—	1.0		—	1.0	
Weighted average exercise price	—		n/a	—		n/a

28.4 Options granted under the LTIP during the year

	2018 (October Grant)		2018 (March Grant)	
	EPS element	TSR element	EPS element	TSR element
Fair value of options granted	645.5p	426.0p	605.5p	368.9p
Share price on date of grant	645.5p	645.5p	605.5p	605.5p
Expected volatility	n/a	27.9%	n/a	32.1%
Risk-free interest rate	n/a	0.9%	n/a	0.8%
Exercise price (per share)	nil	nil	nil	nil
Expected term (years)	3	3	3	3
Expected dividend yield	nil	nil	nil	nil

Vesting of 50% of shares awarded is based on headline EPS growth and 50% upon the Group's three-year TSR performance relative to that of the constituent companies of the FTSE 250 (excluding investment trusts).

The fair value of share options with non-market performance conditions has been calculated using the Black-Scholes option pricing model. The fair value of options with market-related performance conditions has been measured using the Monte Carlo model. Expected volatility was determined by calculating the historical volatility of the Group's share price over the 2.8 years (2017: 2.8 years) prior to the grant date for the March 2018 Grant and 2.25 years for the October 2018 Grant. The risk-free rate of return was assumed to be the yield to maturity on a UK fixed gilt with the term to maturity equal to the expected life of the option. At the discretion of the Remuneration Committee, award holders receive the value of dividends that would have been paid on their vested shares in the period between grant and vesting. Accordingly, there is no discount to the valuation for dividends foregone during the vesting period.

29. Trade and Other Payables

29.1 Accounting policy

Trade and other payables are initially recognised at fair value and subsequently measured at amortised cost, using the effective interest method.

29.2 Analysis of trade and other payables

	2018 £m	2017 £m
Non-current		
Accruals and other payables	15.5	14.4
Deferred purchase and contingent consideration	0.6	2.9
Total non-current other payables	**16.1**	17.3
Current		
Trade payables	197.3	185.9
Other taxes and social security	35.3	32.6
Deferred purchase and contingent consideration	1.9	0.8
Accruals and other payables	77.3	73.3
Total current trade and other payables	**311.8**	292.6

There is no significant difference between the fair value of the Group's trade and other payables balances and the amount at which they are reported in the Group Balance Sheet.

Included within trade payables in the table above is £4.1m (2017: £1.8m) subject to a supplier financing agreement. Under the terms of this agreement, which the Group entered into as one of a series of measures aimed at improving control over its working capital, invoices received by the Group from approved suppliers are assigned to a third-party finance company, which assumes legal responsibility for settling the amount owing directly with the supplier. The Group subsequently settles the amount owing to the finance company. There is no cost to the Group from this arrangement.

Notes to the Group Financial Statements continued

30. Leases

30.1 Accounting policy

Leases are classified as finance leases whenever the terms of the lease transfer substantially all the risks and rewards of ownership to the Group, the asset is capitalised in the Group Balance Sheet and the corresponding liability to the lessor is recognised as a finance lease obligation. All other leases are classified as operating leases and neither the asset nor the corresponding liability to the lessor is recognised in the Group Balance Sheet. Rentals payable under operating leases are charged to the Group Income Statement on a straight-line basis over the term of the lease. Benefits received and receivable as an incentive to enter an operating lease are also spread on a straight-line basis over the lease term.

30.2 Operating lease commitments

The future aggregate minimum lease payments under non-cancellable operating leases are payable as follows:

	2018 £m	2017 £m
Not later than one year	11.6	8.3
Later than one year and not later than five years	19.2	13.4
Later than five years	8.5	7.9
Total operating lease commitments	39.3	29.6

The net book value of the Group's property, plant and equipment assets held under finance lease contracts at 31 December 2018 was £4.4m (2017: £4.6m).

The cost incurred by the Group in the year in respect of assets held under operating leases, all of which was charged within trading profit, amounted to £20.9m (2017: £18.6m).

31. Provisions

31.1 Accounting policy

Provisions are recognised when the Group has a present obligation as a result of a past event and it is probable that the Group will be required to settle that obligation. Provisions are measured at the Directors' best estimate of the expenditure required to settle the obligation at the balance sheet date. Where the effect of the time value of money is material, provisions are discounted using a pre-tax discount rate that reflects both the current market assessment of the time value of money and the specific risks associated with the obligation. Where discounting is used, the increase in the provision due to the passage of time is recognised as a finance cost.

31.2 Analysis of provisions

	Disposal and closure costs £m	Restructuring charges £m	Other £m	Total £m
As at 1 January 2018	36.1	22.9	5.2	64.2
Exchange adjustments	2.2	0.1	0.1	2.4
Charge to Group Income Statement	3.6	15.3	9.3	28.2
Unused amounts released to Group Income Statement	(0.5)	—	—	(0.5)
Adjustment to discount	1.2	0.1	—	1.3
Cash spend	(2.8)	(19.3)	(10.1)	(32.2)
Transferred to other balance sheet accounts	—	(1.7)	0.2	(1.5)
As at 31 December 2018	39.8	17.4	4.7	61.9

Of the total provision balance as at 31 December 2018 of £61.9m (2017: £64.2m), £38.8m (2017: £34.4m) is recognised in the Group Balance Sheet within non-current liabilities and £23.1m (2017: £29.8m) within current liabilities.

The provision for disposal and closure costs includes the Directors' current best estimate of the costs to be incurred both in the fulfilment of obligations incurred in connection with former Group businesses, resulting from either disposal or closure, together with those related to the demolition and clean-up of closed sites. The provision comprises amounts payable in respect of known or probable costs resulting both from legal or other regulatory requirements, or from third-party claims, including claims relating to product liability. As the settlement of many of the obligations for which provision is made is subject to legal or other regulatory process, the timing of the associated cash outflows is subject to some uncertainty, but the majority of the amounts provided are expected to be utilised over the next ten years and the underlying estimates of costs are regularly updated to reflect changed circumstances with regard to individual matters.

Where insurance cover exists for any of these known or probable costs, a related asset is recognised in the Group Balance Sheet only when its value can be reliably measured by management. As at 31 December 2018, £21.5m (2017: £21.6m) was recorded in other receivables in respect of associated insurance reimbursements, of which £17.7m (2017: £20.7m) is non-current.

In assessing the probable costs and realisation certainty of provisions, or related assets, reasonable assumptions are made. Changes to the assumptions used could significantly alter the Director's assessment of the value, volume of claims, timing or certainty of the costs or related amounts.

The provision for restructuring charges includes the costs of all of the Group's recognised initiatives to rationalise its operating activities. The balance of £17.4m as at 31 December 2018, (2017: £22.9m) comprises £4.3m (2017: £2.7m) in relation to onerous lease provisions in respect of leases terminating between one and six years, and £13.1m (2017: £20.2m) in relation to expenditure on restructuring initiatives that have been announced the majority of which is expected to be paid out over the next year.

Other provisions comprise amounts payable in respect of known or probable costs resulting both from legal or other regulatory requirements, workers' compensation and medical claims, and from third-party claims. As the settlement of many of the obligations for which provision is made is subject to reasonable assumptions, legal or other regulatory process, the timing of the associated outflows is subject to some uncertainty, but the majority of amounts provided are expected to be utilised over the next five years and the underlying estimates of costs are regularly updated to reflect changed circumstances with regard to individual matters. During 2018 the Group recognised net charges of £9.3m (2017: £11.7m) in the Group Income Statement to provide for various litigation settlements and other claims.

