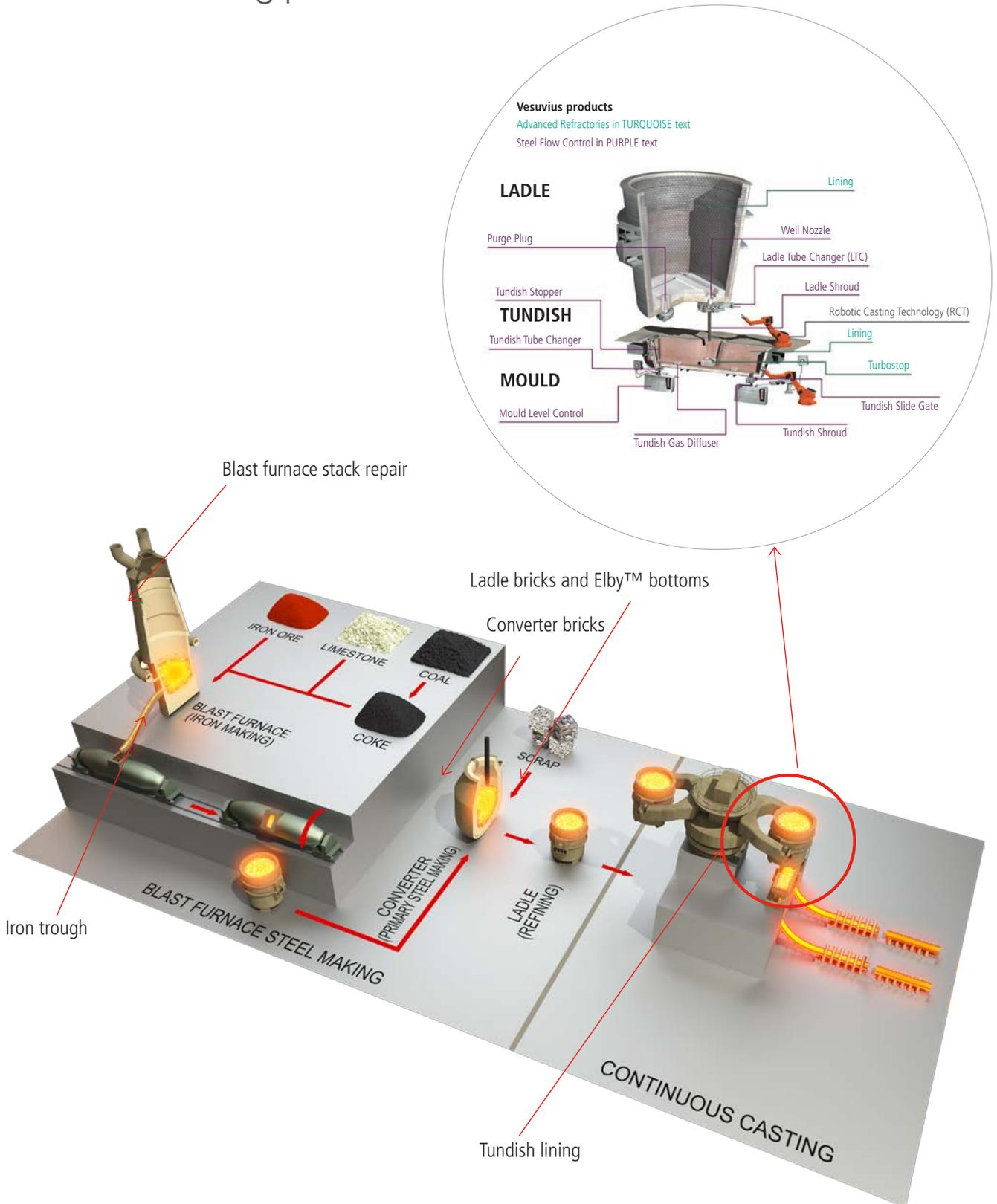


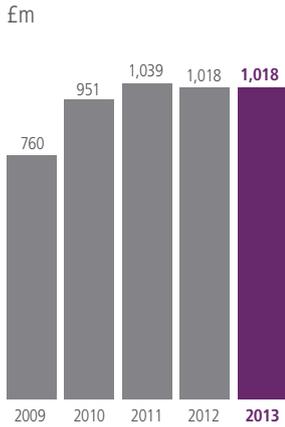
# Steel Division

Flow Control and Advanced Refractories products in the steel manufacturing process

