USGS
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2006 Minerals Yearbook

MANGANESE

U.S. Department of the Interior
U.S. Geological Survey

June 2008

MANGANESE

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In 2006, U.S. manganese apparent consumption was an estimated 1.05 million metric tons (Mt), a 36% increase from 773,000 metric tons (t) in 2005 (table 1). Increases in manganese ore and high-carbon ferromanganese shipments from the U.S. Government's National Defense Stockpile (NDS), and ferromanganese, silicomanganese, and manganese metal imports accounted for most of the rise in apparent consumption.

Manganese imports increased by 8% on a content basis compared with those of 2005 (table 6). Manganese exports increased by 5% compared with those of 2005 on a content basis, based on the typical manganese contents of the materials as calculated in table 4.

In 2006, the price of ore decreased by 20% from that of 2005, while the average prices of manganese ferroalloys rose (except manganese metal). The price of metallurgical-grade ore decreased by about 25% internationally. Prices for high- and medium-carbon ferromanganese and silicomanganese increased from those in 2005 by 36%, 12%, and 14%, respectively.

In 2006, sales of manganese materials from the NDS reduced the Government's inventory of manganese by 20% (content basis), leaving an inventory of about 55% of the annual apparent consumption. The larger disposals (reported sales) were of metallurgical-grade ore and high-carbon ferromanganese.

World production of manganese ore in 2006 rose by 7% on a gross weight basis and by 8% on a contained-weight basis, compared with that in 2005 (table 7). 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 rose by 14% to 12.3 Mt on a gross weight basis compared with that in 2005 (table 8). 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 domestic manganese demand, currently in the range of 85% to 90% of the total 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

The revised Annual Materials Plan (AMP) for fiscal year 2006 that the Defense National Stockpile Center (DNSC) of the Defense Logistics Agency issued on November 14, 2005, covered the period from October 1, 2005, through September 30, 2006. Under this AMP, the maximum disposal authority for manganese materials was 453,592 t for metallurgical-grade ore; 90,718 t for the high-carbon ferromanganese; 36,287 t for chemical-grade ore; 27,216 t for natural battery-grade ore; 2,732 t for synthetic manganese dioxide; and 1,814 t for electrolytic manganese metal (Defense National Stockpile Center, 2006). 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 2006, disposals (reported sales) of manganese materials announced by the DNSC totaled 94,851 t for high-carbon ferromanganese and 13,309 t for nonstockpile-grade metallurgical-grade ore.

The NDS physical inventory of manganese materials, in gross weight, indicated that all inventories decreased except nonstockpile-grade metallurgical ore and synthetic manganese dioxide (increased by 47,052 t and 1,314 t, respectively). The decreases consisted of 106,012 t for stockpile-grade metallurgical ore; 56,460 t for high-carbon ferromanganese; 13,605 t for chemical-grade ore; and 408 t for natural battery-grade ore (Defense National Stockpile Center, unpub. data, December 2006). In 2006, the estimated manganese content of manganese inventories being held by the Government at yearend was lowered by 20% to 580,000 t. On the basis of manganese content, the total remaining inventory was about 55% of the current national apparent consumption.

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 type of 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.

A strike by hourly workers at Eramet Marietta Inc.'s plant in Marietta, OH, began on August 27. The company was able to continue producing manganese ferroalloys to meet its contractual requirements although the strike continued past yearend (Marietta Times, 2006; Ryan's Notes, 2006e).

Globe Metallurgical Inc., a U.S. silicon company, did not produce silicomanganese in 2006, as it had for the first time during January through March 2005. Felman Production Inc. sporadically produced silicomanganese during the year; the company reportedly resumed operating one of its three furnaces in September after about a 9-month closure, and then starting the other two in October. The company planned to produce about 300 metric tons per day by yearend, although this rate could not be confirmed (Ryan's Notes, 2006b, d).

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 2006, 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 2005 and remained a relatively minor component of overall manganese use in steelmaking. Reported consumption (gross weight) of ferromanganese increased from that in 2005, by 4%, and decreased by 4% for manganese metal and 2% for silicomanganese (table 4). Because of the incompleteness of 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 unit consumption in steelmaking was about 6.8 kilograms per metric ton (kg/t) or about 2.4 times that calculated on the basis of reported consumption in 2006. This level was 26% more than the quantity of 5.4 kg/t estimated for 2005 and was a result of significant increases in apparent consumption of ferromanganese and silicomanganese. Increases in apparent consumption were attributable to significant increases in imports of these materials.

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 automobiles, cookware, radiators, and roofing (Harben and others, 1998, p. 80-105).