32. Off-Balance Sheet Arrangements

In compliance with current reporting requirements, certain arrangements entered into by the Group in its normal course of business are not reported in the Group Balance Sheet. Of such arrangements, those considered material by the Directors are future lease payments in relation to assets used by the Group under non-cancellable operating leases (Note 30).

33. Contingent Liabilities

Guarantees given by the Group under property leases of operations disposed of amounted to £0.8m (2017: £1.1m). Details of guarantees given by the Company, on behalf of the Group, are given in Note 10 to the Company Financial Statements.

Vesuvius has extensive international operations and is subject to various legal and regulatory regimes, including those covering taxation and environmental matters. Several of Vesuvius' subsidiaries are parties to legal proceedings, certain of which are insured claims arising in the ordinary course of the operations of the company involved, and the Directors are aware of a number of issues which are, or may be, the subject of dispute with tax authorities. Provisions are made for the expected amounts payable in respect of known or probable costs resulting both from legal or other regulatory requirements, and from third-party claims.

Certain of Vesuvius' subsidiaries are subject to lawsuits, predominantly in the US, relating to a small number of products containing asbestos manufactured prior to the acquisition of those subsidiaries by Vesuvius. These suits usually also name many other product manufacturers. To date, Vesuvius is not aware of there being any liability verdicts against any of these subsidiaries. A number of lawsuits have been withdrawn, dismissed or settled and the amount paid, including costs, in relation to this litigation has not had a material adverse effect on Vesuvius' financial position or results of operations.

As the settlement of many of the obligations for which reserve is made is subject to legal or other regulatory process, the timing and amount of the associated outflows is subject to some uncertainty (see Note 31 for further information).

Notes to the Group Financial Statements continued

34. Investments in Subsidiaries, Joint Ventures and Associates

34.1 Investment in subsidiaries

A subsidiary is an entity over which the Group has control. The Group controls an entity when the Group is exposed to, or has rights to, variable returns from its involvement with the entity and can affect those returns through its power over the entity. Subsidiaries are fully consolidated from the date on which control is transferred to the Group.

The subsidiaries, joint ventures and associates of Vesuvius plc and the countries in which they are incorporated are set out below. With the exception of Vesuvius Holdings Limited, whose ordinary share capital was directly held by Vesuvius plc, the ordinary capital of the companies listed below was wholly owned by a Vesuvius plc subsidiary as at 31 December 2018.

Company legal name	Registered office address	Jurisdiction
Advent Process Engineering Inc.	333 Prince Charles Drive, Welland, Ontario, L3B 5P4, Canada	Canada (Ontario)
Avemis SAS	Saint Symphorien Sur Coise (69590) au 2, Hotel d'Entreprises, ZI Grange Eglise, France	France
BMI Refractory Services Inc.	600 N 2nd Street, Suite 401, Harrisburg, PA 17101-1071, United States	US (Pennsylvania)
Brazil 1 Limited	165 Fleet Street, London, EC4A 2AE, England	England
Cookson Dominicana, SRL	Km 7 1/2, Autopista San Isidro, Edificio Modelo A, Zona Franco San Isidro, Santo Domingo Oeste, Dominican Republic	Dominican Republic
Cookson Investments (Jersey) Limited	IFC5, St Helier, JE1 1ST, Jersey	Jersey
Cookson Jersey Limited	IFC5, St Helier, JE1 1ST, Jersey	Jersey
East Moon Investment (HK Holding) Company Limited	36/F Tower Two Times Square, 1 Matheson Street, Causeway Bay, Hong Kong	Hong Kong
Flo-Con Holding, Inc.	CT Corporation, 1209 Orange Street, The Corporation Trust Company, Wilmington, DE 19801, United States	US (Delaware)
Flo-Con Systems, LLC	CT Corporation, 208 South LaSalle Street, Chicago, Cook County, IL 60604, United States	US (Illinois)
Foseco (FS) Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire, S43 4XA, England	England
Foseco (GB) Limited	165 Fleet Street, London, EC4A 2AE, England	England
Foseco (Jersey) Limited	44 Esplanade, St Helier, JE4 9WG, Jersey	Jersey
Foseco (MRL) Limited	165 Fleet Street, London, EC4A 2AE, England	England
Foseco (RUL) Limited	165 Fleet Street, London, EC4A 2AE, England	England
Foseco (UK) Limited	165 Fleet Street, London, EC4A 2AE, England	England
Foseco Canada Limited	181 Bay Street, Suite 1800, Toronto, Ontario, M5J 2T9, Canada	Canada (Ontario)
Foseco Espanola SA	5, Barrio Elizalde, Izurza, Bizkaia, 48213, Spain	Spain
Foseco Foundry (China) Limited	Room 819, Shekou Zhaoshang Building, Nanshan, Shenzhen, Guangdong, 20030, China	China
Foseco Fundición Holding (Espanola), S.L.	5, Barrio Elizalde, Izurza, Bizkaia, 48213, Spain	Spain
Foseco Holding (Europe) Limited	165 Fleet Street, London, EC4A 2AE, England	England
Foseco Holding (South Africa) (Pty) Limited	12, Bosworth Street, Alrode, Alberton, 1449, South Africa	South Africa

Company legal name	Registered office address	Jurisdiction
Foseco Holding BV	165 Fleet Street, London, EC4A 2AE, England (Branch registration)	Netherlands
Foseco Holding International Limited	165 Fleet Street, London, EC4A 2AE, England	England
Foseco Holding Limited	165 Fleet Street, London, EC4A 2AE, England	England
Foseco Industrial e Comercial Ltda	Km 15, Rodovia Raposo Tavares, Butanta Cep, São Paulo, 05577-100, Brazil	Brazil
Foseco International Holding (Thailand) Limited	170/69, 22nd Floor Ocean Tower 1, Ratchadapisek Road, Klongtoey, Bangkok, 10110, Thailand	Thailand
Foseco International Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire, S43 4XA, England	England
Foseco Japan Ltd	9th Floor, Orix Kobe Sannomiya Building, 6-1-10, Goko dori, Chuo-ku, Kobe Hyogo, 651-0087, Japan	Japan
Foseco Korea Limited	74 Jeongju-ro, Wonmi-gu, Bucheon-si, Gyeonggi-do, 14523, South Korea	South Korea
Foseco Limited	165 Fleet Street, London, EC4A 2AE, England	England
Foseco Metallurgical Inc	CT Corporation, 1209 Orange Street, The Corporation Trust Company, Wilmington, DE 19801, United States	US (Delaware)
Foseco Nederland BV	Binnenhavenstraat 20, 7553 GJ Hengelo (OV), Netherlands	Netherlands
Foseco Overseas Limited	165 Fleet Street, London, EC4A 2AE, England	England
Foseco Pension Fund Trustee Limited	165 Fleet Street, London, EC4A 2AE, England	England
Foseco Philippines Inc	Unit 401, 4th Floor 8 Antonio Centre, Prime St. Madrigal Business Park 2, Ayala Alabang Muntinlupa City, 1770 Philippines	Philippines
Foseco Portugal Produtos para Fundição Lda	Rua 25 de Abril, Lote 3, Aveleda – 4485-010 VCD, Vila do Conde, Portugal	Portugal
Foseco Pty Limited	40-46 Gloucester Boulevarde, Port Kembla, NSW, 2505, Australia	Australia
Foseco SAS	Le Newton C, 7 Mail Barthélémy Thimonnier, 77185 Lognes, France	France
Foseco Steel (Holdings) China Limited	165 Fleet Street, London, EC4A 2AE, England	England
Foseco Steel (UK) Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire, S43 4XA, England	England
Foseco Technology Limited	165 Fleet Street, London, EC4A 2AE, England	England
Foseco Transnational Limited	165 Fleet Street, London, EC4A 2AE, England	England