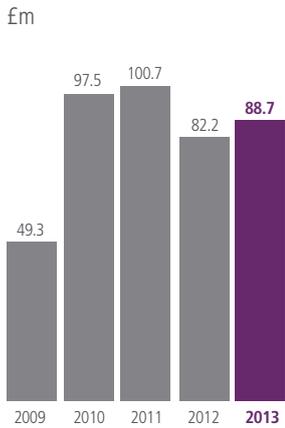


We supply the global steel industry with products that increase efficiency and quality in the continuous casting process

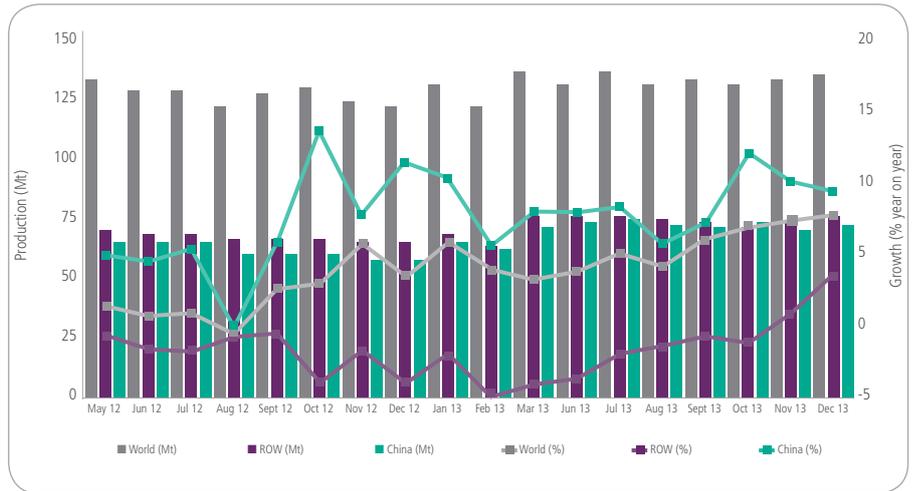
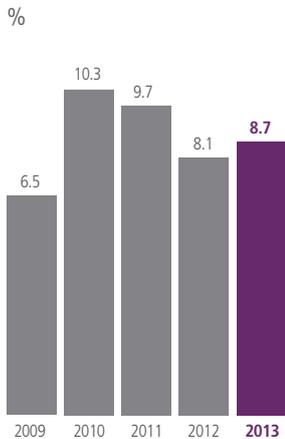
**Steel Revenue<sup>1</sup>**



**Steel Trading Profit<sup>1</sup>**



**Steel Return on Sales<sup>1</sup>**



**Steel Industry Overview in 2013**

According to the World Steel Association (“WSA”) global steel production (see above chart) grew 3.5% in 2013 vs 2012 to 1,607.2 megatonnes (“Mt”), with China experiencing growth of 9.9% to 779Mt; global production, excluding China, was flat at 828.2Mt. The growth came mainly from Asia, the Middle East and India whilst crude steel production in the European Union, South America and NAFTA decreased compared with 2012.

Growth compared to the prior year was stronger, in the second half of 2013 than the first half, partially due to the fact the first half of 2012 was very strong with the second half experiencing a substantial reduction in production.

Asia’s share of world steel production, driven predominantly by China, increased slightly from 65.4% to 67.3% in 2013. Growth in China was substantial albeit that month-on-month declines from Q3 2013 resulted in a reduction in Chinese growth in late 2013 which is expected to continue into 2014.

