



2008 Minerals Yearbook

MANGANESE [ADVANCE RELEASE]

MANGANESE

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In 2008, U.S. manganese apparent consumption was an estimated 868,000 metric tons (t), an 11% decrease from the revised amount of 975,000 t in 2007 (table 1). Decreases in manganese ore and high-carbon ferromanganese shipments from the U.S. Government's National Defense Stockpile (NDS) accounted for the fall in apparent consumption.

Manganese imports (table 6) increased 6% on a content basis to 930,000 t compared with those of 2007, based on U.S. Census data for manganese ore, ferromanganese, and silicomanganese, and the stoichiometric ratios for manganese dioxide, manganese metal, and potassium permanganate. Manganese exports increased by 21% to 58,500 t compared with those of 2007 (48,400 t) on a content basis, based on the typical manganese contents of the materials as calculated in table 4.

In 2008, the annual average domestic price of ore increased by 292% from the revised price of 2007, and the average prices of manganese ferroalloys rose while that of manganese metal fell. The benchmark price range of metallurgical-grade ore increased by 314% to 413% internationally. Average spot-market prices for high- and medium-carbon ferromanganese and silicomanganese increased from those in 2007 by 92%, 103%, and 31%, respectively. The average spot market price for manganese metal decreased slightly from that in 2007.

In 2008, sales of manganese materials from the NDS reduced the Government's inventory of manganese by 8% (content basis), leaving an inventory of about 42% of the annual apparent consumption. The larger disposals (reported sales) were of high-carbon ferromanganese and natural battery-grade ore.

World production of manganese ore in 2008 rose by 8% on a gross weight basis and by 6% on a contained-weight basis, compared with that in 2007 (table 8). China was the leading producer on a gross weight basis; South Africa was the leading producer on a contained-weight basis. Combined world production of ferromanganese and silicomanganese fell slightly to 13.2 million metric tons (Mt) on a gross weight basis compared with the revised amount in 2007 (table 9). China was the leading producer of these manganese ferroalloys.

Manganese is essential to iron and steel production by virtue of its sulfur-fixing, deoxidizing, and alloying properties. Steelmaking, including its ironmaking component, accounted for most of the reported domestic manganese consumption, currently in the range of 77% to 90% of U.S. apparent consumption. Among a variety of other uses, manganese is a key component of certain widely used aluminum alloys, and is used in oxide form in dry cell batteries.

Legislation and Government Programs

Stockpile.—The Annual Materials Plan (AMP) for fiscal year 2008 that the Defense National Stockpile Center (DNSC)

of the Defense Logistics Agency issued on October 5, 2007, covered the period from October 1, 2007, through September 30, 2008. Under this AMP, the maximum disposal authority for manganese materials was 226,796 t for metallurgical-grade ore; 90,718 t for high-carbon ferromanganese; 18,144 t for natural battery-grade ore; and 2,722 t for synthetic manganese dioxide. No amount was given for chemical-grade ore (Defense National Stockpile Center, 2007). The maximum disposal authority under an AMP is the maximum quantity of material that may be disposed in a given fiscal year as authorized by Congress; these may differ from the disposal authority quantities listed in table 2.

For calendar year 2008, disposals (reported sales) of manganese materials announced by the DNSC totaled 22,238 t for high-carbon ferromanganese, 15,894 t for natural battery-grade ore, and 1,237 t for synthetic manganese dioxide.

The NDS physical inventory of manganese materials, in gross weight, indicated that all inventories decreased from those of 2007. The decreases consisted of 22,840 t for high-carbon ferromanganese; 15,904 t for natural battery-grade ore; 2,785 t for nonstockpile-grade metallurgical ore; 1,237 t for synthetic manganese dioxide; and 456 t for chemical-grade ore (Defense National Stockpile Center, unpub. data, December 2008). At yearend 2008, the estimated manganese content of manganese inventories being held by the Government decreased by about 8% to 361,000 t, which was about 42% of the current national apparent consumption.

Exploration and Development

Rocher Debole Minerals Corp., White Rock, British Columbia, Canada (now American Manganese Inc.) purchased 112 patented and 254 unpatented lode mining claims in the Artillery Peak manganese district, Mohave County, AZ. The mining claims contained several low-grade manganiferous deposits and stockpiles (less than 5% manganese content) that were worked sporadically from 1928 to 1955. The company began metallurgical tests using new proprietary electrolysis technology for possible electrolytic manganese metal or electrolytic manganese dioxide (EMD) production (Rocher Debole Minerals Corp., 2008).

Production

Ore and Concentrate.—The only mine production of manganese in the United States consisted of small amounts of manganiferous material having a natural manganese content of less than 5%. This material was produced in South Carolina for use in coloring brick.

Chemicals, Ferroalloys, and Metal.—Production statistics for these materials were concealed to avoid disclosing company

proprietary data. Domestic producers of manganese ferroalloys, metal, and synthetic dioxide are listed in table 3.

The global financial problems that began during the third quarter of 2008 affected the largest domestic producers of manganese materials to a varying extent in the fourth quarter. Eramet SA, the parent company of Eramet Marietta Inc.'s plant in Marietta, OH, reported a 7% reduction in worldwide manganese alloy output in 2008 compared with that in 2007 (Eramet SA, 2009). However, Felman Production Inc. was able to produce silicomanganese from two of its three electric arc furnaces steadily throughout the year, with some production from its third and largest furnace. Production from the two smaller furnaces was reported to be greater than 180 metric tons per day, while the production capacity of the largest furnace is almost twice that of the other two (Metal-Pages Ltd., 2008g).

Bateman Mineral Recovery began construction of a ferromanganese-slag recovery plant in late 2007 in Johnstown, PA. The Riders plant was designed to recover 500 metric tons per month (t/mo) of high-carbon ferromanganese from 25,000 t/mo of stockpiled blast-furnace slag produced by ArcelorMittal's (formerly Bethlehem Steel Corp.) Johnstown steel operations. The plant would employ physical separation technologies to process the stockpiled slag into salable ferromanganese and crushed slag. The recovered ferromanganese would be sold to the steel industry and the crushed slag to the aggregate market, and possibly for use in acid mine water treatment. The plant became fully operational in May 2009 (Bateman Mineral Recovery, 2008; Louis Eybers, general manager, Jigging Technologies LLC, unpub. data, March 25, 2010).

Consumption, Uses, and Stocks

Data relating to manganese end use and other information have shown that metallurgical applications account for most domestic manganese consumption, 85% to 90% of which has been for steelmaking. In 2008, reported U.S. ore consumption indicated that unit consumption of manganese in ironmaking, which could not be published to avoid disclosing company proprietary data, was about the same as that of 2007 and remained a relatively minor component of overall manganese use in steelmaking. Reported consumption (gross weight) of silicomanganese, manganese metal, and ferromanganese increased by 27%, 13%, and 12%, respectively, from that in 2007 (table 4). Because of incomplete reporting to the U.S. Geological Survey (USGS) voluntary consumption survey, the figures in this table represent relative rather than absolute quantities.

The combination of the indicated consumption pattern with estimates of apparent consumption, on a gross weight basis, suggested that manganese alloys unit consumption in steelmaking was about 7.3 kilograms per metric ton (kg/t) or about 2.3 times that calculated on the basis of reported consumption in 2008. This level was 7% more than the quantity of 6.8 kg/t estimated for 2007 and was a result of a significant increase in ferromanganese apparent consumption. The increase in ferromanganese apparent consumption was attributable to a significant increase in ferromanganese imports.

Relatively small quantities of manganese were used for alloying with nonferrous metals, chiefly in the aluminum industry as manganese-aluminum briquettes that typically contained either 75% or 85% manganese. Manganese plays an important alloying role in aluminum to increase corrosion resistance. The most important use of aluminum-manganese alloys is in the manufacture of soft drink cans. Other uses include, but are not limited to, aircrafts, automobiles, cookware, radiators, and roofing (Roskill Information Services Ltd., 2008, p. 195–200).

Comparatively small amounts of manganese were used domestically in animal feed, brick coloring, dry cell batteries, fertilizers, and manganese chemicals. These were among the many nonmetallurgical applications of manganese (Roskill Information Services Ltd., 2008, p. 206–229). The source of manganese units for these applications was mainly manganese ore.

In 2008, reported domestic consumption of manganese ore increased by 10% to 386,000 t, while corresponding yearend stocks increased by 36% to 258,000 t compared with the revised amounts in 2007 (table 1). Apparent consumption of manganese ore on a gross-weight basis in 2008 was about 445,000 t, which excluded some manganese ore consumed directly by ironmaking and steelmaking plants. The USGS must exclude reporting by these operations to avoid disclosing company proprietary information. The discrepancy between apparent and reported consumption represented incomplete reporting to the USGS voluntary consumption survey.