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 (Weiss, 1977, p. 221-323; Harben and others, 1998, p. 80-105). The source of manganese units for these applications was mainly manganese ore.

In 2006, reported domestic consumption of manganese ore decreased slightly to 365,000 t, while corresponding yearend stocks decreased by 53% to 159,000 t (table 1). The decrease in yearend stocks was not reflected in the amount of manganese ore that was reported consumed by domestic companies or in the amount of manganese ore exported to other countries. Rather this apparent discrepancy represented incomplete reporting to the USGS voluntary consumption survey. Apparent consumption of manganese ore in 2006 was about 792,000 t, which included some manganese ore consumed directly by ironmaking and steelmaking plants. The USGS must exclude reporting by these operations to avoid disclosing company proprietary information.

Data on domestic consumption of manganese ore, exclusive of that consumed within the steel industry, are collected by means of the "Manganese Ore and Products" survey. In 2006, 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. 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 or a basis upon which to estimate the data were obtained from all of these firms for 2005, excluding Felman Production Inc.

Prices

Manganese Ore.—The USGS estimated the annual average contract price of metallurgical-grade ore containing 48% manganese to be about $3.51 per metric ton unit (mtu). 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 North American transaction prices as reported by Ryan's Notes was $2.33 per mtu. The range in spot market prices peaked in December at $2.70 to $2.80 mtu, up from a low of $2.30 to $2.40 mtu during the second and third quarters. The price of a metric ton of ore 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 between ore quality requirements by end use—ferroalloy production, blast furnace ironmaking, and manufacture of manganese chemicals.

The price of manganese in ore in 2006 and 2005 was 35.1 and 43.9 cents per kilogram, respectively. These values indicate a decrease of 20% in U.S. cost, insurance, freight (c.i.f.) price, or about 5% less than the increase in free on board (f.o.b.) price in international markets compared with those in 2005.

In fiscal year 2006 (April 2006 to March 2007), the international benchmark price for metallurgical-grade ore decreased by 24.5% from that of 2005, when price negotiations between BHP Billiton Ltd. and major Japanese consumers were concluded in December. On an f.o.b. basis for delivery during the annual contract year, the agreed price was $3.01 per mtu for ore from the Groote Eylandt Mine in Australia (TEX Report, 2005). The decrease in manganese ore prices was attributable primarily to an increased supply of manganese ore.

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 $867.51 per gross ton for high-carbon ferromanganese, 66.70 cents per pound for medium-carbon ferromanganese, and

39.57 cents per pound for silicomanganese. These prices were 36%, 12%, and 14% higher, respectively, than those of 2005. 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 75.52 cents per pound, which was a 15% decrease compared with that of 2005. The year-average price for manganese metal was 34% less than the last listed U.S. price for domestically produced electrolytic manganese metal of $1.15 per pound at the beginning of 1996.

Prices for both grades of ferromanganese and silicomanganese increased based on increased demand from the domestic steel sector during 2006. Manganese metal prices decreased in response to decreased demand from the domestic aluminum sector.

According to Platts Metals Week, the price range for high-carbon ferromanganese containing 78% manganese, per gross ton, began the year at $710 to $750 and ended the year at $820 to $850, for a net increase of 14%. 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 49.5 to 52 cents and ended the year at 66 to 70 cents, for a net increase of 34%. The price range for imported silicomanganese with 2% carbon, per pound of alloy, started the year at 36 to 39 cents and ended 2006 at 38 to 40 cents, for a net increase of 4%.

According to Ryan's Notes North American transaction prices, the 2006 yearend price of bulk manganese metal shipments was 92 to 95 cents per pound, a net increase of 36% from the price of 68 to 70 cents per pound at the beginning of the year. However, as mentioned, the 2006 annual average price for manganese metal was 15% less than that of 2005.

Foreign Trade

In the absence of domestic mine production and recycling, U.S. net import reliance, as a percentage of apparent consumption, was 100% for manganese, the same as it has been for the past 21 years. The ensuing comparisons of foreign trade data were made on the basis of gross weight.

U.S. exports of ferromanganese, manganese metal, and silicomanganese increased during 2006, while exports of manganese dioxide and ore decreased compared with exports for 2005 (table 5). The biggest year-to-year change in exports was that of manganese ore, which decreased 83% compared with those in 2005. Canada accounted for 66% of manganese ore exports, followed by Venezuela at 16%.