Company legal name	Registered office address	Jurisdiction
Foseco Vietnam Limited	717-1 Campus 02, 7th Floor, Me Linh Tower, No 2 Ngo Duc Ke Street, Ben Nghe Ward, District 01, Ho Chi Minh, Vietnam	Vietnam
HGAC Participações Limitada	Street Duque de Caxias, 563 Room 2, Centro, Barueri, SP, 06401-010, Brazil	Brazil
J.H. France Refractories Company	CT Corporation, 1209 Orange Street, The Corporation Trust Company, Wilmington, DE 19801, United States	US (Delaware)
John G. Stein & Company Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire, S43 4XA, England	England
Mainsail Insurance Company Limited	Canon's Court, 22 Victoria Street, Hamilton, HM 12, Bermuda	Bermuda
Mascinco Empreendimentos e Participações Ltda	Avenida Brasil, 49550 - parte, Distrito Industrial de Palmares – Campo, Grande – Cep: 23065-480, Rio de Janeiro, RJ, Brazil	Brazil
Mastercodi Industrial Ltda	Avenida Giovanni Gronchi, 5174, suíte 11, Vila Andrade, 05724-002, São Paulo, State of São Paulo, Brazil	Brazil
Mercajoya, S.A.	Capitán Haya, 56 - 1ºH, 28020 Madrid, Spain	Spain
Metal Way Equipamentos Metalurgicos Ltda	Estrada Santa Isabel, 7655 KM37, Bairro Do Una, Itaquaquecetuba, São Paulo – SP, CEP: 08580 000, Brazil	Brazil
Micro Jewels Limited	10 Frere Felix De Valois Street, Port Louis, Mauritius	Mauritius
Minerals Separation Limited	165 Fleet Street, London, EC4A 2AE, England	England
New Foseco (UK) Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire, S43 4XA, England	England
Process Metrix, LLC	6622 Owens Drive, Pleasanton, CA 94588, United States	US (California)
PT Foseco Indonesia	Jl Rawa 2/5, Kawasan Industri, Pulogadung, Jakarta, 13930, Indonesia	Indonesia
PT Foseco Trading Indonesia	Jl Rawa 2/5, Kawasan Industri, Pulogadung, Jakarta, 13930, Indonesia	Indonesia
Realisations 789, LLC	CT Corporation, 1209 Orange Street, The Corporation Trust Company, Wilmington, DE 19801, United States	US (Delaware)
S G Blair & Company Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire, S43 4XA, England	England
SERT-Metal SAS	3, Avenue de l'Europe, Parc, Les Pivolles', Decines-Charpieu 69150, France	France
SIDERMES Inc.	175, Calixa-Lavallée Verchêres, Québec J0L 2R0, Canada	Canada
SIDERMES Do Brasil Sensores Termicos Ltda	Estrada Municipal PDD 436, S/N, Prédio 'C', Bairro da Boa Vista, Municipio de Piedade, Estado de São Paulo, Brazil	Brazil
SIDERMES Latinoamericana CA	Zona Industrial, San Vicente Av., Anton Phillips Grupo Industrial, San Vicente Local 4, Maracay, Venezuela	Venezuela
SIDERMES S.A.	Urquiza 919 Piso 2 Rosario Santa Fe, Argentina, CP 2000	Argentina
SIDERMES S.p.A.	Via Oslavia 94, Desio (MB), 20832(1), Italy	Italy
SIR Feuerfestprodukte GmbH	Siegener Strasse 152, Kreuztal, D-57223, Germany	Germany
SOLED SAS	Centre d'Activités Economiques Zone Industrielle Franchepré 54240 Joeuf, France	France
Tamworth UK Limited	165 Fleet Street, London, EC4A 2AE, England	England
Thomas Marshall (Loxley) Limited	Beaver House, 23-38 Hythe Bridge Street, Oxford, OX1 2EP, England	England
Unicorn Industries Limited	165 Fleet Street, London, EC4A 2AE, England	England
Veservice Ltda	Av Brasil, 49550, Distrito Industrial de Palmares, Campo Grande, Rio de Janeiro, 23065-480, Brazil	Brazil
Vesuvius (Thailand) Co., Ltd	170/69, 22nd Floor Ocean Tower 1, Ratchadapisek Road, Klongtoey, Bangkok, 10110, Thailand	Thailand
Vesuvius (V.E.A.R.) S.A.	Street Urquiza, 919,Floor 2, Rosario, Provincia de Santa Fé, Argentina	Argentina
Vesuvius Advanced Ceramics (China) Co., Ltd	221 Xing Ming Street, China-Singapore Suzhou Ind Park, Suzhou, Jiangsu Province, 215021, China	China
Vesuvius America, Inc.	1209 Orange Street, Wilmington, DE 19801, United States	US (Delaware)
Vesuvius Americas Holding, Inc	Corporation Trust Center, 1209 Orange Street, Wilmington, New Castle County, DE 19801, United States	US (Delaware)
Vesuvius Australia (Holding) Pty Limited	40-46 Gloucester Boulevarde, Port Kembla, NSW, 2505, Australia	Australia
Vesuvius Australia Pty Ltd	40-46 Gloucester Boulevarde, Port Kembla, NSW, 2505, Australia	Australia
Vesuvius Belgium N.V.	Zandvoordestraat 366, Oostende, B-8400, Belgium	Belgium
Vesuvius Canada Inc	181 Bay Street, Suite 1800, Toronto, Ontario, M5J 2T9, Canada	Canada
Vesuvius Ceramics Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius China Holdings Co. Limited	Office 813, 8/F, Paul Y centre, 51 Hung To Road, Kwun Tong, Kowloon, Hong Kong	Hong Kong
Vesuvius China Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Colombia SAS	Street 90, number 13 A - 31, floor 6, Bogota, Colombia	Colombia
Vesuvius Corporation S.A.	Via Nassa 17, Lugano, CH 6900, Switzerland	Switzerland
Vesuvius CSD Sp z.o.o.	ul. Jasnagórska 11, Kraków, 31-358, Poland	Poland
Vesuvius Emirates FZE	Warehouse No: 1J-09/3, P O Box 49261, Hamriyah Free Zone, Sharjah, United Arab Emirates	United Arab Emirates
Vesuvius Europe S.A.	17 Rue de Douvrain, Ghlin, 7011, Belgium	Belgium
Vesuvius Financial 1 Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Finland OY	Pajamäentie 8D7, 00360 Helsinki, Finland	Finland
Vesuvius Foundry Products (Suzhou) Co., Ltd.	12 Wei Wen Road, China-Singapore Suzhou Ind Park, Suzhou, Jiangsu Province, 215122, China	China
Vesuvius Foundry Technologies (Jiangsu) Co. Ltd	2 Changchun Road, Economic Development Area, Changshu, Jiangsu, China	China
Vesuvius France S.A.	Rue Paul Deudon 68, Boite Postale 19, Feignies 59750, France	France
Vesuvius GmbH	Gelsenkirchener Strasse 10, Borken, D-46325, Germany	Germany

