

MANGANESE

By Ian Robinson

The world steel boom continued to drive manganese demand during 2004. China's voracious appetite for steel, fuelled by its burgeoning economy, led to a second consecutive annual increase of over 20% in steel production - by 23.2% to 272 million tonnes (Mt). The importance of China as the world's leading steel producer and, therefore, as the world's leading consumer of manganese, is illustrated by the fact that in 2004 its production was well over twice that of Japan, the world's second-largest producer, with a production of nearly 113 Mt in 2004. In 2004, China's share of total world steel production rose to over a quarter (26.3%) compared with 23.3% in 2003.

Although not on the same scale as China, most other major steel-producing countries also recorded substantial increases in production in 2004 and, excluding China, production in the rest of the world grew by 4.5%, thereby boosting worldwide demand for manganese alloys.

In a paper titled 'Manganese - a Worldwide Industry Overview' presented at the 6th Asian Ferro-Alloys Conference held in Hong Kong in March 2005, market research analyst Damien Francaviglia of the International Manganese Institute (IMI) estimated that world manganese alloy production in 2004 rose by 14% over 2003 to reach a level of 10.4 Mt. This figure comprised 5.9 Mt of silicomanganese, 3.55 Mt of high-carbon (HC) ferromanganese (over 2% carbon) and 925,000t of refined ferro-manganese.

The strong demand for manganese to supply the world steel industry resulted in an escalation in the prices of manganese alloys during the first quarter of 2004 and the *Metal Bulletin* quotations for silicomanganese and HC ferromanganese in Europe more than doubled to the ranges €1,250 - €1,350/t and €1,100 - €1,200/t, respectively. Supply problems also contributed to the rise in prices as the only producer of manganese alloys in the US, Eramet's plant at Marietta in Ohio, experienced technical problems, which limited its production.

However, the increase in production and supplies of manganese alloys outpaced the growth in demand, and imports from China into the EU rose well above the levels in 2003 as Chinese producers were attracted by the high prices available in Europe, partly reflecting the strength of the euro. Large quantities of alloys also entered the EU from former Soviet Union countries - Ukraine, Russia and Kazakhstan. According to IMI estimates, a deficit of 52,000 t in the world supply-demand balance in the first quarter of 2004 was converted into a surplus of 131,000 t in the fourth quarter, resulting in a sharp fall in prices which brought down the *Metal Bulletin* quotations for silicomanganese and HC ferromanganese in

Europe to the ranges of €700-€750/t and €800-€900/t, respectively, at the end of February 2005.

Manganese alloys

China is the world's largest producer of manganese ferro-alloys. According to Mr Francaviglia's estimates, China produced a total of 3.16 Mt of manganese ferro-alloys in 2004, representing 36% of total world production of 10.4 Mt. The second-largest producing region comprised the CIS countries, with a total production of 2.01 Mt, 19.2% of world production. The EU was in third place with a production of 1.31 Mt, or 12.6% of world production.

Asia's share of world production of manganese ferro-alloys has grown since 2000, in tandem with the growth in its share of world steel production. According to another speaker at the 6th Asian Ferro-Alloys Conference, Toshimi Nakada of Japan's Nippon Denko Co, the growth in Asia's share of world steel production which rose from 38% in 2000 to 46% in 2004 has been surpassed by the increase in its share of world production of manganese alloys which rose from 40% to 49% over the same period.

China is the dominant producer of manganese alloys in Asia, and in 2004 it contributed some 73% of total Asian production, followed by India (12%), Japan (10%) and South Korea (5%). China produced 3.76 Mt, in 2004, of which almost 2.39 Mt (63%) was silicomanganese. Exports totalled 996,000 t, equivalent to over 25% of output. Like China, India also produced over half its total manganese alloy production of 586,000 t in the form of silicomanganese, and was also a significant exporter of manganese alloys. These totalled 114,000 t, equivalent to about 20% of total production.

In contrast, Asia's third-largest producer, Japan, with a total manganese alloy production of 514,000 t, produced predominantly HC ferromanganese (68% of total production) and is a large importer, rather than an exporter of manganese alloys. In 2004 Japan imported a total of 348,000 t of manganese alloys, of which 302,000 t (87%) was silicomanganese.

The boom in Asian production of manganese alloys is expected to continue. In November 2004 the chief of sales at the ferro-alloys and minerals division of Tata Steel, Gautam Kumar, predicted that Indian alloy production would rise by 20% from 540,000 t in 2003/04 to 655,000 t in 2004/05. The expansion in Indian manganese alloy production in India reflects the expected boom in its steel production, and one of the major factors driving the production of manganese alloys in India is its production of low-nickel austenitic stainless steels where manganese is added to substitute for the more expensive nickel.

For the first time, Japanese companies initiated moves to become directly involved in the production of manganese alloys in China. In mid-2004, Japan's largest ferro-

alloys producer, Nippon Denko, announced plans to form a joint venture with China's Jinzhou Ferro-Alloy Works to produce silicomanganese in Liaoning province in northeast China. The new plant will have an annual capacity of 50,000 t when commissioned in mid-2005. Production from this project will replace production from Nippon Denko's Hidaka plant in Hokkaido, Japan, which will close in 2006.

Soon after the Nippon Denko announcement, two other Japanese companies, JFE Steel and Mitsui, announced plans for a joint venture with China's Erdos Group Corp to build and manage a silicomanganese plant in Inner Mongolia. The plant would ultimately have an annual capacity of 150,000 t of silicomanganese, of which some 100,000 t would be supplied to JFE Group in Japan. The Japanese partners envisage that ore for the project will be sourced from Australia, Brazil or South Africa.