Data on domestic consumption of manganese ore, exclusive of that consumed by the steel industry, are collected by means of the "Manganese Ore and Products" survey. In 2008, nine firms were canvassed that process ore or had processed ore in the past by such methods as grinding and roasting or that consume it in the manufacture of dry cell batteries and manganese chemicals, ferroalloys, and metals. Of those nine companies, all consumed manganese ore in their processes in 2008. The collective consumption of these firms was considered to constitute all the manganese ore consumption in the United States, exclusive of that consumed by the steel industry. Full-year responses on a basis upon which to estimate the data were obtained from all of these firms for 2008.

Prices

Manganese Ore.—The USGS estimated the annual U.S. average contract price of metallurgical-grade ore containing 48% manganese to be at an alltime high of \$12.15 per metric ton unit (mtu). This was a 292% increase compared with that in 2007, which followed the 314% to 413% increase in the international benchmark price for this grade of ore set between Japanese consumers and BHP Billiton Ltd. in February. Prices were above or below this value, depending on ore quality, time of year, and nature of transaction. The year-average spot market price for this grade of ore based on weekly averages of Chinese cost and freight (CNF) transaction prices as reported by Ryan's Notes was \$14.70 per mtu. The range in CNF spot market prices per mtu peaked in June and July at \$17.50 to \$18.50, up from \$11.50 to \$12.00 per mtu at the beginning of the year, and

about double that in late December (\$8.00 to \$8.50). The price of a metric ton of ore (gross weight) is obtained by multiplying the mtu price by the percentage manganese content of the ore; for example, by 48 when the manganese content is 48%. The ore market consisted of a number of submarkets because of differences in ore-quality requirements by end use—ferroalloy production, blast furnace ironmaking, and manufacture of manganese chemicals.

For Japanese fiscal year 2008 (April 2008 to March 2009), BHP Billiton and major Japanese consumers negotiated for the first time a range in international benchmark prices for metallurgical-grade ore. The contract included a clause that would allow Japanese prices to be reviewed on a quarterly or semiannual basis based on fluctuations in Chinese manganese ore spot-market prices. On a free-on-board (f.o.b.) basis for delivery during the annual contract year, the agreed price range was US\$8.50 to US\$11.20 per mtu for ore from the Groote Eylandt Mine in Australia, up 314% to 413%, respectively, from \$2.70 in fiscal year 2007 (Ryan's Notes, 2008a). The primary influences on manganese ore price at the time were increased global consumption, particularly by China and India, and lower production in Brazil, China, and South Africa for technical and local economic reasons.

Manganese Ferroalloys and Metal.—Prices for manganese ferroalloys tend to vary in response to changes in demand by the steel and ferrous foundry industries, while those of manganese metal predominantly follow changes in demand by the aluminum industry. Manganese ferroalloy prices are also influenced by changes in the product mix of the world's suppliers because different manganese ferroalloys are largely interchangeable with each other.

Annual average import prices for manganese ferroalloys are given by Platts Metals Week. These prices are based on free market spot prices per unit of measurement, f.o.b. Pittsburgh, PA, or Chicago, IL, warehouse. Annual average import prices were \$2,736.40 per gross ton for high-carbon ferromanganese, 213.13 cents per pound for medium-carbon ferromanganese, and 100.86 cents per pound for silicomanganese. These prices were 92%, 103%, and 31% higher, respectively, than those of 2007, and were at an alltime high. The annual average price for manganese metal is based on weekly averages of North American transaction prices published by Ryan's Notes for bulk shipments of manganese metal, f.o.b. Chicago, IL, or Pittsburgh, PA, warehouse. The annual average North American transaction price for manganese metal was 197.64 cents per pound, which was a slight decrease compared with that of 2007. The year-average price for manganese metal was 72% more than the last listed U.S. price for domestically produced electrolytic manganese metal of \$1.15 per pound at the beginning of 1996.

The alltime high U.S. annual manganese alloy spot-market prices were attributable to market conditions before the global financial problems began in the third quarter 2008. The prices rose because of the following reasons: a 4% increase in domestic steel production in 2008 through September compared with the same period in 2007; a large increase in manganese ore contract and spot prices; concern that temporary production cuts by manganese alloy producers in Brazil, China, France, and South Africa might lead to supply shortages; and an increase

in export duties on manganese alloys by China. The annual average manganese metal price fell slightly compared with that of 2007 in response to decreased demand from the domestic aluminum sector in the fourth quarter of 2008.

Although the annual averages of manganese alloy and metal spot-market prices were higher than those of 2007, the price ranges for these materials at the end of 2008 were significantly lower than those at the beginning of the year because of the global financial problems during the fourth quarter. According to Platts Metals Week, the price range for high-carbon ferromanganese containing 78% manganese, per gross ton, began the year at \$1,875 to \$1,950 and ended the year at \$1,375 to \$1,450, for a net decrease of 28%. The price range for medium-carbon ferromanganese with a manganese content of 80% to 85% and a nominal carbon content of 1.5%, per pound of manganese, began the year at 160 to 170 cents and ended the year at 140 to 160 cents, for a net decrease of 9%. The price range for imported silicomanganese with 2% carbon, per pound of alloy, started the year at 81 to 83 cents and ended 2008 at 45 to 47 cents, for a net decrease of 44%.

According to Ryan's Notes North American transaction prices, the 2008 yearend price range of bulk manganese metal shipments was 135 to 140 cents per pound, a net decrease of 26% from the price of 180 to 190 cents per pound at the beginning of the year.

Foreign Trade

In the absence of domestic mine production and recycling for manganese, U.S. net import reliance, as a percentage of apparent consumption, was 100% for manganese, the same as it has been for the past 23 years. The ensuing comparisons of foreign trade data were made on the basis of gross weight.

In 2008, U.S. exports of manganese dioxide, manganese metal, manganese ore, and silicomanganese increased, while exports of ferromanganese decreased compared with exports of these materials for 2007 (table 5). The biggest year-to-year change in exports was that of manganese ore, which were 68% higher than those in 2007. China accounted for 94% of manganese ore exports, followed by Canada at 3%.

In 2008, U.S. imports of ferromanganese increased compared with those of 2007, while imports of manganese dioxide, manganese metal, manganese ore, silicomanganese, and potassium permanganate fell (table 6). The most significant year-to-year change was for imports of ferromanganese; these were 42% more than those of 2007. Increases in this import category were especially notable for those from China, with an increase of 34,900 (46%), the Republic of Korea, with an increase of 21,700 (229%), Ukraine, with an increase of 21,200 t (423%), and India, with an increase of 17,600 t (718%) year-on-year.

Imports of spiegeleisen (pig iron containing about 20% manganese) from South Africa decreased to 1 t in 2008 from 2 t in 2007, on a gross weight basis. The 2008 customs value for spiegeleisen imports was \$514,610 (U.S. Census Bureau, unpub. data, December 2008).

Antidumping Duty Administrative Reviews.—Final antidumping duty rates assessed in 2008 on imports of

manganese materials to the United States are summarized in table 7.

World Industry Structure

World manganese ore production was estimated by the USGS at 13.3 Mt (contained manganese) in 2008, up 6% from the revised amount in 2007. Most (98%) of manganese ore was produced in 10 countries. On a manganese-content basis, the leading producer countries of manganese ore were, in decreasing order, South Africa (22%), Australia (17%), China (17%), Gabon (12%), and Brazil (10%) (table 8). World manganese ferroalloy production in 2008 was 13.2 Mt (gross weight), a slight decrease from that of 2007. On a gross weight basis, the leading producer countries of manganese ferroalloys were, in decreasing order, China (55%), Ukraine (10%), South Africa (7%), Brazil (5%), Japan (4%), and Norway (3%) (table 9).

The International Manganese Institute (IMnI) estimated that world apparent consumption of manganese ferroalloys increased slightly to 13.5 Mt in 2008 compared with that of 2007. Of that amount, 7.5 Mt was silicomanganese, 4.9 Mt was high-carbon ferromanganese, and 1.1 Mt was refined (medium- and low-carbon) ferromanganese. IMnI estimated that world production of manganese ferroalloys was 13.6 Mt, slightly more than world consumption. World manganese ore production was 13.9 Mt (contained manganese), which was an increase of about 9% from the IMnI estimate of 2007. IMnI estimated that the world supply of manganese ore slightly exceeded the production of manganese ferroalloys in 2008 (Mark Camaj, market analyst, International Manganese Institute, unpub. data, November 20, 2009).