Notes to the Group Financial Statements continued

34. Investments in Subsidiaries, Joint Ventures and Associates continued

34.1 Investment in subsidiaries continued

Company legal name	Registered office address	Jurisdiction
Vesuvius Group Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Group S.A.	17 Rue de Douvrain, Ghlin, 7011, Belgium	Belgium
Vesuvius Holding Deutschland GmbH	Gelsenkirchener Strasse 10, Borken, D-46325, Germany	Germany
Vesuvius Holding France S.A.S	68 Rue Paul Deudon, BP 19, Feignies 59750, France	France
Vesuvius Holding Italia - Società a Responsabilità Limitata	Piazza Borgo Pila 40, Genoa, 16129, Italy	Italy
Vesuvius Holdings Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Ibérica Refractarios S.A.	Capitán Haya, 56 - 1ºH, 28020 Madrid, Spain	Spain
Vesuvius International Corporation	CT Corporation, 1209 Orange Street, The Corporation Trust Company, Wilmington, DE 19801, United States	US (Delaware)
Vesuvius Investments Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Istanbul Refrakter Sanayi ve Ticaret AS	Gebze OSB2 Mh. 1700., Sok No:1704/1, Cayirova, Kocaeli, 41420, Turkey	Turkey
Vesuvius Italia SPA	Piazza Borgo Pila 40, Genoa, 16129, Italy	Italy
Vesuvius Japan Inc.	Daini-Naruse Akihabara Bldg. 3F, 27-10, 1-chome, Taito, Taito-ku, Tokyo, 110-0016, Japan	Japan
Vesuvius K.S.R. Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire S43 4XA, United Kingdom	England
Vesuvius Life Plan Trustee Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius LLC	10, Ul. Kooperativnaya, Zhukovsky, Moscow, 140180, Russian Federation	Russia
Vesuvius Malaysia Sdn Bhd	Unit 30-01, Level 30 Tower A, Vertical Business Suite Avenue 3, Bangsar South, No 8 Jalan Kirinchi, Kuala Lumpur Wilayah Persekutuan, 59200, Malaysia	Malaysia
Vesuvius Management Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Mexico S.A. de C.V.	Av. Ruiz Cortinez, Num. 140, Colonia Jardines de San Rafael, Guadalupe, Nuevo León, CP 67119, Mexico	Mexico
Vesuvius Mid-East Limited	56, rd 15, Apt 103, Maadi, Cairo, Egypt	Egypt
Vesuvius Minerals Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Moravia, s.r.l	Konska c.p. 740, Trinec, 739 61, Czech Republic	Czech Republic
Vesuvius New Zealand Limited	18 Cryers Road, East Tamaki, Auckland, New Zealand	New Zealand
Vesuvius OOO	Afanasyevsky, Pereulok 41 A, Moscow, 119019, Russian Federation	Russia
Vesuvius Overseas Investments Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Overseas Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Pension Plans Trustees Limited	165 Fleet Street, London, EC4A 2AE, England	England

Company legal name	Registered office address	Jurisdiction
Vesuvius Peru SAC	Avenida el Ejercito 282, Distrito de Magdalena del Mar, provincia y departamento de Lima, Peru	Peru
Vesuvius Pigments (Holdings) Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Poland Spólka z.o.o	Ul Tyniecka 12, Skawina, 32-050, Poland	Poland
Vesuvius Ras Al Khaimah FZ-LLC	Street No. F14, RAK Investment Authority Free Zone, Al Hamra, Ras Al Khaimah, PO Box 86408, United Arab Emirates	United Arab Emirates
Vesuvius Refractarios de Chile SA	Street San Martin 870, Room 308, Tower B, Concepcion, Chile	Chile
Vesuvius Refractories (Tianjin) Co., Ltd	56, 13th Avenue, TEDA, Tianjin, 300457, China	China
Vesuvius Refractories S.r.l.	Galati, Marea Unire avenue 107, Galati county, 800329, Romania	Romania
Vesuvius Refratários Ltda	Av Brasil, 49550, Distrito Industrial de Palmares, Campo Grande, Rio de Janeiro, 23065-480, Brazil	Brazil
Vesuvius Refractory India Private Limited	Room No. 9, 3rd Floor, 7 Ganesh Chandra Avenue, Kolkata, WB 700013, India	India
Vesuvius Scandinavia AB	4, Forradsgatan, Amal, S-662 34, Sweden	Sweden
Vesuvius Solar Crucible (Suzhou) Co., Ltd.	58, KuaChun Road, Kua Tang, China-Singapore Suzou Ind Park, Suzhou, Jiangsu Province, 215122, China	China
Vesuvius South Africa (Pty) Ltd.	Pebble Lane, Private Bag X2, Olifantsfontein, Gauteng Province, 1665, South Africa	South Africa
Vesuvius SSC Sp z.o.o.	ul. Jasnogórska 11, Kraków, 31-358, Poland	Poland
Vesuvius UK Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire, S43 4XA, United Kingdom	England
Vesuvius Ukraine LLC	27, Udarnykiv Street, City of Dnipropetrovsk, 49000, Ukraine	Ukraine
Vesuvius USA Corporation	CT Corporation, 208 South LaSalle Street, Chicago, Cook County, IL 60604, United States	US (Illinois)
Vesuvius VA Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Zyalons Holdings Limited	Brown Street, Newmilns, Ayrshire, KA16 9AG, Scotland	Scotland
Vesuvius Zyarock Ceramics (Suzhou) Co., Ltd	58, KuaChun Road, Kua Tang, China-Singapore Suzou Ind Park, Suzhou, Jiangsu Province, 215122, China	China
Vesuvius-Premier Refractories (Holdings) Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire, S43 4XA, England	England
Vesv Distribution (Private) Limited	Peninsular Business Park, 17th Floor, Tower B, Ganpat Rao Kadam Marg, Lower Parel-West, Mumbai, 400013, India	India
VSV Advanced Ceramics (Anshan) Co., Ltd	Xiaotaizi Village, Ningyuan Town, Qianshan District, Anshan, Liaoning Province, 114011, China	China
Wilkes-Lucas Limited	165 Fleet Street, London, EC4A 2AE, England	England
Yingkou Bayuquan Refractories Co., Ltd	Cui Tun Village, Hai Dong Office, Bayuquan District, Liaoning Province, YingKou, 115007, China	China

34.2 Investment in joint ventures and associates

A joint venture is a type of joint arrangement whereby the parties that have joint control of the arrangement have rights to the net assets of the joint venture. Joint control is the contractually agreed sharing of control of the arrangement, which exists only when decisions about the relevant activities require unanimous consent of the parties sharing control. An associate is an entity over which the Group has significant influence. Significant influence is the power to participate in the financial and operating policy decisions of an entity, but is not control or joint control over those policies.

The Group's investments in its associates and joint ventures are accounted for using the equity method from the date significant influence/joint control is deemed to arise until the date on which significant influence/joint control ceases to exist or when the interest becomes classified as an asset held for sale. The Consolidated Income Statement reflects the Group's share of profit after tax of the related associates and joint ventures. Investments in associates and joint ventures are carried in the Consolidated Balance Sheet at cost adjusted in respect of post-acquisition changes in the Group's share of net assets, less any impairment in value. None of the joint ventures or associates are deemed individually to be material to the Group's results.