U.S. imports of ferromanganese, manganese dioxide, manganese metal, potassium permanganate, and silicomanganese increased during 2006 compared with those of 2005, while imports of manganese ore fell (table 6). The most significant year-to-year change was for imports of ferromanganese; these were 41% more than those of 2005. Increases in this import subcategory were especially notable for those from China, with an increase of 40,100 t (149%), and from South Africa, with an increase of 43,500 t (29%) year-on-year.

Imports of spiegeleisen (pig iron containing about 20% manganese) decreased to 247 t in 2006 from 291 t in 2005, on a gross weight basis, with a total customs value of $229,989 or about $931 per metric ton. Most of these imports were from South Africa (95%), with the remaining from India (U.S. Census Bureau, unpub. data, December 2006).

Pending U.S.-Southern African Customs Union Free Trade Agreement.—Representatives from the Office of the United States Trade Representative (USTR) and member nations of the Southern African Customs Union (Botswana, Lesotho, Namibia, South Africa, and Swaziland) continued negotiations on the pending U.S.-Southern African Customs Union Free Trade Agreement (FTA). In April 2006, the parties agreed to establish a framework for pursuing the FTA during the longer term (Office of the United States Trade Representative, 2006, p. 7). The USTR launched negotiations for the FTA in June 2003 (Office of the United States Trade Representative, 2003). The FTA could result in the permanent elimination of the 14% ad valorem duty on all imports of unwrought manganese—manganese flake (HTS subheading 8111.00.47) and "other" unwrought manganese articles, such as manganese powder and manganese-aluminum briquettes (HTS subheading 8111.00.49)—from South Africa.

Antidumping Duty Administrative Reviews.—On January 3, both the International Trade Administration of the U.S. Department of Commerce (ITA) and the U.S. International Trade Commission (ITC) instituted 5-year reviews of the antidumping duty orders on silicomanganese from Brazil, China, and Ukraine to determine whether revocation of the orders would likely lead to continuation or recurrence of material injury (International Trade Administration, 2006a; U.S. International Trade Commission, 2006a). On May 9, the ITA determined to continue the antidumping duties on silicomanganese imports from the following countries: Ukraine, 163.00%; China, 150%; and Brazil 17.6%, except for Rio Doce Manganes S.A. (RDM) [Companhia Vale do Rio Doce (CVRD)], 64.93% and its subsidiaries Companhia Paulista de Ferro-Ligas and Urucum Mineracao S.A. (International Trade Administration, 2006d). Also in May, the ITC announced it would conduct expedited reviews of the antidumping duty orders (U.S. International Trade Commission, 2006b). In September, the ITC decided to extend the orders on Brazilian, Chinese, and Ukrainian silicomanganese (U.S. International Trade Commission, 2006c). As a result of the ITC decision, the ITA announced it would continue to collect antidumping duties on silicomanganese imports from these countries (International Trade Administration, 2006c).

On January 17, the ITA made a final determination that no duty would be imposed on silicomanganese imported from Brazilian producer RDM during December 1, 2003, through November 30, 2004 (International Trade Administration, 2006b).

World Review

World manganese ore production was an estimated 11.9 Mt (contained manganese) in 2006, up 8% from that in 2005. The bulk (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 (19%), Australia (18%), China (13%), Brazil (12%), and Gabon (11%) (table 7). World manganese ferroalloy production in 2006 was about 12.3 Mt (gross weight), a 14% increase from that of 2005. On a gross weight basis, the leading producer countries of manganese ferroalloys were, in decreasing order, China (46%), Ukraine (13%), South Africa (8%), Brazil (5%), Norway (4%), and Japan (4%) (table 8).

Camaj (2007) estimated world apparent consumption of manganese ferroalloys increased by 8% to 11.6 Mt in 2006 compared with that of 2005. Of that amount, 6.5 Mt was silicomanganese, 4.1 Mt was high-carbon ferromanganese, and 1.1 Mt was refined (medium- and low-carbon) ferromanganese. Manganese ore apparent consumption was 11 Mt (contained manganese), an increase of 2% from that of 2005. World supply of manganese ferroalloys and ore in 2006 exceeded world consumption of those materials by 6% and 8%, respectively.

European Union.—On September 6, the European Commission's Directorate General for Trade began an antidumping investigation of silicomanganese imported during the period of July 1, 2005, to June 30, 2006, from China, Kazakhstan, and Ukraine. The Commission started the investigation based on the complaint lodged on July 24 by Euroalliages, the European Union ferroalloy producers' association (Official Journal of the European Union, 2006b).

On December 21, the European Commission's Directorate General for Trade started an antidumping investigation of electrolytic manganese dioxide (EMD) imported during the period of October 1, 2005, to September 30, 2006, from South Africa. The Commission began the investigation based on the complaint lodged on November 10 by Tosoh Hellas AIC, an EMD producer in Greece (Official Journal of the European Union, 2006a).