New manganese materials projects scheduled for completion around the world from 2008 through 2013 are listed in table 10.

World Review

European Union.—On August 27, the Commission of the European Communities extended the suspension of antidumping duties on silicomanganese imported from China (8.2%) and Kazakhstan (6.5%) through September 6, 2009 (Official Journal of the European Union, 2008).

Australia.—Delta plc closed its Newcastle EMD plant in March because of antidumping duties assessed on Australian EMD imports by the European Union in 2007 and by Japan and the United States in 2008. The company thought production from its South African operations would be adequate to meet consumer demand (Delta plc, 2009, p. 6).

Brazil.—Companhia Vale do Rio Doce (Vale) was the leading manganese ore and ferroalloy producer in Brazil. Vale produced 2.4 Mt of manganese ore in 2008, an increase of 79% from that of 2007. The Azul Mine in the Carajás region produced 2 Mt of ore after operations resumed mid-December 2007. Vale's manganese alloy production in Brazil was 288,000 t, the same as it was in 2008 (Companhia Vale do Rio Doce, 2009).

China.—Chinese imports of manganese ore were at an alltime high of 7.58 Mt (gross weight) in 2008, up 14% from that of 2007 (TEX Report, The, 2009b). This was about 20% of the USGS estimated total world production (gross weight) in 2008.

Most of the imported manganese ore was likely used to blend with lower-grade domestic manganese ore for the production of manganese ferroalloys and metal.

China was the leading producer of manganese ferroalloys in the world and exported 740,638 t of silicomanganese and 365,250 t of ferromanganese in 2008. Japan, Taiwan, and the Republic of Korea received the bulk of these silicomanganese imports, accounting for 36%, 10%, and 9%, respectively (TEX Report, The, 2009a, c). The leading destination for Chinese ferromanganese exports, at 30%, was the United States (table 6).

China, the largest producer of electrolytic manganese metal (EMM) in the world with more than 190 producers, produced 1.14 Mt of EMM in 2008, an increase of 11.2% from that in 2007. The country exported about 241,000 t of EMM in 2008, a decrease of 15% from that in 2007. Only two countries—China and South Africa—have the capacity to produce EMM. China's EMM capacity in 2008 was estimated to be about 1.88 million metric tons per year or 96% of the world total (1.95 Mt) (Metal-Pages Ltd., 2009a, b).

In 2008, China was also the leading producer of EMD in the world with total output of 159,238 t. This equated to 74% of the country's annual production capacity, which was 216,000 t. China's share of the active world EMD production capacity in 2008 was about 59%, followed by the United States with 17%. China's EMD exports fell by 17% to 38,947 t from that of 2007, owing mainly to antidumping duties assessed by Japan and the United States (Li, 2009, p. 5–7, 23, 26).

The Central Government of China maintained the 20% duty on ferromanganese and silicomanganese exports effective December 1, 2008. They also kept the duties on unwrought manganese and manganese ore exports at 20% and 15%, respectively (Metal-Pages Ltd., 2008c; TEX Report, The, 2008b).

On December 29, the Central Government of China announced there were 164 companies who qualified as exporters of bulk ferroalloys, such as ferrosilicon, under a new export licensure system. To qualify, companies—either producers or traders—had to meet several conditions, which included documentation that they had exported more than 3,000 metric tons per year (t/yr) of ferromanganese or silicomanganese between 2005 and 2007, and received International Organization for Standardization (ISO) 9000 certification for quality management. Those companies that are not licensed exporters cannot export ferromanganese or silicomanganese from China (TEX Report, The, 2008a, c; 2009d).

Côte d'Ivoire.—Manganese ore exports from the country were 176,561 t in 2008, an 87% increase from those of 2007 (Metal-Pages Ltd., 2009c). Manganese ore is mined by the state mining company Société pour le Développement Minier and India's Taurian Resources Private Ltd.

France.—Eramet reported a 7% reduction in worldwide manganese alloy output in 2008 compared with that in 2007. The company owned manganese alloy plants in France, Norway, and the United States (Eramet SA, 2009). Vale's Rio Doce Manganese Europe (RDME) stopped manganese alloy production at its Dunkerque plant from August 2008 through April 2009 owing to problems with an electric furnace. As a

result, RDME production was down 47% to 55,000 t in 2008 from that of 2007 (Companhia Vale do Rio Doce, 2009).

Japan.—The Japanese Government levied antidumping duties for 5 years from September 1 on EMD imports from China, 46.5% (except 34.3% for Guizhou Redstar Developing Dalong Manganese Industry Co., Ltd.); Australia, 29.3%; South Africa, 14.5%; and Spain, 14% (Japan Ministry of Economy, Trade and Industry, 2008).

Norway.—Manganese ferroalloy production at Vale's Mo I Rana plant was 112,000 t, a 13% decrease from that of 2007. The decrease in production was attributable to extended furnace maintenance (Companhia Vale do Rio Doce, 2009). In July, Eramet acquired 56% of Norwegian silicomanganese producer Tinfos AS. Tinfos produces silicomanganese at its Kvinesdal plant, which has an 180,000-t/yr production capacity. Through the acquisition, Eramet expected to increase its global manganese alloy production by more than 20% (Eramet, SA, 2008).

Mexico.—Minera Autlán, S.A.B. de C.V. reported total manganese ferroalloy production surpassed 200,000 t/yr for the first time. The company also started a new manganese oxygen refining plant—the second of two—at its Tamós facility, which increased medium-carbon ferromanganese production capacity to 104,000 t/yr from 68,000 t/yr (Minera Autlán, S.A.B. de C.V., 2009, p. 23, 25).

South Africa.—South Africa was the world's leading producer of manganese ore (content-basis) and third-leading producer of manganese ferroalloys (gross-weight basis). Eskom, the South African electrical power supplier, reduced electrical power to industrial users early in the year, including producers of manganese materials. Mines were forced to shut down for 5 days in January and then required to reduce consumption between 5% and 10% for the rest of the year. As a result of the power shortages, some companies also reduced intermediate manganese materials production, as BHP Billiton did at its Metalloys silicomanganese and Nelspruit EMM plants. Eskom projected the power crisis would go on for years (BHP Billiton Ltd., 2008a, b; Metal-Pages Ltd., 2008f).

Technical problems persisted at Assmang Ltd.'s Cato Ridge Works ferromanganese plant in KwaZulu Natal during 2008. All production was halted in February owing to an explosion that killed 6 workers and severely damaged Furnace No. 6. By April, production had resumed in four of the plant's six furnaces, and by the fourth quarter, production had restarted in Furnace No. 6. The production capacity of Furnace No. 6 is about 40,000 t/yr, or one-sixth of Cato Ridge Works annual production capacity. In December, Assmang temporarily shut down three high-carbon and one medium-carbon ferromanganese furnaces at Cato Ridge Works because of weakened market conditions (Assore Ltd., 2008, p. 10; Metal Bulletin, 2008; Metal-Pages Ltd., 2008a, b).

In mid-year 2008, United Manganese of Kalahari (UMK) began surface mining at its new Kalahari Manganese Mine. UMK, a joint venture between Russia's Renova Group (49%) and South African interests (51%), received a mining license on February 8 to develop a 1.5-million-metric-ton-per-year (Mt/yr) manganese ore mine. UMK's current resource estimate of 282 Mt was categorized as follows with average manganese content: measured, 42.1 Mt (36.34%); indicated, 140.9 Mt (34.9%); and

inferred, 99 Mt (34.68%) (Metal-Pages Ltd., 2008e; Ryan's Notes, 2008b; United Manganese of Kalahari, 2009, p. 13).

There were ownership changes in one South African ferroalloy producer. In June 2008, Kermas Ltd. (British Virgin Islands), the world's second-leading ferrochrome producer, acquired Mogale Alloys. During the year, Mogale produced ferrochromium, silicomanganese, and stainless steel; the production capacity for this mix of materials was 100,000 t/yr (OurMetals.com, 2008; GlobeNewswire, Inc., 2009).

Spain.—In January, Grupo FerroAtlántica, S.L. announced a 70% reduction in manganese ferroalloy production at its operations in Boo (210,000-t/yr capacity), Cee (80,000-t/yr capacity), and Monzón (134,000-t/yr capacity) (Metal-Pages Ltd., 2008d; Grupo FerroAtlántica, S.L., 2009).

Ukraine.—Ukraine's total output of manganese concentrate decreased by 16.2% in 2008 to 1.45 Mt, compared with that of 2007. Manganese ferroalloy production also decreased in 2008 by 27% for silicomanganese and 3% for ferromanganese. Domestic producers reduced production heavily in the fourth quarter of 2008 because of the global economic downturn (Metal-Pages Ltd., 2009d).