**Market View 2014 and Beyond**

Despite continued volatility and limited market visibility the perspectives for steel production in 2014 are generally positive. The WSA has predicted a 3.3% increase in steel demand in 2014. Our expectations are that steel production increases will be broadly in line with this increase in demand, with modest growth in China and a return to growth across the developed world.

**The Steel Process and Vesuvius**  
**Vesuvius in the Steel Industry**

The two product lines that comprise the Steel division are Steel Flow Control and Advanced Refractories.

Flow control products are used in the continuous casting process which enables steel manufactured in a blast furnace or electric arc furnace to be cast directly into blooms or slabs without interruption (i.e. be continuously cast) and to remain protected from the atmosphere between tundish and mould (i.e. be enclosed), thus significantly reducing the levels of contamination.

NOTE  
1 At constant 2013 currency

## Steel Division continued

Vesuvius products have a short service life (often a matter of a few hours) due to the significant wear caused by the high temperature, high thermal cycling and the erosive and corrosive environment in which they operate.

They represent a relatively small proportion of the input costs of our customers (e.g. less than 1% for a steel producer) but their performance is critical to their production processes. Therefore, customers demand high quality and consistent products for these most demanding of applications to ensure maximum safety, quality and productivity. Vesuvius is a global leader in the 'metal flow' market. We achieve this by working closely with our customers to develop customised refractory systems, services and technologies that enable them to improve their performance.

Vesuvius also supplies the steel industry and other process industries with advanced refractory materials used for lining vessels such as blast furnaces, ladles and tundishes to enable them to withstand high temperatures and/or corrosive attack.

As both flow control and advanced refractory products are consumables, steel production volumes (and, in particular, production of higher quality steels using the enclosed continuous casting process) are the critical driver of demand for the Vesuvius Steel division.

Steel producers are continually striving to enhance the enclosed continuous casting process to improve production through less downtime, to reduce labour costs, to increase steel quality, reduce energy usage, and reduce reworking through thinner slab casting.

Vesuvius has developed close, collaborative relationships with industry-leading customers and Original Equipment Manufacturers ("OEMs") and, due to the specialised nature of its products and the high volume in which they are consumed, has developed a global network closely aligned with its customers' locations, with 65 major manufacturing facilities across the world. Through this network we develop customised refractory systems, services and technologies that enable our customers to enhance performance.

Customers of the Steel division are principally steel producers themselves, but also include the manufacturers of steel production equipment.

Around 10% to 15% of revenues in the Steel division arise from non steel-related process industries supplied by the Advanced Refractories product line.

### The Vesuvius Product and Service Offering

Our products are highly specialised consumable ceramics, including shrouds, stoppers, nozzles, slide gates, lining refractories (monolithic and pre-cast) and fluxes for the steel production industry. In addition, we supply automation equipment and sensors used to control, monitor and regulate the flow of molten metal. This technical and application expertise is a significant part of our product offering giving us a distinct competitive advantage.

### Steel Division Performance

In 2013, the Steel division's revenue of £1,018 million comprised £556 million for Steel Flow Control and £462 million for Advanced Refractories

### Steel Flow Control

Steel Flow Control products supplied by Vesuvius include: the Viso™, isostatically pressed alumina graphite and VAPEX® extruded clay graphite product ranges, used to channel and control the flow of steel from ladle to tundish and from tundish to mould; slide-gate refractories, including nozzles, plates and speciality shapes for furnace, ladle and tundish slide-gate systems; Accumetrix® temperature measurement and RADAR™ slag level detection; tundish and mould fluxes; purging systems and control devices to monitor and regulate steel flow into the mould. These products have been designed to resist extreme thermo-mechanical stresses and corrosive environments. They must withstand temperature changes from ambient to 1,600°C in just a few minutes, while resisting liquid steel and slag corrosion for several hours. In addition, the ceramic parts in contact with the liquid steel must not in any way contaminate it. To bring all of these characteristics together in the same products, Vesuvius has designed composite parts combining a variety of special materials. The majority of these products are consumed during the process of making steel and some must be replaced frequently. Demand for Vesuvius' products is thus primarily linked to steel production volumes.