	2018 £m	2017 £m
At 1 January	17.5	18.0
Additions	—	0.4
Share of post-tax profit of joint ventures	2.8	1.3
Dividends received from joint ventures	(1.2)	(1.7)
Foreign exchange	—	(0.5)
At 31 December	19.1	17.5

Joint ventures

Set out below is the summarised financial information in respect of joint ventures. Amounts relate to the Group's share.

	2018 £m	2017 £m
Revenue	75.3	53.9
Trading profit	3.4	2.1
Net finance costs	0.3	0.1
Profit before tax	3.7	2.2
Income tax expense	(0.9)	(0.9)
Profit after tax	2.8	1.3
Non-current assets	4.2	5.9
Current assets	53.9	41.7
Non-current liabilities	—	—
Current liabilities	(39.8)	(30.8)
Net assets	18.3	16.8

The purpose of the Chinese joint venture companies is to research, develop, manufacture and sell refractory products. The role of Vesuvius is to provide technical personnel, training and access to the Group's international sales network.

Notes to the Group Financial Statements continued

34. Investments in Subsidiaries, Joint Ventures and Associates continued

34.2 Investment in joint ventures and associates continued

Name of entity	Registered address	Jurisdiction	% ownership
Angang Vesuvius Refractory Company Ltd	Taxi District, Anshan City, Liaoning Province, 114021, China	China	50
Wuhan Wugang-Vesuvius Advanced CCR Co., Ltd	Gongnong Village Qingshan District, Wuhan, Hubei Province, 430082, China	China	50
Wuhan Wugang-Vesuvius Advanced Ceramics Co., Ltd	Gongnong Village Qingshan District, Wuhan, Hubei Province, 430082, China	China	50
Beauvac Participações S/A	Street Libero Badaro, 293, cj. 20D, São Paulo, Centro, 01009-000, Brazil	Brazil	50
INTAHSA SA	Street Duque de Caxias 563, house 04, Room 01, Barueri, São Paulo, Centro, 06401-010, Brazil	Brazil	25
Newshelf 480 (Proprietary) Limited	44 Main Street, Johannesburg, 2001, South Africa	South Africa	45

Associates

Name of entity	Registered address	Jurisdiction	% ownership
Sapotech Oy	Paavo Havaksen tie 5 D, 90570 Oulu, Finland	Finland	14.90

34.3 Non-controlling interests

Non-controlling interests represent the portion of the equity of a subsidiary not attributable either directly or indirectly to the parent company and are presented separately in the Consolidated Income Statement and within equity in the Consolidated Balance Sheet, distinguished from parent company shareholders' equity.

The total profit attributable to non-controlling interest at 31 December 2018 is £6.8m (2017: £6.4m) of which £4.4m relates to Vesuvius India Ltd (2017: £4.6m). The profit attributable to non-controlling interests in respect of the Group's other subsidiaries are not considered to be material.

Name of entity	Registered address	Jurisdiction	% ownership
Vesuvius India Limited	P-104 Taratala Road, Kolkata, 700 088, India	India	55.57
Foseco India Limited	922/923, Gat, Sanaswadi, Taluka, Shirur, Pune, 412208, India	India	74.98
Foseco Golden Gate Company Limited	6 Kung Yeh 2nd Road, Ping Tung Dist, Ping Tung, 90049, Taiwan	Taiwan	51
Foseco (Thailand) Limited	170/69, 22nd Floor Ocean Tower 1, Ratchadapisek Road, Klongtoey, Bangkok, 10110, Thailand	Thailand	74
VESUVIUS CESKÁ REPUBLIKA, a.s.	Prumyslová 726, Konská, Trinec, 739 61, Czech Republic	Czech Republic	60

Details of subsidiaries exempt from audit of their individual financial statements by virtue of Section 479A of the Companies Act 2006 are disclosed in Note 6 to the Company Financial Statements.

As with Vesuvius plc, all of the above companies have a 31 December year-end.

35. Related Parties

All transactions with related parties are conducted on an arm's-length basis and in accordance with normal business terms. Transactions between related parties that are Group subsidiaries are eliminated on consolidation.

The related parties identified by the Directors include joint ventures, associates, and key management personnel. To enable users of our financial statements to form a view on the effects of related party relationships on the Group, we disclose the related party relationship when control exists, irrespective of whether there have been transactions between the related parties.

35.1 Transactions with joint ventures and associates

All transactions with joint ventures and associates are in the normal course of business. Further details of joint ventures and associates are included in Note 34.

35.2 Transactions with key management personnel

There have been no transactions with key management personnel of the Group other than the Directors' remuneration.

Directors' remuneration is disclosed in Note 8 of the Group Financial Statements and in the Directors' Remuneration Report.

35.3 Transactions with other related parties

There are no controlling shareholders of the Group as defined by IFRS. There have been no material transactions with the shareholders of the Group.

Pension contributions to Group schemes are disclosed in Note 27 of the Group Financial Statements.

Other than the parties disclosed above, the Group has no other material related parties.

36. Post Balance Sheet event

On 27 February 2019 the Group signed an agreement to acquire the entire issued share capital of CCPI Inc ("CCPI"), a specialty refractory producer focused on tundish (steel continuous casting) applications (65% of sales) and aluminium (35% of sales). CCPI is based in Ohio, USA, and will become part of the Group's Advanced Refractories business unit. The transaction values CCPI at US$43.4m (£33.1m) on a cash and debt free basis. The acquisition is expected to close within the coming week.

Company Balance Sheet

As at 31 December 2018

	Notes	2018 total £m	2017 total £m
Fixed assets			
Investment	6	**1,778.0**	1,778.0
Total fixed assets		**1,778.0**	1,778.0
Current assets			
Cash at bank and in hand		**1.7**	—
Debtors – amounts falling due within one year		**3.3**	5.1
Total current assets		**5.0**	5.1
Creditors – amounts falling due within one year			
Bank overdraft		**(0.3)**	(0.4)
Other creditors	7	**(923.9)**	(1,124.7)
Net current liabilities		**(919.2)**	(1,120.0)
Total assets less current liabilities		**858.8**	658.0
Net assets		**858.8**	658.0
Equity capital and reserves			
Issued share capital	8	**27.8**	27.8
Retained earnings		**831.0**	630.2
Total shareholders' funds		**858.8**	658.0

Company number 8217766

Under Section 408 of the Companies Act 2006, the Company is exempt from the requirement to present its own income statement. During 2018 the Company recognised a profit of £260.5m (2017: £4.3m loss).

The financial statements on pages 176 to 182 were approved and authorised for issue by the Directors on 27 February 2019 and signed on their behalf by:

Patrick André
Chief Executive

Guy Young
Chief Financial Officer

Company Statement of Changes in Equity

As at 31 December 2018

	Share capital £m	Retained earnings £m	Total £m
As at 1 January 2017	27.8	677.5	705.3
Loss recognised for the year	—	(4.3)	(4.3)
Recognition of share-based payments	—	2.6	2.6
Dividend paid	—	(45.6)	(45.6)
As at 1 January 2018	**27.8**	**630.2**	**658.0**
Profit recognised for the year	—	**260.5**	**260.5**
Purchase of ESOP shares	—	**(13.4)**	**(13.4)**
Recognition of share-based payments	—	**3.7**	**3.7**
Dividend paid	—	**(50.0)**	**(50.0)**
As at 31 December 2018	**27.8**	**831.0**	**858.8**

The Company had distributable reserves of £831.0m as at 31 December 2018 (2017: £630.2m).