Outlook

The trend of domestic and global consumption for manganese is expected to follow closely that of steel production, for which the combined annual growth rates have been typically in the range of 1% to 2% in the United States. Although growth rates for some nonmetallurgical components of manganese consumption, especially batteries, may be higher than for steel production, this situation should have only a minor effect on overall manganese demand.

Details of the outlook for the steel industry are discussed in the Outlook section of the Iron and Steel chapter of the 2008 USGS Minerals Yearbook, volume I, Metals and Minerals. Raw steel production in the United States had decreased by 6.3% to 91.9 Mt from that in 2007 (American Iron and Steel Institute, 2009, p. 75). According to the World Steel Association (2009a), raw steel production decreased slightly worldwide from that in 2007. However, raw steel production in China increased by about 3% to 502 Mt. China was the leading producer of raw steel and became the first country to produce more than 500 Mt in a single year.

World apparent consumption of finished steel products declined slightly to 1.20 billion metric tons in 2008 from that in 2007. However, steel consumption in Brazil, China, India, and Russia increased slightly to 537.6 Mt, which accounted for about 45% of the world total. World steel apparent consumption was projected to decrease by 15% in 2009 from that in 2008. On a volume basis, the largest decrease in consumption would be in the following regions: Asia and Oceania (56.4 Mt; 8%); the EU (52.3 Mt; 29%); and North America (41.7 Mt; 32%). The United States was expected to show the largest decrease in steel consumption at 37%. The only countries where steel consumption was expected to increase between 2008 and 2009 were India (53.5 Mt; 2%), Iran (16.5 Mt; 6%), and Egypt (7.8 Mt; 19%) (World Steel Association, 2009b).

Demand for manganese metal comes primarily from the aluminum industry followed by the steel industry. The outlook

for the aluminum industry is discussed in the Outlook section of the Aluminum chapter of the 2008 USGS Minerals Yearbook, volume I, Metals and Minerals.

Demand for EMD comes from the primary and secondary battery industries. As a rough indicator of EMD demand, U.S. demand for primary and secondary batteries was projected to increase 2% annually through 2012 to \$16.4 billion. Primary battery sales were forecast to rise faster than those of secondary batteries, owing in part to the growing need for replacement primary batteries in portable devices. Sales of secondary batteries were expected to increase at an annual rate of 1.5% through 2012 (Freedonia Group, Inc., The, 2009).

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United Nations commodity trade statistics.

TABLE 1
SALIENT MANGANESE STATISTICS¹

(Thousand metric tons, gross weight, unless otherwise specified)

	2004	2005	2006	2007	2008
United States:					
Manganese ore (35% or more Mn):					
Exports	123	13	2	29	48
Imports for consumption	451	656	572	602	571
Consumption ²	441	368	365	351 ^r	386
Stocks, December 31, consumers ²	159	337	153 ^r	190 ^r	258
Ferromanganese:					
Exports	9	14	22	29	23
Imports for consumption	429	255	358	315	448
Consumption	315	286	297	272	304
Stocks, December 31, consumers and producers	25	30	31	20 ^r	25
Consumption, apparent, manganese content ³	1,030	773	1,060 ^r	975 ^r	868
Ore price, c.i.f. ⁴ U.S. ports, dollars per metric ton unit	2.89	4.39	3.22 ^r	3.10 ^r	12.15
World, production of manganese ore	27,900	31,000	32,900 ^r	35,400 ^{r,e}	38,300 ^e

^eEstimated. ^rRevised.

¹Data are rounded to no more than three significant digits.

²Exclusive of iron and steel plants.

³Based on estimates of average content for all significant components except imports, for which content is reported.

⁴Cost, insurance, and freight.

TABLE 2
U.S. GOVERNMENT DISPOSAL AUTHORITIES AND INVENTORIES FOR MANGANESE MATERIALS
AS OF YEAREND 2008¹

(Metric tons, gross weight)

Material	Disposal authority	Physical inventory ⁶				Grand total
		Uncommitted		Total	Sold, pending shipment	
		Stockpile grade	Nonstockpile grade			
Synthetic manganese dioxide	1,240	--	--	--	1,240	1,240
Natural battery ore	15,900	--	--	--	15,900	15,900
Chemical ore	456	--	--	--	456	456
Metallurgical ore	5,200	--	2,420	2,420	2,790	5,200
High-carbon ferromanganese	459,000	436,000	--	436,000	22,800	459,000

⁶Estimated. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

Source: Defense National Stockpile Center.

TABLE 3
DOMESTIC PRODUCERS OF MANGANESE PRODUCTS IN 2008

Company	Plant location	Products ¹			Type of process
		FeMn	SiMn	MnO ₂	
Energizer Holdings, Inc., Eveready Battery Co.	Marietta, OH			X	Electrolytic.
Erachem Comilog	Baltimore, MD			X	Chemical.
Do.	New Johnsonville, TN			X	Electrolytic.
Eramet Marietta Inc.	Marietta, OH	X	X		Electric furnace.
Felman Productions Inc.	Letart, WV		X		Do.
Tronox LLC	Henderson, NV			X	Electrolytic.
Do. Ditto.					

¹FeMn, ferromanganese; SiMn, silicomanganese; MnO₂, synthetic manganese dioxide.

TABLE 4

U.S. CONSUMPTION, BY END USE, AND INDUSTRY STOCKS OF MANGANESE FERROALLOYS AND METAL IN 2008¹

(Metric tons, gross weight)

End use	Ferromanganese			Silicomanganese	Manganese metal
	High carbon	Medium and low carbon	Total		
Steel:					
Carbon	101,000	106,000	207,000	65,400	(2)
High-strength, low-alloy	20,000	10,900	30,900	6,300	139
Stainless and heat-resisting	6,980	2,520	9,500	16,000	1,240
Full alloy	20,900	14,500	35,400	20,500	22
Unspecified ³	1,130	600	1,730	934	3,280
Total	150,000	135,000	285,000	109,000	4,680
Cast irons	6,600	396	7,000	535	(4)
Superalloys	W	W	W	(4)	W
Alloys (excluding alloy steels)	5,970	6,280	12,200	3,040	17,600 ⁵
Miscellaneous and unspecified	(4)	(4)	(4)	(4)	(4)
Grand total	163,000	141,000	304,000	110,000 ⁶	22,200
Total manganese content ⁷	141,000	132,000	273,000	72,800	22,200
Stocks, December 31, consumers and producers	10,900	14,400	25,300	19,600	632

W Withheld to avoid disclosing company proprietary data; included with "Alloys (excluding alloy steels)."

¹Data are rounded to no more than three significant digits; may not add to totals shown.²Withheld to avoid company proprietary data, included with "Steel: Unspecified."³Includes electrical and tool steel.⁴Withheld to avoid company proprietary data.⁵Approximately 85% of this combined total was for consumption in aluminum alloys.⁶Internal evaluation indicates that silicomanganese consumption is considerably understated.⁷Estimated based on typical percentages of manganese content.

TABLE 5
U.S. EXPORTS OF MANGANESE ORE, FERROALLOYS, AND METAL, BY COUNTRY¹

Country	2007		2008	
	Quantity, gross weight (metric tons)	Value, f.a.s. ² (thousands)	Quantity, gross weight (metric tons)	Value, f.a.s. ² (thousands)
Ore and concentrates with 20% or more manganese:				
Canada	1,090	\$409	1,630	\$565
China	26,700	3,700	45,300	7,290
Germany	469	859	882	1,800
Japan	--	--	2	8
Korea, Republic of	124	102	361	631
Mexico	50	22	33	87
Sweden	--	--	31	82
Vietnam	209	58	--	--
Other	96	51	76	258
Total	28,700	5,200	48,300	10,700
Ferromanganese, all grades:				
Canada	5,030	4,440	15,100	11,900
Mexico	16,400	15,400	4,580	3,390
Netherlands	6,370	3,820	796	734
Other	1,240	1,290	2,960	4,550
Total	29,100	25,000	23,400	20,600
Silicomanganese:				
Brazil	21	20	673	552
Canada	2,960	2,870	901	837
Mexico	301	311	2,650	4,250
Spain	--	--	1,640	1,650
Other	35 ^r	32 ^r	1,280	1,730
Total	3,310	3,230	7,140	9,020
Metal, including alloys and waste and scrap:				
Belgium	615	1,330	613	1,740
Canada	168	451	101	304
China	235	512	684	1,520
France	5	11	14	41
Germany	178	387	124	271
Hong Kong	469	1,200	522	1,450
India	306	843	251	546
Japan	736	2,630	1,120	2,460
Other	563	1,510	1,150	3,260
Total	3,280	8,880	4,580	11,600
Manganese dioxide:				
Belgium	277	511 ^r	2,170	5,550
Canada	5,060	2,740	5,320	4,010
Germany	430	874	159	298
Indonesia	305	210	498	505
Mexico	1,020	900	808	770
Poland	116	175	138	157
Russia	372	433	143	191
Other	1,740	2,800	1,770	3,110
Total	9,330^r	8,640	11,000	14,600

^rRevised. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Free alongside ship.