Production capacity of manganese alloys increased in Georgia when the Zestafoni ferro-alloys plant opened a new furnace to bring its annual production capacity of medium carbon (MC) ferromanganese and silicomanganese up to a level of 420,000 t.

In Europe, Anglo-Dutch steel producer Corus signed a three-year contract in August 2004 with Brazilian raw materials producer CVRD for the supply of 30,000 t/y of ferromanganese.

Manganese Ore

According to IMI estimates, world production of manganese ore rose by 19% in 2004 to 29.4 Mt, with a total manganese (Mn) content of 10.3 Mt. Manganese ore is classified into three grades on the basis of its Mn content – high grade with over 44% Mn, mid grade with 30-44% Mn and low grade with less than 30%. World production in 2004 comprised 33% high grade, 30% mid grade and 37% low grade. The production of high-grade ore showed the largest increase in 2004 of 30%, compared with 15% for low grade and zero growth for mid grade.

The five largest-producing countries in 2004 were South Africa, China, Australia, Gabon and Brazil. The top five second-tier producers were India, Ukraine, Ghana, Kazakhstan and Mexico. Gabon, Australia and South Africa are predominantly high-grade producers; Brazil, India, Kazakhstan and Mexico are mid grade producers; and China, Ukraine and Ghana are low-grade producers.

The 'Other Asia' region (predominantly Australia) achieved the largest year-on-year production increase in 2004, rising by 42%. This growth was driven by Australia's relative proximity to China, which experienced a spectacular rise of 41% in demand for manganese ore to 3.76 Mt (Mn content). Ore production in China, Africa (predominantly South Africa and Gabon) and India all recorded substantial increases – of 16%, 18% and 13% in terms of gross weight. The increase in

production in India was driven by the rise in domestic production of manganese alloys but for the first time India's alloy producers also ordered some 100,000 t of high-grade ore (48-52% Mn with low phosphorus) from South Africa, Gabon, Australia and Brazil to supplement their supplies of domestic ore. Demand in Europe also rose sharply by 44%, mainly in response to a rise in production of silicomanganese.

The boom in demand for manganese and the outlook for continuing high levels of demand has triggered expansion plans by producers in Gabon, South Africa, India and Australia.

The Manganese Division of French ore and alloys producer Eramet recorded a sensational increase in its operating profit which rose to €129 million in the first half of 2004 compared with only €3 million in the first half of 2003. The high prices for manganese alloys in the second quarter of 2004 made a major contribution to the profit. Eramet has announced plans to increase plant capacity at its mine at Moanda in Gabon from the current level of 2 Mt to 3 Mt by 2006.

In South Africa, ore production has increased but production of alloys remains static. This reflects the relatively high costs of producing manganese alloys in South Africa owing to the shortage of domestic coke and the high cost of imported coke as well as the limited range of ore types mined domestically which makes it difficult for alloy producers to achieve optimum blends of ore for smelting. In the financial year ended June 30, 2004, BHP Billiton produced a total of 5 Mt of ore from its mining operations in South Africa and Australia, representing a rise of over 20% from 4.1 Mt during the previous financial year, but production of manganese alloys remained at the same level of 0.7 Mt. South Africa's second manganese producer, Assmang, increased sales of ore by 16% to 767,986 t (excluding inter-Group sales to its Cato Ridge works) during the second half of calendar 2003 to the second half of 2004 but sales of manganese alloys declined by 7% to 105,272 t.

Assmang has been building relationships with selected customers in China who have found its ore to be "highly acceptable" in both electric and blast furnaces. The company's largest shareholder, African Rainbow Minerals (ARM) announced in April 2005 that the company might double production of ore by 2013 in order to supply Chinese demand. These developments indicate that South Africa's future role as a supplier of manganese to the international markets may be orientated more towards ore than to alloy production.

India's production of all grades of manganese ore rose only slightly in 2003/04 to 1.74 Mt compared with 1.68 Mt in 2002/03. State-owned Manganese Ore India Ltd (MOIL), the country's largest producer of high-grade ore, was forced to raise its prices to levels which hurt the alloy producers because, as a public sector company, it is obliged to sell its output by tender at the highest price. As a result of

the shortage and high prices of domestic ore, India may be forced to import ore on a regular basis unless there is a substantial rise in domestic production. India has large ore reserves of 406 Mt, which provide considerable potential for expansion of production.

Chinese imports of manganese ore surged by 62% year-on-year to 3.71 Mt during the first ten months of 2004, with Australia supplying nearly a third – 1.17 Mt. This strong demand from China and growing demand from India prompted existing and new producers in Australia to formulate plans to raise production in order to be able to continue to supply a large share of the growing Asian demand for imported high grade ore.

In September 2004, the manganese trading group OM Holdings (OMH) approved in principle the development of the 545,000 t/y Bootu Creek mine in the Northern Territory. Bootu Creek, owned 75% by Singapore-based OMH and 25% by Groote Eylandt Mining Co (Gemco), will produce 415,000 t/y of lump ore and 130,000 t/y of fines. The first shipments were scheduled to begin in June 2005.

In December 2004, Consolidated Minerals NL announced its intention to increase production at its Woodie Woodie mine in the Pilbara Range in Western Australia to 1 Mt/y after having just completed an upgrade to increase production by 200,000 t/y to 800,000 t/y. The company sells the bulk of its production to Chinese steelmakers through a sales agreement with Hong Kong trading house Noble Resources, which owns a 15% share in the company.