Notes to the Company Financial Statements

1. General Information

Vesuvius plc ('Vesuvius' or 'the Company') is a public company limited by shares. It is incorporated and domiciled in England and Wales and listed on the London Stock Exchange. The nature of the company is a holding company. The address of its registered office is 165 Fleet Street, London EC4A 2AE.

2. Basis of Preparation

2.1 Basis of accounting

The financial statements of the Company have been prepared in accordance with Financial Reporting Standard 101, Reduced Disclosure Framework (FRS 101) and the Companies Act 2006 as applicable to companies using FRS 101. The financial statements have been prepared under the historical cost convention.

In these financial statements, the Company has applied the exemptions available under FRS 101 in respect of the following disclosures:

> A cash flow statement and related notes

> Disclosures in respect of transactions with wholly owned subsidiaries

> Disclosures in respect of capital management and financial instruments

> Disclosures in respect of fair value measurements

> The effects of new but not yet effective IFRSs

> Disclosures in respect of the compensation of key management personnel

Under Section 408 of the Companies Act 2006, the Company is exempt from the requirement to present its own profit and loss account.

The accounting policies set out below have, unless otherwise stated, been applied consistently to all periods presented in these financial statements. There were no identified critical accounting estimates or judgements.

2.2 Going concern

The Directors have a reasonable expectation that the Group and the Company have adequate resources to continue in operational existence for period of at least 12 months from the date of approval of these financial statements. The net current liabilities are due to amounts owed to subsidiary undertakings, therefore the Directors do not believe that they will affect the Company's ability to continue in operational existence. Accordingly, they continue to adopt a going concern basis in preparing the financial statements of the Group and the Company.

2.3 Accounting policy

Taxation

Both current and deferred tax are calculated using tax rates and laws that have been enacted, or substantively enacted, by the balance sheet date.

Current tax payable is based on the taxable result for the year. Deferred taxation is recognised, without discounting, in respect of all temporary differences that have originated, but not reversed, at the balance sheet date, with the exception that deferred taxation assets are only recognised if it is considered more likely than not that there will be suitable future profits from which the reversal of the underlying temporary differences can be deducted. Provision is made for the tax that would arise on remittance of the retained earnings of overseas subsidiaries only to the extent that, at the balance sheet date, dividends have been accrued as receivable. All other accounting policies are set out within the respective notes.

3. Employee Benefits Expense

	2018 £m	2017 £m
Wages & Salaries	**3.4**	3.7
Social security costs	**0.7**	0.6
Share-based payments	**1.2**	0.7
Pension costs – defined contribution pension plans	**—**	—
Total employee benefits expense	5.3	5.0

The total average number of employees for 2018 was 3 (2017: 3). As at 31 December 2018, the Company had 3 employees.

Details of the Directors' remuneration are disclosed in the Directors' Remuneration Report.

4. Audit and Non-Audit Fees

Amounts payable to PricewaterhouseCoopers LLP in relation to audit and non-audit fees are disclosed within Note 6 to the Group Financial Statements.

5. Dividends

A final dividend for the year ended 31 December 2017 of £33.8m (2016: £30.8m), equivalent to 12.5 pence (2016: 11.4 pence) per ordinary share, was paid in May 2018 (May 2017) and an interim dividend for the year ended 31 December 2018 of £16.2m (2017: £14.8m), equivalent to 6.0 pence (2017: 5.5 pence) per ordinary share, was paid in September 2018 (September 2017).

A proposed final dividend for the year ended 31 December 2018 of £37.0m, equivalent to 13.8 pence per ordinary share, is subject to approval by shareholders at the Company's Annual General Meeting and has not been included as a liability in these financial statements. If approved by shareholders, the dividend will be paid on 24 May 2019 to ordinary shareholders on the register at 23 April 2019.

6. Investment in Subsidiaries, Associates and Joint Ventures

6.1 Accounting policy

Shares in subsidiaries, associates and joint ventures are stated at cost less any impairment in value. Impairment is assessed in accordance with Note 17.1 on page 152.

6.2 Analysis of investment in subsidiaries, associates and joint ventures

	Shares in subsidiaries £m
As at 1 January 2017 and 31 December 2017	1,778.0

The subsidiaries, joint ventures and associates of Vesuvius plc, their country of incorporation and % ownership is set out in Note 34 of the Notes to the Group Financial Statements. With the exception of Vesuvius Holdings Ltd, whose ordinary share capital was directly held by Vesuvius plc, the ordinary share capital of the other companies was owned by a Vesuvius plc subsidiary as at 31 December 2018.

6.3 Audit-exempt subsidiaries

The following UK subsidiaries are exempt from audit of their individual financial statements by virtue of Section 479A of the Companies Act 2006.

Brazil 1 Limited
Foseco Limited
Foseco Technology Limited
Foseco Transnational Limited
Foseco (FS) Limited
Foseco (GB) Limited
Foseco Steel (Holdings) China Limited
Foseco (UK) Limited
John G. Stein & Company Limited
S G Blair & Company Limited
Vesuvius China Limited
Vesuvius Group Limited
Vesuvius Minerals Limited
Vesuvius Pigments (Holdings) Limited
Vesuvius-Premier Refractories (Holdings) Limited
Vesuvius VA Limited

7. Other Creditors

	2018 £m	2017 £m
Amounts owned to subsidiary undertakings	**921.7**	1,122.4
Accruals and other creditors	**2.2**	2.3
Total amounts falling due within one year	**923.9**	1,124.7

Amounts owed to subsidiary undertakings are interest free, have no fixed date of repayment and are repayable on demand.

Notes to the Company Financial Statements continued

8. Issued Share Capital

8.1 Accounting policy

Equity instruments issued by the Company are recorded at the proceeds received, net of direct issue costs.

8.2 Analysis of issued share capital

The issued and fully paid ordinary share capital of the Company as at 31 December 2018 was 278,485,071 shares of £0.10 each (2017: 278,485,071 shares of £0.10 each). 7,271,174 (2017: 7,271,174) shares were held in Treasury and 2,874,060 (2017: 877,744) shares were held by the Vesuvius Group employee share ownership plan trust (ESOP). The Company has one class of shares in issue, ordinary shares. All shareholders enjoy the same rights in relation to these shares, including rights in relation to voting at General Meetings of the Company, distribution of dividends and repayment of capital.

9. Share-based Payments

9.1 Accounting policy

The Company operates equity-settled share-based payment arrangements for its employees. Equity-settled share-based payments are measured at fair value at the date of grant. The fair value determined at the grant date takes account of the effect of market-based conditions, such as the total shareholder return target upon which vesting for some of the awards is conditional, and is expensed on a straight-line basis over the vesting period with a corresponding increase in equity. The cumulative expense recognised is adjusted for the best estimate of the shares that will eventually vest and for the effect of other non-market-based vesting conditions, such as growth in headline earnings per share, which are not included in the fair value determined at the date of grant. For grants with market-based conditions attaching to them, fair value is measured using a form of stochastic option pricing model. For all other grants, fair value is measured using the Black-Scholes option pricing model.