Source: U.S. Census Bureau.

TABLE 6

U.S. IMPORTS FOR CONSUMPTION OF MANGANESE ORE, FERROALLOYS, METAL, AND SELECTED CHEMICALS, BY COUNTRY¹

Country	2007			2008		
	Quantity		Value, customs (thousands)	Quantity		Value, customs (thousands)
	Gross weight (metric tons)	Mn content (metric tons)		Gross weight (metric tons)	Mn content (metric tons)	
Ore and concentrates with 20% or more manganese:						
All grades:						
Australia	70,500	34,900	\$9,230	103,000	51,900	\$25,500
Belgium	64	42	26	--	--	--
Brazil	39,600	20,000	3,960	68,300	34,400	19,300
Canada	24,500	5,380	1,000	--	--	--
China	36,300	10,600	1,690	862	516	436
Gabon	307,000	170,000	31,200	356,000	181,000	85,200
Ghana	--	--	--	12,500	6,230	5,580
Mexico	9,020	3,670	895	--	--	--
South Africa	115,000	53,600	9,590	30,800	14,600	18,400
Other	3	1	5	4	1	8
Total	602,000	298,000	57,600	571,000	289,000	154,000
More than 20% but less than 47% manganese:						
Australia	27,500	12,500	2,940	--	--	--
Brazil	--	--	--	4,950	1,540	1,100
Canada	24,500	5,380	1,000	--	--	--
China	31,500	7,830	1,060	--	--	--
Gabon	46,600	20,300	3,860	122,000	57,400	20,400
Mexico	5,980	2,150	712	--	--	--
South Africa	60,400	26,900	4,370	--	--	--
Other	3	1	5	4	1	5
Total	196,000	75,000	13,900	127,000	58,900	21,500
47% or more manganese:						
Australia	43,000	22,500	6,300	103,000	51,900	25,500
Belgium	64	42	26	--	--	--
Brazil	39,600	20,000	3,960	63,300	32,800	18,200
China	4,760	2,760	630	862	516	436
Gabon	261,000	149,000	27,300	233,000	124,000	64,800
Ghana	--	--	--	12,500	6,230	5,580
Mexico	3,040	1,520	183	--	--	--
South Africa	54,200	26,700	5,230	30,800	14,600	18,400
Total	405,000	223,000	43,700	443,000	230,000	133,000
Ferromanganese:						
All grades:						
Australia	3,410 ^r	2,500 ^r	3,880 ^r	1,530	1,170	3,870
Brazil	2,220 ^r	1,710 ^r	1,980 ^r	4,330	3,340	13,000
China	76,300 ^r	61,100	99,400	111,000	88,500	318,000
France	1,300	1,050	970	80	66	345
Georgia	2,010	1,580	1,910	8,020	6,650	21,900
India	2,450	1,850	2,880	20,000	14,900	51,000
Japan	2,800	2,380	3,390	3,000	2,250	8,700
Korea, Republic of	9,500	7,690	14,300	31,200	24,200	87,100
Mexico	16,800	13,600	17,900	23,600	19,000	49,900
Norway	1,680	1,360	3,610	6,000	4,900	19,100
South Africa	182,179	141,939	189,358	197,166	153,176	451,400

See footnotes at end of table.

TABLE 6—Continued

U.S. IMPORTS FOR CONSUMPTION OF MANGANESE ORE, FERROALLOYS, METAL, AND SELECTED CHEMICALS, BY COUNTRY¹

Country	2007			2008		
	Quantity		Value, customs (thousands)	Quantity		Value, customs (thousands)
	Gross weight (metric tons)	Mn content (metric tons)		Gross weight (metric tons)	Mn content (metric tons)	
Ferromanganese—Continued:						
All grades:						
Ukraine	5,010 ^r	3,870 ^r	\$7,290 ^r	26,200	20,600	\$68,000
Other	9,440 ^r	6,850 ^r	11,200 ^r	16,000	12,400	42,300
Total	315,000	247,000	358,000	448,000	351,000	1,130,000
1% or less carbon:						
China	32,100	27,000	57,400	33,500	28,100	111,000
Japan	1,100	935	1,400	--	--	--
Korea, Republic of	4,200	3,390	7,210	2,000	1,610	6,940
Mexico	6,560	5,320	7,600	10,900	8,840	26,000
Norway	1,170	934	2,510	3,830	3,150	14,200
South Africa	5,400	4,410	4,990	--	--	--
Other	60	50	188	763	603	2,600
Total	50,600	42,000	81,300	51,000	42,300	160,000
More than 1% to 2% or less carbon:						
Brazil	--	--	--	1,240	988	4,820
China	11,600	9,270	10,800	39,600	31,400	120,000
Korea, Republic of	5,300	4,290	7,090	7,600	6,140	25,400
Mexico	9,900	7,950	9,930	12,600	10,100	23,800
Norway	516	424	1,100	1,170	962	3,420
South Africa	24,800	20,100	34,300	33,300	26,800	82,100
Other	1,800	1,530	2,170	5,970	4,920	16,300
Total	53,900	43,600	65,400	102,000	81,400	276,000
More than 2% but not more than 4% carbon:						
China	--	--	--	633	498	275
Georgia	--	--	--	3,050	2,610	9,930
South Africa	--	--	--	54	44	122
Ukraine	--	--	--	220	191	837
Total	--	--	--	3,960	3,340	11,200
More than 4% carbon:						
Australia	3,410	2,500	3,880	1,530	1,170	3,870
Brazil	2,220	1,710	1,980	2,440	1,850	5,740
China	32,600	24,800	31,200	37,400	28,500	87,100
France	1,300	1,050	970	--	--	--
Georgia	2,010	1,580	1,910	488	415	1,170
India	2,450	1,850	2,880	20,000	14,900	51,000
Korea, Republic of	--	--	--	21,600	16,400	54,800
Mexico	370	295	414	43	34	147
Norway	--	--	--	1,000	786	1,530
South Africa	152,000	117,000	150,000	164,000	126,000	369,000
Ukraine	5,010	3,870	7,290	24,700	19,300	62,700
Other	9,280	6,720	10,700	18,700	14,400	50,200
Total	211,000	162,000	211,000	292,000	224,000	687,000
Silicomanganese:						
Australia	36,300	24,700	40,200	36,500	23,900	68,800
Georgia	52,600	37,600	68,500	59,800	44,900	116,000
Korea, Republic of	7,430	4,810	10,100	3,820	2,390	7,540
Macedonia	29,900	19,900	37,100	12,900	8,470	27,500
Mexico	15,700	10,300	12,600	16,400	10,800	21,900
Norway	55,700	34,600	72,700	72,500	45,400	136,000
Romania	37,800	26,500	49,900	2,340	1,660	5,010
Russia	7,160	4,990	10,600	2,070	1,370	3,870

See footnotes at end of table.

TABLE 6—Continued

U.S. IMPORTS FOR CONSUMPTION OF MANGANESE ORE, FERROALLOYS, METAL, AND SELECTED CHEMICALS, BY COUNTRY¹

Country	2007			2008		
	Quantity		Value, customs (thousands)	Quantity		Value, customs (thousands)
	Gross weight (metric tons)	Mn content (metric tons)		Gross weight (metric tons)	Mn content (metric tons)	
Silicomanganese—Continued:						
Saudi Arabia	3,540	2,250	\$3,350	5,150	3,430	\$10,700
South Africa	166,000	110,000	181,000	153,000	102,000	284,000
Other	2,490	1,710	3,440	724	490	1,120
Total	414,000 [†]	278,000	489,000	365,000	245,000	682,000
Metal:						
Unwrought ² :						
China	27,900	XX	72,800	21,700	XX	75,000
Germany	1,420	XX	4,840	1,420	XX	8,220
South Africa	5,950	XX	11,900	5,570	XX	23,500
Spain	181	XX	380	24	XX	132
Other	387	XX	1,490	1,590	XX	3,820
Total	35,900	XX	91,400	30,300	XX	111,000
Other manganese, wrought:						
China	372	XX	914	649	XX	2,320
Mexico	420	XX	1,870	426	XX	2,530
Other	166	XX	1,100	9	XX	52
Total	958	XX	3,890	1,080	XX	4,900
Waste and scrap, Canada	1,140	XX	413	312	XX	81
Manganese dioxide:						
Australia	16,300	XX	21,700	4,380	XX	6,230
Brazil	118	XX	178	241	XX	365
China	9,050	XX	9,520	507	XX	565
Japan	3,560	XX	4,860	4,730	XX	8,620
South Africa	161	XX	274	9,500	XX	19,100
Other	958	XX	1,870	3,560	XX	2,750
Total	30,100	XX	38,400	22,900	XX	37,600
Potassium permanganate:						
Czech Republic	403	XX	948	395	XX	1,100
India	554	XX	1,340	305	XX	858
Other	161	XX	392	14	XX	37
Total	1,120	XX	2,680	714	XX	1,990

[†]Revised. XX Not applicable. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Imports of unwrought metal include flake, powder, and other.