In addition to a large range of products and equipment Vesuvius has developed 'state-of-the-art' global modelling and simulation capabilities which enable the development of custom refractory designs to optimise the flow of molten metal within the tundish and mould. More details on this are contained in the Innovation section on pages 34 and 35.

Global steel production represents almost 100% of the end-market for Steel Flow Control products and services. There is therefore a strong correlation between steel production and Steel Flow Control revenues. Global steel production in the first half of the year was approximately 2% higher than the first half of 2012, mainly driven by China. However, from September onwards there was a strengthening in steel production compared with 2012, resulting in higher Steel Flow Control revenues.

Revenue of £556 million was 2.7% higher compared with 2012. On an underlying basis (being revenue at constant exchange rates and adjusted for the acquisition of Metallurgica in March 2012), revenue was up 0.7% on the prior year.

Prices for raw materials, particularly for graphite and zirconia, remained relatively stable during 2013. However, significant currency devaluation in both Brazil and India adversely impacted our input costs. Consequently, price increases were initiated at the end of 2013 to compensate for higher material costs but, due to timing, will not have a positive impact until 2014.

We maintain our technology leadership in flow control by continuing to leverage our understanding of customer processes to provide products and solutions that meet customers' needs in terms of safety, quality, reliability, productivity and ergonomics.

Vesuvius flow control products can greatly influence the quality of our customers' products and the efficiency of their processes. Recently introduced new products and solutions are developed with value creation for our customers in mind, as demonstrated by our innovative technical solutions around the continuous caster. The latest robot compatible tundish tube changer (SEM3085) and the first products of our new Robotic Casting Technology range continue to perform well with the first fully robotic installation now fully operational in Korea.

A number of significant contracts for the SEM3085 have also been secured in Europe, China and Vietnam.

Maintaining a strong regional manufacturing capability combined with local development centres, including physical and computational fluid dynamic modelling, represents a key element in our strategy of capturing the growth in developing markets. Previously announced capacity expansion projects in Eastern Europe and South America were successfully completed in 2013. Equipment installation, commissioning and production ramp-up of the Isostatic capacity expansion in Trinec, Czech Republic, was completed successfully in the second half of 2013. The new manufacturing facility in Brazil to improve the efficiency of raw material processing and sourcing was completed with commissioning and production ramp-up commencing in the last quarter of 2013. This will facilitate greater use of local raw materials, allowing shorter leadtimes, a reduction in working capital, improved production flexibility and allow us to maintain our cost leadership.

Vesuvius' presence at our customer sites and our intimate understanding of their processes places Vesuvius in a strong position to build a technical services offering. The integration of SERT, AVEMIS and Metallurgica combined with Vesuvius' refractory and flow control systems knowledge and expertise is playing a key role in supporting this last strategic pillar. In particular, the acquisition of Metallurgica, and the benefits that we have been able to deliver in this business within Vesuvius, shows the opportunities that can be captured from the acquisition of complementary businesses.

We have developed new products and capabilities to monitor flow characteristics throughout various points in the steel casting process and data feedback systems and control schemes for real-time optimal flow control throughout the entire casting sequence.

### Advanced Refractories

Under new management, Advanced Refractories has embarked on a process of culture change by introducing value selling, training, brand and product rationalisation and multi-branding. We have also exited low-margin and high risk business associated with labour-only construction projects. The focus has changed to providing best-in-class products and application equipment supported by highly experienced and trained technical support personnel. Quality initiatives have also improved performance which has assisted in the margin improvement we have seen within this business during the year.

A restructuring was undertaken in NAFTA and South America to align our organisation with customer requirements, as well as investment in growth areas in Central Europe, and the Middle East and North Africa ("MENA").

Investment has also been made in a new production facility in Ras Al Khaima in the United Arab Emirates and also at Port Kembla in Australia, as well as capabilities for tapchill clay production in India. These new facility investments are on schedule to achieve their projected returns, despite a considerable downturn in the Australian market. Furthermore, Vesuvius Advanced Refractories has recently acquired its production site in Sao Paulo and invested in new senior management to assist in our strategy of growth in developing markets. Finally, investment in a new laboratory in India has been approved and construction is expected to begin in early 2014.