9.2 Profit and loss account recognition

The Company operates a number of different share-based payment schemes, the main features of which are detailed in the Directors' Remuneration Report. A total of £1.2m was charged to the profit and loss account in the year with regard to share-based payments (2017: £0.7m).

9.3 Details of outstanding options

	Outstanding awards							
	As at 1 Jan 2018 no.	Granted no.	Exercised no.	Forfeited/ lapsed no.	As at 31 Dec 2018 no.	Awards exercisable as at 31 Dec 2018 no.	Weighted average outstanding contractual life of awards years	Range of exercise prices pence
LTIP	934,918	301,901	(117,051)	(150,803)	968,965	—	5.7	n/a
Weighted average exercise price	nil	nil	nil	nil	nil	—		n/a
Other plans	—	28,246	—	—	28,246	—	2.2	n/a
Weighted average exercise price	nil	nil	nil	nil	nil	—		n/a

For options exercised during 2018, the share price at the date of exercise ranged from 568 pence to 581 pence.

	Outstanding awards							
	As at 1 Jan 2017 no.	Granted no.	Exercised no.	Forfeited/ lapsed no.	As at 31 Dec 2017 no.	Awards exercisable as at 31 Dec 2017 no.	Weighted average outstanding contractual life of awards years	Range of exercise prices pence
LTIP	1,156,560	409,453	—	(631,095)	934,918	—	4.8	n/a
Weighted average exercise price	nil	nil	nil	nil	nil	—		n/a
Other plans	8,557	—	(8,557)	—	—	—	—	n/a
Weighted average exercise price	nil	nil	nil	nil	nil	—		n/a

For options exercised during 2017 included in 'Other plans', the share price at the date of exercise was 592 pence.

Details of market performance conditions are included in the Directors' Remuneration Report.

As at 31 December 2018, the total options exercisable by all Group employees over the £0.10 ordinary shares and capable of being satisfied through new allotments of shares or through shares held by the Company's ESOP were as follows:

	Years of award/grant	Option prices	Latest year of exercise/ vesting	Number of options/ allocations outstanding
Long Term Incentive Plan	2016–2018	nil	2018/2028	2,360,478
Medium Term Incentive Plan	2017–2018	nil	2020	270,644
Deferred Share Bonus Plan	2018	nil	2020	28,246

Fair value of options granted under the LTIP during the year:

	2018 (October Grant)		2018 (March Grant)	
	EPS element	TSR element	EPS element	TSR element
Fair value of options granted	645.5p	426.0p	605.5p	368.9p
Share price on date of grant	645.5p	645.5p	605.5p	605.5p
Expected volatility	n/a	27.9%	n/a	32.1%
Risk-free interest rate	n/a	0.9%	n/a	0.8%
Exercise price (per share)	nil	nil	nil	nil
Expected term (years)	3	3	3	3
Expected dividend yield	nil	nil	nil	nil

Vesting of 50% of shares awarded is based on headline EPS growth and 50% upon the Group's three-year TSR performance relative to that of the constituent companies of the FTSE 250 (excluding investment trusts). The fair value of share options with non-market performance conditions has been calculated using the Black-Scholes option pricing model. The fair value of options with market-related performance conditions has been measured using the Monte Carlo model. Expected volatility was determined by calculating the historical volatility of the Group's share price over the 2.8 years (2017: 2.8 years) prior to the grant date for the March 2018 Grant and 2.25 years for the October 2018 Grant. The risk-free rate of return was assumed to be the yield to maturity on a UK fixed gilt with the term to maturity equal to the expected life of the option. At the discretion of the Remuneration Committee, award holders receive the value of dividends that would have been paid on their vested shares in the period between grant and vesting. Accordingly, there is no discount to the valuation for dividends foregone during the vesting period.

10. Contingent Liabilities

Where the Company enters into financial guarantee contracts to guarantee the indebtedness of other companies within its Group, the Company considers these to be insurance arrangements and accounts for them as such. In this respect, the Company treats the guarantee contract as a contingent liability until such time as it becomes probable that the Company will be required to make a payment under the guarantee. Guarantees provided by the Company as at 31 December 2018 in respect of the liabilities of its subsidiary companies amounted to £605.2m (2017: £563.4m), which includes guarantees of \$200.0m and €130.0m (2017: \$200.0m and €130.0m) in respect of US Private Placement Loan Notes and £180.8m (2017: £146.3m) in respect of drawings under the syndicated bank facility; together with £150.8m (2017: £150.8m) in relation to a guarantee provided to the Company's UK subsidiary which acts as Trustee for the Group's UK pension plan. The guarantee is over all present and future pension liabilities of the plan and the contingent liability amount represents the net deficit on a buy-out basis as shown in the most recent triennial valuation.

Vesuvius has extensive international operations and is subject to various legal and regulatory regimes, including those covering taxation and environmental matters. Several of the Company's subsidiaries are parties to legal proceedings, certain of which are insured claims arising in the ordinary course of the operations of the company involved, and are aware of a number of issues which are, or may be, the subject of dispute with tax authorities. Whilst the outcome of litigation and other disputes can never be predicted with certainty, having regard to legal advice received and the insurance arrangements of the Company and its subsidiaries, the Directors believe that none of these matters will, either individually or in the aggregate, have a materially adverse effect on the Company's financial condition or results of operations.

Notes to the Company Financial Statements continued

11. Related Parties

All transactions with related parties are conducted on an arm's-length basis and in accordance with normal business terms. Transactions between related parties that are wholly owned Company subsidiaries are not disclosed in this Note.

The related parties identified by the Directors include joint ventures, associates and key management personnel. To enable users of our financial statements to form a view on the effects of related party relationships on the Company, we disclose the related party relationship when control exists, irrespective of whether there have been transactions between the related parties.

Transactions with joint ventures and associates

All transactions with joint ventures and associates are in the normal course of business. Further details of joint ventures and associates are included in Note 34 of the Notes to the Group Financial Statements.

Transactions with key management personnel

There have been no transactions with key management personnel of the Company other than the Directors' remuneration.

Directors' remuneration is disclosed in the Annual Report on Directors' Remuneration.

Transactions with other related parties

There are no controlling shareholders of the Company as defined by IFRS. There have been no material transactions with the shareholders of the Company.

Pension contributions are disclosed in Note 27 of the Group Financial Statements.

Other than the parties disclosed above, the Company has no other material related parties.

Five-Year Summary: Divisional Results from Continuing Operations

		2018	2017	2016	2015	2014
Steel Division						
Revenue	£m	**1,236.7**	1,148.7	942.0	897.6	981.4
Trading profit	£m	**128.3**	100.4	79.2	79.5	96.4
Return on sales	%	**10.4**	8.7	8.4	8.9	9.8
Employees: year-end	no.	**7,766**	7,930	7,782	7,783	8,349
Foundry Division						
Revenue	£m	**561.3**	535.2	459.4	424.4	463.0
Trading profit	£m	**68.9**	65.1	54.1	44.5	46.4
Return on sales	%	**12.3**	12.2	11.8	10.5	10.0
Employees: year-end	no.	**3,043**	3,080	3,058	3,129	3,443

Shareholder Information

Enquiries

The share register is managed by Equiniti, who can be contacted if you have any Vesuvius shareholding queries.