Source: U.S. Census Bureau, adjusted by the U.S. Geological Survey.

TABLE 7
MANGANESE MATERIALS: FINAL ANTIDUMPING DUTY RATES ASSESSED IN 2008, BY DATE¹

Date	Imported material	Country of origin	Period of investigation	Producer and duty rate
October 7	Electrolytic Manganese Dioxide	Australia	7/1/06–6/30/07	All imports (83.66%).
Do.	do.	China	1/1/07–6/30/07	All imports (149.92%).
Do., do. Ditto.				

¹Antidumping duties are assessed by the International Trade Administration (ITA) of the U.S. Department of Commerce.

Source: Federal Register.

TABLE 8
MANGANESE ORE: WORLD PRODUCTION, BY COUNTRY^{1,2}

(Thousand metric tons)

Country ³	Mn content, percentage ^{e,4}	2004	2005	2006	2007	2008
Australia: ⁵						
Gross weight		3,431	3,136	4,556	5,289	4,837
Mn content	37–53	1,570	1,500	2,192	2,540	2,320
Brazil: ⁶						
Gross weight		3,143	3,200	3,128	1,866	3,210
Mn content	37–51	1,346	1,370	1,845	933 ^e	1,380
China: ^{e,7,8}						
Gross weight		5,500	7,500	8,000	10,000	11,000
Mn content	20–30	1,100	1,500	1,600	2,000	2,200
Gabon: ⁹						
Gross weight		2,460	2,859	3,000	3,300	3,460
Mn content ^e	45–53	1,090	1,290	1,350	1,490 ^r	1,600
Ghana:						
Gross weight		1,597	1,715 ^r	1,659 ^r	1,156 ^r	1,150 ^e
Mn content ^e	32–34	559	600	580 ^r	410 ^r	400
India: ¹⁰						
Gross weight		1,776	2,386	2,084	2,300 ^e	2,400
Mn content	10–54	630	927	844	900 ^e	960
Kazakhstan, crude ore:						
Gross weight		2,318	2,208	2,531	2,482	2,485
Mn content ^e	20–30	570	540	550	600	600
Mexico: ¹¹						
Gross weight		377	369	346	423 ^r	472 ^e
Mn content	36–37	136	133	124	152 ^r	170
South Africa: ⁹						
Gross weight		4,282	4,612	5,213	5,996	6,807 ^p
Mn content	30–48+	1,905	2,100	2,300	2,600	2,900
Ukraine:						
Gross weight		2,362	2,260	1,606	1,720	1,447
Mn content ^e	30–35	810	770	546	580	490
Other: ^{e,12}						
Gross weight		656 ^r	745 ^r	772 ^r	869 ^r	992
Mn content	XX	192 ^r	231 ^r	227 ^r	264 ^r	311
Total:						
Gross weight		27,900	31,000	32,900 ^r	35,400 ^{r,e}	38,300 ^e
Mn content ^e	XX	9,910 ^r	11,000	12,200	12,500 ^r	13,300

^eEstimated. ^pPreliminary. ^rRevised. XX Not applicable.

¹World totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Table includes data available through July 19, 2009. Data pertain to concentrates or comparable shipping product, except that in a few instances the best data available appear to be for crude ore, possibly after some upgrading.

³In addition to the countries listed, Cuba, Panama, Philippines, and Sudan may have produced manganese ore and/or manganiferous ore, but available information is inadequate to make reliable estimates of output levels.

⁴May be average content of each year's production rather than for content of typical products.

⁵Metallurgical ore.

⁶Production of beneficiated ore as reported in Mineral Summary, Brasilia, Brazil.

⁷Includes manganiferous ore.

⁸The International Manganese Institute estimated Chinese manganese ore production, in gross weight and Mn content, respectively, to be in metric tons, as follows: 2004—8,500,000 and 1,700,000; 2005—12,000,000 and 2,400,000; 2006—11,000,000 and 2,200,000; 2007—14,000,000 and 2,800,000; and 2008—19,000,000 and 3,400,000.

⁹Calculated metal content includes allowance for assumed moisture content. Includes ore and sinter.

¹⁰Reported on a fiscal year-basis. Much of India's production grades below 35% Mn; content averaged 38.3% Mn for fiscal years 2004–05 through 2008–09.

TABLE 8—Continued
MANGANESE ORE: WORLD PRODUCTION, BY COUNTRY^{1,2}

¹¹Mostly oxide nodules; may include smaller quantities of direct-shipping carbonate and oxide ores for metallurgical and battery operations.

¹²Category represents the combined totals of Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burma, Chile, Colombia, Cote d'Ivoire, Egypt, Georgia, Hungary, Indonesia, Iran, Italy (from wastes), Morocco, Namibia, Romania, Russia (crude ore), Thailand, Turkey, and Zambia.

TABLE 9
FERROMANGANESE AND SILICOMANGANESE: WORLD PRODUCTION, BY COUNTRY^{1,2}

(Metric tons, gross weight)

Country ³	2004	2005	2006	2007	2008 ^c
Argentina, electric furnace, silicomanganese ^c	24,000	24,000	24,000	24,000	24,000
Australia, electric furnace: ^e					
Ferromanganese	115,000	120,000	125,000	125,000	125,000
Silicomanganese	135,000	140,000	140,000	140,000	140,000
Total	250,000	260,000	265,000	265,000	265,000
Brazil, electric furnace:					
Ferromanganese	204,216 ^r	182,400 ^r	280,770 ^r	336,630 ^r	340,000
Silicomanganese	303,784	297,600	292,230	350,370	350,000
Total	508,000 ^r	480,000 ^r	573,000 ^r	687,000 ^r	690,000
China: ^c					
Blast furnace, ferromanganese	590,000	500,000	600,000	600,000 ^r	600,000
Electric furnace:					
Ferromanganese	1,120,000	1,150,000	1,400,000	1,930,000 ^r	2,100,000
Silicomanganese	2,600,000	3,000,000	3,600,000	4,340,000 ^r	4,500,000
Total	4,310,000	4,650,000	5,600,000	6,870,000 ^r	7,200,000
Egypt, electric furnace, ferromanganese ^c	30,000	30,000	30,000	30,000	30,000
France, electric furnace: ^c					
Ferromanganese	106,000	109,000	146,000	103,000	103,000
Silicomanganese ⁴	64,100	52,300	63,300	65,000	55,000
Total	170,100	161,300	209,300	168,000	158,000
Georgia, electric furnace:					
Ferromanganese	12,800	13,945	5,130	5,000	5,000
Silicomanganese	91,900	109,414	116,945	120,000	120,000
Total	104,700	123,359	122,075	125,000	125,000
India, electric furnace:					
Ferromanganese	204,800	192,900	180,000 ^e	180,000 ^e	170,000
Silicomanganese	96,893	69,224	80,000 ^{r, e}	80,000 ^{r, e}	90,000
Total	301,693	262,124	260,000 ^{r, e}	260,000 ^{r, e}	260,000
Indonesia, electric furnace: ^c					
Ferromanganese	12,000	12,000	12,000	12,000	12,000
Silicomanganese	7,000	4,000	5,000	6,000	7,000
Total	19,000	16,000	17,000	18,000	19,000
Iran, electric furnace, ferromanganese	36,700	NA	NA	NA	NA
Italy, electric furnace: ^c					
Ferromanganese	38,000	32,000	13,000	15,000	15,000
Silicomanganese	100,000	100,000	96,600	95,000	95,000
Total	138,000	132,000	109,600	110,000	110,000
Japan, electric furnace:					
Ferromanganese	437,389	448,616	406,162	420,151	430,000
Silicomanganese	73,041	94,725	59,424	52,901	56,000
Total	510,430	543,341	465,586	473,052	486,000
Kazakhstan, electric furnace:					
Ferromanganese ^c	2,000	2,100	2,100	2,100	2,100
Silicomanganese	155,324	170,214	220,000 ^e	188,445 ^r	179,939 ⁵
Total	157,324	172,314	222,100 ^e	190,545 ^r	182,039 ⁵
Korea, Republic of, electric furnace:					
Ferromanganese	165,525	124,434	169,202	209,321	251,125 ⁵
Silicomanganese	82,917	74,193	94,119	105,607	76,184 ⁵
Total	248,442	198,627	263,321	314,928	327,309 ⁵

See footnotes at end of table.