Australia.—The Australian Government reported manganese ore resources decreased by 2.6% in 2006 to 139 Mt compared with that of 2005. Manganese ore reserves that met the Australian Joint Ore Resources Committee (JORC) code were 112 Mt in 2006. The resource life based on JORC code reserves was estimated to be about 12 years based on the current rate of production of beneficiated manganese ore of 4.6 million metric tons per year (Mt/yr) (Geoscience Australia, 2007, p. 46-47).

In June, Bootu Creek Resources Pty. Ltd. (a subsidiary of Singapore's OM Holdings) commissioned its 600,000-metric-ton-per-year (t/yr) manganese mine in the Northern Territory. Production at the Bootu Creek Mine was about 165,000 t in 2006 (OM Holdings Limited, 2007).

Consolidated Minerals Ltd. (2007) reported a 2% increase in manganese ore production to 902,052 t at its Woodie Woodie Mine during FY 2007 (July 1, 2006, to June 30, 2007).

Brazil.—Mineração Buritirama S.A. (2008) reported it had received a Government license in January to construct a 90,000-t/yr manganese alloys plant near its mine in Maraba Industrial District. Production at the plant was scheduled to start in 2008, with a production mix of high-carbon ferromanganese, 50,000 t/yr; medium-carbon ferromanganese 20,000 t/yr; and silicomanganese, 20,000 t/yr (Ryan's Notes, 2006f).

CVRD produced 2.2 Mt of manganese ore in 2006, a decrease of 26% from that of 2005. The Azul Mine in Carajas produced 1.7 Mt. CVRD's manganese alloy production was also lower in 2006 than in 2005, falling to 534,000 t from 563,000 t. The decreases in manganese alloy and ore production resulted when the company restructured its manganese business by shutting down inefficient manganese alloy furnaces and some small manganese mines (Companhia Vale do Rio Doce, 2007).

China.—Chinese imports of manganese ore were at an alltime high of 6.21 Mt (gross weight) in 2006, up 35% from that of 2005. This was 18% of the estimated total world production in 2006 (TEX Report, 2007e). The bulk of the imported manganese ore was most likely used to blend with lower-grade domestic manganese ore for the production of manganese ferroalloys and metal.

The Central Government of China, through the National Development and Reform Commission (NDRC), announced on April 11 its plan to reduce the ferroalloy production capacity in the country by 25% to 17.0 Mt/yr by 2010 (TEX Report, 2006a). The NDRC estimated the number of ferroalloy producers in the country to be 1,570; total installed production capacity was about 22 Mt/yr—twice that of 2000. In 2005, 1.16 Mt of ferroalloy production capacity was under construction, with an additional 1.23 Mt planned. Ferroalloy production in 2006 and 2005 was 14.332 Mt (70% utilization rate) and 10.947 Mt, respectively. In 2005, China accounted for 40% of global ferroalloy production and 30% each of global consumption and exports (TEX Report, 2006c, d; TEX Report, 2007c).

The Central Government of China raised the duty on ferromanganese, medium-carbon ferromanganese, and silicomanganese exports to 10% effective November 1, 2006, an increase of 5% from that imposed on June 1, 2005 (Ryan's Notes, 2006a; TEX Report, 2007f). Despite the increased export duty, China exported 518,099 t of silicomanganese in 2006, an increase of 38% from that in 2005 and 25% less than the highest level of 694,326 t in 2004 (TEX Report, 2007d).

During the year, additional silicomanganese plants were brought online or were under construction. Jinzhou Nichiden Ferroalloy Ferroalloy Co., Ltd. started production in May at its new 50,000-t/yr silicomanganese plant in Liaoning Province. The company planned to produce 35,000 t in 2006 (TEX Report, 2006b).

In July, Erdos EJM Manganese Alloys Co. (a joint venture between ERDOS Group and two Japanese firms—JFE Steel Corporation, and Mitsui & Co.) started production at its new 75,000-t/yr silicomanganese plant in Qi Panjing, Inner Mongolia Autonomous Region (JFE Steel Corporation, 2006). The company's original plans called for a plant with a silicomanganese production capacity of 150,000-t/yr (Ryan's Notes, 2004).

Also in July, Henan Anyang Xinxin Ferroalloys started production at its new 70,000-t/yr silicomanganese smelter. The company planned to expand the plant's production capacity to 100,000 t/yr within 3 years (Metal-Pages, 2006b).