Equiniti Limited
Aspect House, Spencer Road
Lancing, West Sussex, BN99 6DA
United Kingdom

Telephone*
0371 384 2335 (UK only)
+44 121 415 7047 (Outside the UK)

Website www.shareview.co.uk

For the hard of hearing, Equiniti offers a Textel service which can be accessed by dialling 0371 384 2255 (or +44 121 415 7028 if calling from outside the UK).

Any shareholder enquiries not related to the share register should be sent by email to shareholder.information@vesuvius.com or by letter to the Company Secretary at the registered office.

Registered Office and Group Head Office

Vesuvius plc
165 Fleet Street
London EC4A 2AE
United Kingdom

Tel +44 (0)20 7822 0000

Registered in England & Wales No. 8217766
LEI: 213800ORZ521W585SY02

Vesuvius Website

Shareholder and other information about the Company, including details of the current and historic share price, can be accessed on the Vesuvius website, www.vesuvius.com.

Shareview and Electronic Communication

Equiniti's website, www.shareview.co.uk, enables shareholders to access details of their shareholdings online. The website provides answers to frequently asked questions and information useful for the management of investments. To access online information on your shareholding, you will require your shareholder reference number, which can be found at the top of your share certificate or dividend confirmation.

Shareholders can register to receive shareholder communications electronically, including the Company's Annual Report and Financial Statements, rather than in paper form, using Shareview. The registration process requires shareholders to input their shareholder reference number. To receive shareholder communications in electronic form, shareholders should select 'email' as their mailing preference. Once registered, shareholders will receive an email notifying them each time a shareholder communication has been published on the Vesuvius website.

Share Dealing Service

The Company's shares can be traded through most banks, building societies or stockbrokers. UK resident shareholders can also buy and sell shares online or by telephone using Equiniti's Shareview dealing service by either logging on to www.shareview.co.uk/dealing or by calling 0345 603 7037 between 8.00 am and 4.30 pm on any business day (excluding public holidays in England and Wales). The shareholder reference number (found at the top of your share certificate or on your dividend confirmation) is required to use the dealing service.

ShareGift

ShareGift, the charity share donation scheme, is a free service for shareholders wishing to give shares to charitable causes. It is particularly useful for those shareholders who may wish to dispose of a small quantity of shares where the market value makes it uneconomic to sell on a commission basis. Further information can be obtained from ShareGift's website at www.sharegift.org; telephone +44 (0)20 7930 3737; or by emailing help@sharegift.org.

Dividend Reinvestment Plan

Equiniti offers a dividend reinvestment plan, through which shareholders can use any cash dividends declared to buy additional shares in Vesuvius. Further details, including how to sign up, and the terms and conditions of the plan, are available on Equiniti's website, www.shareview.co.uk or by calling the Share Dividend Helpline on 0371 384 2268 (or +44 121 415 7173 if calling from outside the UK).

Overseas Payment Service

Equiniti provides a dividend payment service in over 90 countries that automatically converts payments into local currency and pays the funds into a shareholder's bank account. Further details, including an application form and the terms and conditions of the service, are available on www.shareview.co.uk or from Equiniti by calling +44 (0)121 415 7047 or writing to Equiniti, Aspect House, Spencer Road, Lancing, West Sussex, BN99 6DA, United Kingdom (please quote Overseas Payment Service, the Company's name and your shareholder reference number).

Financial Calendar

2019 Annual General Meeting	15 May 2019
Announcement of 2019 half-year results	25 July 2019

* Lines are open Monday to Friday 8.30 am to 5.30 pm (excluding public holidays in England and Wales).

Analysis of ordinary shareholders

As at 31 December 2018	Investor type: Private	Investor type: Institutional and other	Total	Shareholdings: 1–1,000	Shareholdings: 1,001–50,000	Shareholdings: 50,001–500,000	Shareholdings: 500,001+
Number of holders	2,500	574	3,074	2,405	457	137	75
Percentage of holders	81.33%	18.67%	100%	78.24%	14.87%	4.45%	2.44%
Percentage of shares held	0.48%	99.52%	100%	0.13%	1.40%	8.85%	89.62%

Share Fraud – Spot the Warning Signs

Investment scams are designed to look like genuine investments.

Have you been...

> Contacted out of the blue

> Promised tempting returns and told the investment is safe

> Called repeatedly

> Told the offer is only available for a limited time?

If so, you might have been contacted by fraudsters.

How to Avoid Share Fraud

1. Reject cold calls

If you have been contacted by telephone, email or post, or via a third party or at a seminar or exhibition, with an offer to buy or sell shares, the chances are that it's a high-risk investment or a scam. You should treat any offer with extreme caution. The safest thing to do is to ignore the approach and if you were contacted by phone to hang up on the call.

2. Check if the firm is authorised by the Financial Conduct Authority (FCA) and recorded on the Financial Services register at https://register.fca.org.uk/

The Financial Services Register is a public record of all the firms and individuals in the financial services industry that are, or have been, regulated by the Prudential Regulation Authority and/or the FCA.

3. Get impartial advice

Think about getting impartial financial advice before you hand over any money. Seek advice from someone unconnected to the firm that has approached you.

Reporting a Scam

If you suspect that you have been approached by fraudsters please tell the FCA by contacting them on 0800 111 6768 (or +44 20 7066 1000 from outside the UK) or by using the share fraud reporting form at www.fca.org.uk/scams, where you can find out more about investment scams.

If you have lost money to investment fraud, you should report it to Action Fraud on 0300 123 2040 or online at www.actionfraud.police.uk.

Find out more at www.fca.org.uk/scamsmart.

Glossary

5S	Five Steps to improve housekeeping and therefore workplace safety and efficiency: separate, sort, shine, standardise and sustain
8D	Eight Disciplines: an eight-step methodology to resolve customer, supplier and internal quality issues
AGM	Annual General Meeting
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
Company	Vesuvius plc
DSBP	Deferred Share Bonus Plan
DTR	The Disclosure and Transparency Rules of the UK Financial Conduct Authority
EBITDA	Trading profit before depreciation and amortisation of non-acquired intangible charges
EMEA	Europe, Middle East and Africa
EPS	Earnings per share
EU	European Union
FRC	Financial Reporting Council
FRS	Financial Reporting Standards
FTSE 250	Equity index whose constituents are the 101st to 350th largest companies listed on the London Stock Exchange in terms of their market capitalisation
FX	Foreign exchange
GHG	Greenhouse gas
Group	Vesuvius plc and its subsidiary companies
IAS	International Accounting Standard
IFRS	International Financial Reporting Standards
KPI	Key Performance Indicator
LTI	Lost time injury
LTIFR	Lost time injury frequency rate, a KPI which calculates the number of LTIs per million hours worked
Median	The middle number in a sorted list of numbers
NAFTA	The area to which the North American Free Trade Agreement applies
Ordinary share	An ordinary share of 10 pence in the capital of the Company
R&D	Research and development
TSR	Total shareholder return
TurboS	The Vesuvius safety training programme
UK GAAP	UK Generally Accepted Accounting Principles
VSP	Vesuvius Share Plan

Photographed by Samuel Dhote, the portraits featured in this Annual Report celebrate the Vesuvius team from our locations around the world.

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Vesuvius plc
165 Fleet Street
London
EC4A 2AE

T +44 (0)20 7822 0000
www.vesuvius.com

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Business overview video
CEO's strategy and performance video
Vesuvius employee career journey videos