TABLE 9—Continued
FERROMANGANESE AND SILICOMANGANESE: WORLD PRODUCTION, BY COUNTRY^{1, 2}

(Metric tons, gross weight)

Country ³	2004	2005	2006	2007	2008 ^c
Macedonia, electric furnace:					
Ferromanganese	--	--	--	--	12,623 ⁵
Silicomanganese	--	--	--	70,472	54,931 ⁵
Total	--	--	--	70,472	67,554 ⁵
Mexico, electric furnace: ⁶					
Ferromanganese	72,471	89,642	62,485	74,578 ^r	97,366 ⁵
Silicomanganese	103,206	104,780	97,457	109,286 ^r	114,320 ⁵
Total	175,677	194,422	159,942	183,864 ^r	211,686 ⁵
Norway, electric furnace: ^e					
Ferromanganese	245,000	250,000	245,000	245,000	215,000
Silicomanganese	230,000	230,000	230,000	225,000	200,000
Total	475,000	480,000	475,000	470,000	415,000
Poland:					
Blast furnace, ferromanganese	46,900	7,800	4,100	4,000	4,000
Electric furnace, silicomanganese	29,600	10,242	3,310	3,000	3,000
Total	76,500	18,042	7,410	7,000	7,000
Romania, electric furnace:					
Ferromanganese	191	18,625	3,329	--	--
Silicomanganese	194,745	100,957	53,085	26,868	10,000
Total	194,936	119,582	56,414	26,868	10,000
Russia: ^e					
Blast furnace, ferromanganese	110,000	110,000	130,000	120,000	110,000
Electric furnace, silicomanganese	141,000	48,000	40,000	40,000	40,000
Total	251,000	158,000	170,000	160,000	150,000
Slovakia, electric furnace:					
Ferromanganese	66,959	43,458	59,391	74,065 ^r	61,194 ⁵
Silicomanganese	64,842	47,843	59,128	71,587 ^r	59,940 ⁵
Total	131,801	91,301	118,519	145,652 ^r	121,134 ⁵
South Africa, electric furnace:					
Ferromanganese	611,914	570,574	656,235	698,654 ^r	610,000
Silicomanganese ^e	334,000 ^r	231,000 ^r	247,000 ^r	302,000 ^r	260,000
Total	945,914 ^r	801,574 ^r	903,235 ^r	1,000,654 ^r	870,000
Spain, electric furnace: ^e					
Ferromanganese	10,000	10,000	10,000	10,000	10,000
Silicomanganese	100,000	100,000	100,000	100,000	100,000
Total	110,000	110,000	110,000	110,000	110,000
Ukraine:					
Blast furnace, ferromanganese ^e	79,000	30,000	25,000 ^r	20,000 ^r	14,200 ⁵
Electric furnace:					
Ferromanganese	375,990	359,000	373,000	368,000	362,400 ⁵
Silicomanganese	1,060,000	1,040,000	1,168,000	1,281,000	894,400 ⁵
Total	1,514,990	1,429,000	1,566,000 ^r	1,669,000 ^r	1,271,000 ⁵
United States, electric furnace, ferromanganese ⁷					
	W	W	W	W	W
Venezuela, electric furnace: ^e					
Ferromanganese	15,000	15,000	15,000	15,000	15,000
Silicomanganese	35,000	35,000	35,000	35,000	35,000
Total	50,000	50,000	50,000	50,000	50,000

See footnotes at end of table.

TABLE 9—Continued
 FERROMANGANESE AND SILICOMANGANESE: WORLD PRODUCTION, BY COUNTRY^{1,2}

(Metric tons, gross weight)

Country ³	2004	2005	2006	2007	2008 ^c
Grand total	10,700,000 ^r	10,500,000 ^r	11,800,000 ^r	13,400,000 ^r	13,200,000
Of which:					
Blast furnace, ferromanganese	826,000 ^r	648,000 ^r	759,000	744,000 ^r	728,000
Electric furnace, excluding United States:					
Ferromanganese ⁸	3,880,000 ^r	3,770,000 ^r	4,190,000 ^r	4,850,000 ^r	4,970,000
Silicomanganese ⁹	6,030,000	6,080,000 ^r	6,820,000 ^r	7,830,000 ^r	7,460,000

^cEstimated. ^rRevised. W Withheld to avoid disclosing company proprietary data; not included in "Grand total." NA Not available. -- Zero.

¹World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Table includes data available through July 1, 2009.

³In addition to the countries listed, Iran is thought to have produced silicomanganese, but production information is inadequate for the formulation of estimates of output levels.

⁴Includes silicospiegeleisen, if any.

⁵Reported figure.

⁶Salable products from Cía Minera Autlán S.A. de C.V.

⁷U.S. output of ferromanganese includes silicomanganese.

⁸Ferromanganese includes silicomanganese, if any, for North Korea.

⁹Includes silicospiegeleisen, if any, for France.

TABLE 10
MANGANESE MATERIALS: PROJECTS SCHEDULED FOR COMPLETION, BY YEAR, BY YEAREND 2013^{1, 2, 3}

(Metric tons, gross weight, unless otherwise specified)

Projected year of first production	Country	Project and company	Project type	Incremental annual production capacity	Total annual production capacity	Manganese product ⁴
2008	Brazil	Mineração Buritirama Manganese Alloy Plant Mineração Buritirama S.A.	new ferroalloys plant		120,000	HC FeMn, MC FeMn.
2008	China	ErDOS EJM Manganese Alloys Co. ERDOS Group (51%), JFE Steel Corporation (24.5%), and Mitsui & Co. (24.5%)	ferroalloys plant expansion	75,000	150,000	SiMn.
2008	Georgia	Chiatura Mine Georgia Manganese Holding Limited	mine expansion	100,000	450,000 ⁵	Mn ore.
2008	India	JSL Kalinga Nagar Ferroalloy Plant JSL Limited	new ferroalloys plant	NA	50,000	FeMn.
2008	South Africa	Krugersdorp Manganese Metal Plant Mogale Alloys (Pty.) Limited ⁶	do.	NA	48,000 ^r	do.
2008	Do.	Kalahari Manganese Project United Manganese of Kalahari	new mine	NA	250,000 ^e	Mn ore.
2009	Australia	Balfour Downs Manganese Project Hancock Prospecting Pty. Ltd. ⁷	do.	NA	350,000	do.
2009	Do.	Bootu Creek Manganese Mine OM (Manganese) Ltd.	mine expansion	150,000	850,000	do.
2009	Do.	Groote Eylandt Mining Company Pty. Ltd. BHP Billiton Limited (60%) and Anglo American Corporation (40%)	do.	700,000	4,100,000	do.
2009	China	Anhui EMM Plant Anhui Chizhou Jinshan Mining Co., Ltd. (50%) ^e and Hubei Jiayu Gaoqiang Manganese Co., Ltd. (50%) ^e	new EMM plant	NA	30,000	EMM.
2009	Do.	ErDOS EJM Manganese Alloys Co. ERDOS Group (51%), JFE Steel Corporation (24.5%), and Mitsui & Co. (24.5%)	ferroalloys plant expansion	300,000 NA	450,000 186,000	SiMn. FeMn.
2009	Do.	Guangxi Eramet-Comilog EMD Plant Guangxi Eramet-Comilog Chemicals Co., Ltd.	EMD plant expansion	10,000	20,000	EMD.
2009	Do.	Henan Qi County Qianyuan Plant Henan Qi County Qianyuan Furnace Charge Co., Ltd.	ferroalloys plant expansion	50,000	170,000	SiMn.
2009	Do.	Windsor Manganese Ltd. Singapore Windsor Holdings	new ferroalloys plant	NA	100,000	do.
2009	Gabon	Moanda Mine Compagnie Miniere de l'Ogooue (Comilog) S.A.	mine expansion	200,000	3,700,000	Mn ore.
2009	Georgia	Zestafoni Ferroalloys Plant Georgia Manganese Holding Limited	ferroalloys plant expansion	30,000	180,000	FeMn, SiMn.
2009	India	Aryan Mining Trade Company Stemcor Group	mine expansion	60,000	120,000	Mn ore.
2009	Do.	Orissa Manganese and Minerals Pvt. Ltd. Adhunik Metaliks Ltd.	do.	NA	300,000	do.