Revenue of £462 million was 3.1% lower compared with 2012. On an underlying basis revenue was up 3.5% reflecting the restructuring undertaken to divest non-core activities and to realign our business.

As has been detailed elsewhere, the Group's strategy is based upon five major objectives. The following provides more information about Advanced Refractories' progress with these objectives.

Advanced Refractories continues to focus on technology leadership with:

- The Gard™ brand that has established a best-in-class product offering in each market served
- Application operators who are trained and certified in correct application practice using state-of-the-art equipment specific to the required application
- Total Tundish Management, supported by advanced simulation techniques, which assists our customers in ensuring optimum tundish design and associated steel cleanliness
- Automated robotic application, used to ensure safe and consistent application of our advanced refractories in the tundish
- The Elby™, our Engineered Ladle Bottom Yield programme, which has rapidly gained acceptance at major forward-thinking steel plants. As a result Elby™ production capacity was doubled in the USA with investment in UK and German precast plants currently being planned.

Value creation for our customers is a fundamental focus. It is critical that our technical customer-facing colleagues understand the cost and quality drivers of our customers. This continued high level interaction with our customers is key to meeting their requirements. Customer needs are communicated through to the organisation in R&D as well as reflected in training sessions carried out with key customers. Demonstrating this value creation objective, Advanced Refractories enjoys many Total Material supply contracts under which the customer hands over their entire refractory needs to Vesuvius who takes full responsibility for cost and consistency.

Lithogard™ for the cement industry and Lavagard™ in iron production are two examples of recently launched solutions that drastically reduce overall monolithic refractory consumption and increase up-time associated with these industries. When Elby™ is employed, yield improvements of up to 4% have been identified in many customers.

## Steel Division continued

In a very competitive environment, Vesuvius maintains its focus on cost leadership. The global purchasing organisation only deals with approved suppliers and is constantly looking at opportunities to ensure consistent high quality raw materials with long-term pricing stability. Whilst maintaining consistent quality, dual sourcing of materials is an active ongoing initiative.

The technical services offering of Advanced Refractories is of paramount importance in differentiating us from low-tech commodity suppliers with limited technical support. Recent progress in laser measuring techniques coupled with intelligent camera systems and temperature measurement have enabled us to identify steel cleanliness numerically together with safety risks associated with ladle wear and inclusion reduction. Due to the exceptional quality of our magnesium carbon bricks, capacity was increased by 25% to support this objective and also to support the growing market demand.



**Pictured:**  
An ELBY™ ladle bottom.

### China

A new management structure has been created and implemented in the Steel division in China to drive business growth in this developing market, together with a new overall organisation structure reflecting the new market environment as China moves from a fast capacity growth market to a position of overcapacity.

In 2013 a quality programme was started to improve performance in this area. This has required investment in a new quality team and the introduction of updated quality programmes in several manufacturing plants in China.

After a period of reducing revenue in 2013 Vesuvius achieved a small revenue growth in China. In addition, the profitability improved in the year, by coupling a cost reduction programme and an adjustment of the manufacturing operation footprint with steps forward in quality to meet the current and projected market demand.

### China Market Environment

Whilst the overall steel market in China continued to grow from 2012 to 2013, the strong focus by the central government on environmental issues favours production at new mills over older production sites. More environmentally friendly products and processes are being stipulated, which are beneficial to Vesuvius although these developments are being countered by the need to maintain strong employment prospects in traditional manufacturing areas.

Within the Chinese market production volume exceeded 750Mt in 2013, although in 2013 the second half volumes were stronger than the first half of the year. We believe that 2014 will see a modest growth in steel production although there is estimated to be significant overcapacity of crude steel production in the China market.

Due to this overcapacity the Chinese steel price is under severe downward pressure. As a result, some cash shortages have been experienced throughout the steel industry and have lengthened payment terms and put pressure on receivables.