See footnotes at end of table.

TABLE 10—Continued
MANGANESE MATERIALS: PROJECTS SCHEDULED FOR COMPLETION, BY YEAR, BY YEAREND 2013^{1, 2, 3}

(Metric tons, gross weight, unless otherwise specified)

Projected year of first production	Country	Project and company	Project type	Incremental annual production capacity	Total annual production capacity	Manganese product ⁴
2009	Russia	Siberian Mining and Metallurgical Company (SGMK) Ferro Alloys Plant	new ferroalloys plant	NA	45,000	Mn alloys.
2009	Do.	Selezen Manganese Mine SGMK Shalymkaya Mining Company	new mine	NA	NA	Mn ore.
2010	Australia	Ant Hill and Sunday Hill Mesa Minerals Limited	do.	NA	300,000	do.
2010	Do.	Nicholas Downs Manganese Project Hancock Prospecting Pty. Ltd. ⁸	do.	NA	500,000	do.
2010 ^c	China	CITIC Dameng Tiandong Plant CITIC Dameng Tiandong New Materials Co., Ltd.	new EMM plant	NA	30,000	EMM.
2010	Do.	Wuhai Mengjin Smelting Wuhai Mengjin Smelting Co. Ltd.	ferroalloys plant expansion	120,000	170,000	SiMn.
2010	Gabon	Manganese Project, Bembélé Mountains Compagnie Industrielle et Commerciale des Mines de Huazhou (CICMH)	new mine	NA	500,000 ^r	Mn ore.
2010	Do.	Moanda Mine Comilog S.A.	mine expansion	300,000	4,000,000	do.
2010	India	Balasore Alloys Balasore Alloys Limited	ferroalloys plant expansion	NA	100,000	FeMn, SiMn.
2010	Do.	Bhilai Ferro-Alloys Plant Manganese Ore (India) Limited (MOIL) (50%) and Steel Authority of India Limited (50%)	new ferroalloys plant	NA	150,000 ^r	Mn alloys.
2010	Do.	Bobbili Ferro-Alloys Plant MOIL (50%), Rashtriya Ispat Nigam Limited (50%)	do.	NA	45,000	SiMn.
2010	Do.	Rohit Ferro Tech Haidia Plant Rohit Ferro Tech Ltd.	do.	NA	100,000	FeMn, SiMn.
2010	South Africa	Kalagadi Manganese Project Kalagadi Manganese (50%) and ArcelorMittal (50%)	new mine-beneficiation-sinter complex (Northern Cape Province) and ferroalloys plant (Coega, Eastern Cape Province)	NA NA	3,000,000 320,000	Mn ore. FeMn.
2010	Do.	Kalahari Manganese Project United Manganese of Kalahari	mine expansion	750,000	1,000,000	Mn ore.
2010	Do.	Mamatwan Mine BHP Billiton Limited	do.	1,000,000	3,800,000	do.
2011 ^c	China	CITIC Dameng Beibuwan Plant CITIC Dameng Beibuwan New Materials Co., Ltd.	new ferroalloys plant	NA	160,000	SiMn.
2011 ^c	Do.	Sinosteel Guangxi Ferroalloy Plant Sinosteel Guangxi Ferroalloy Co., Ltd.	ferroalloys plant expansion	700,000	1,000,000	FeMn.

See footnotes at end of table.

TABLE 10—Continued
MANGANESE MATERIALS: PROJECTS SCHEDULED FOR COMPLETION, BY YEAR, BY YEAREND 2013^{1,2,3}

(Metric tons, gross weight, unless otherwise specified)

Projected year of production	Country	Project and company	Project type	Incremental annual production capacity	Total annual production capacity	Manganese product ⁴
2011 ^e	Cote d'Ivoire	Lauzoua Mine Societe pour le Developpement Minier en Cote d'Ivoire (51%), China National Geological & Mining Corporation (39%), and the State of Cote d'Ivoire (10%)	new mine	NA	150,000	Mn ore.
2011 ^e	India	Chandrapur Plant Maharashtra Elektrosmet Ltd.	ferroalloys plant expansion	60,000	180,000	FeMn, SiMn.
2011	Do.	Maithan Vizag Ferro-Alloys Plant Maithan Alloys Limited	new ferroalloys plant	NA	120,000	Mn alloys.
2011	Do.	Orissa Manganese and Minerals Pvt. Ltd. Adhunik Metaliks Ltd.	mine expansion	700,000	1,000,000	Mn ore.
2011	Do.	Rohit Ferro Tech Orissa Plant Rohit Ferro Tech Ltd.	ferroalloys plant expansion	50,000	160,000	HC FeCr, HC FeMn, SiMn.
2011	Do.	10 mines ⁹ Manganese Ore (India) Limited (MOIL)	mine expansion	600,000	2,000,000	Mn ore.
2011	Russia	Krasnoyarsk Ferroalloys Plant ZAO ChEK.SU-Vk and Krasnoyarsk Territory Administration Council	new ferroalloys plant	NA	140,000	Mn alloys.
2011	Do.	Usink Manganese Mine ZAO ChEK.SU-Vk	new mine	NA	300,000 ^e	Mn ore.
2012	Cameroon	Nkamouna Cobalt-Nickel-Manganese Project Geovic Mining Corporation	do.	NA	45,000 ^f	do.
2012 ^e	India	Orissa Manganese and Minerals Pvt. Ltd. Orissa Ferro-Alloys Plant Adhunik Metaliks Ltd.	new ferroalloys plant	NA	40,000	Mn alloys.
2012	Russia	Sosnovoborsk Ferroalloys Plant Turukhansky Meridian	do.	112,000	211,000	FeMn.
2012	South Africa	Kalahari Manganese Project United Manganese of Kalahari	mine expansion	500,000	1,500,000	Mn ore.
2012	Do.	Tshipi Kalahari Manganese Project OM Holdings Limited (49.9%) and Ntsimbintle Mining (Pty) Ltd. (50.1%)	new mine	NA	2,200,000	do.
2012	Do.	Wessels Mine BHP Billiton Limited	do.	700,000	1,600,000	do.
2013	Gabon	Moanda Metallurgical Complex Comilog S.A.	new EMM and SiMn plants	NA NA	65,000 20,000	SiMn. EMM.

^eEstimated. ^fRevised. Do., do. Ditto. NA Not available.

¹Estimated data are rounded to no more than three significant digits.

²Projects in feasibility or later stages of development in 2008. Actual startup dates may be postponed, owing to economic or other factors. Additional projects might produce manganese materials by 2013, but not enough information was available to include them.

³Includes projects having the following minimum tonnage capacities: 45,000 of manganese alloys or manganese ore; and 10,000 metric tons of electrolytic manganese dioxide or electrolytic manganese metal.

⁴Cr Chromium. EMD Electrolytic manganese dioxide. EMM Electrolytic manganese metal. FeMn Ferromanganese. HC FeCr High-carbon ferrochromium. HC FeMn High-carbon ferromanganese. LC FeMn Low-carbon ferromanganese. MC FeMn Medium-carbon ferromanganese. Mn Manganese. SiMn Silicomanganese.

⁵The amount of manganese concentrate produced from 1,180,000-metric tons per year (t/yr) of crude ore.

⁶Mogale Alloys (Pty.) Limited acquired the Krugersdorp manganese metal plant from Manganese Metal Company (Pty.) Ltd. in 2007.

Finland's Ruukki Group acquired an 84.9% stake in Mogale Alloys in May 2009.

TABLE 10—Continued

MANGANESE MATERIALS: PROJECTS SCHEDULED FOR COMPLETION, BY YEAR, BY YEAREND 2013^{1, 2, 3}

⁷Mineral Resources Limited will operate the mine.

⁸The Kalagadi Manganese sinter plant will have a capacity of 2.4 million metric tons per year.

⁹Manganese Ore (India) Limited (MOIL) operates 10 mines, 6 of which are located in the Nagpur and Bhandara Districts of Maharashtra and 4 in the Balaghat District of Madhya Pradesh. The company has not specified which mines would be affected by the planned capacity expansion.

Sources: Company annual reports, presentations, and press releases; unpublished personal communications; and trade publications.