Jilin Ferroalloys Group Company Ltd. announced in July it would build a 200,000-t/yr silicomanganese smelter in Hegang in partnership with local company Hemeng Group. Hegang

is located in Heilongjiang Province that borders Russia. The smelter would use manganese ore from the Nanxingan Manganese Mine, estimated to have about 30 Mt of reserves and located in Russia's Judean Prefecture. Construction was expected to take about 18 months (Ryan's Notes, 2006c).

The NDRC instituted a policy on new industry entrance requirements for manganese metal flake production. The requirements called for a minimum production capacity of 30,000 t/yr and 10,000 t/yr for any affiliated production line. Existing production lines with less than 3,000-t/yr capacity would be eliminated (Metal-Pages, 2006a). The Central Government of China also imposed a 15% duty on manganese metal exports effective November 1 (TEX Report, 2007b). In 2006, China produced 730,000 t of electrolytic manganese metal and had the capacity to produce 1.2 Mt/yr. The number of Chinese electrolytic manganese metal producers was estimated to be 151 (TEX Report, 2007a). Only two countries—China and South Africa—have the capacity to produce electrolytic manganese metal. China's electrolytic manganese metal capacity was 71% of the world total (1.7 Mt).

Guangxi Tianhongxin Manganese Technology commissioned its new 30,000-t/yr electrolytic manganese plant in June. The company planned to double the plant's production capacity in the future at a total investment of Rmb530 million (US$66.5 million) (Metal-Pages, 2006f).

Gabon.—Compagnie Miniere de l'Ogooue or Comilog (a subsidiary of France's Eramet SA) continued to boost production capacity at its Moanda Mine toward 3.5 Mt/yr in 2008. The mine produced 3.0 Mt in 2006 (Eramet SA, 2007).

India.—Manganese Ore India Limited (MOIL) and Rashtriya Ispat Nigam Limited (RINL) formed a 50-50 joint-venture company, RINMOI Limited, in July to construct a new manganese ferroalloy plant near RINL's steel plant in Visakhapatnam. The plant was expected to produce 60,000 t/yr of ferromanganese and silicomanganese starting during the second quarter of 2007 (Metal-Pages, 2006d, e).

Kazakhstan.—Pupchenko (2007), the Head of Raw Materials Research, Metal Expert Research Group (Ukraine), reported that manganese ferroalloy production in 2006 totaled about 220,000 t, about 86% of which was exported to Ukraine (69%), Russia (27%), and China (4%). Joint Stock Company (JSC) Yermak Ferro-Alloys' Aksu Ferroalloy Plant and Temirtau Works accounted for 98% and 2% of the manganese ferroalloys domestic market, respectively,

Mexico.—Mexico continued to impose an antidumping duty of 54.34% on Chinese imports of high-carbon ferromanganese (Metal Pages, 2006c).

Romania.—From July to December, Privat Group (Ukraine) produced silicomanganese at its Feral plant in Romania (Metal-Pages, 2007b).

Russia.—Pupchenko (2007) reported that ferromanganese production in Russia during 2006 was about 140,000 t, and silicomanganese production was about 40,000 t. Chelyabinsk, the largest Russian silicomanganese producer, accounted for 9% of the domestic silicomanganese market. Satka Iron and Steel Works JSC and JSC Kosaya Gora Iron Works accounted for 30% and 37% of Russia's ferromanganese domestic market in 2006, respectively.

South Africa.—In February, Manganese Metal Company (Pty) Ltd. curtailed production at its Krugersdorp electrolytic manganese metal plant. The plant's production capacity was about 20,000 t/yr. The company continued to produce electrolytic manganese metal at its 30,000-t/yr plant in Nelspruit (TEX Report, 2006e; Manganese Metal Company, 2008).

Also in February, Assmang Limited expanded production capacity at its Nchwaning Mine to 3.84 Mt/yr from 3.0 Mt/yr when the new Nchwaning No. 3 shaft complex became fully operational (Assmang Limited, 2008).

In May 2006, BHP Billiton sold its interest in the Palmiet chrome business to Mogale Alloys, a consortium made up of Sebeso (30%), Mindev (25%), PGR Investent (25%), and Atoll (20%). Bateman Engineering N.V. acquired whole ownership of Atoll in 2006, and Sebeso is the consortium's Black Economic Empowerment partner. In addition to ferrochromium products, the Palmiet plant produced 38,300 t of silicomanganese in 2005, somewhat less than its estimated 40,000-t/yr silicomanganese production capacity (BHP Billiton Ltd., 2005; Mintek, 2005; and Bateman Globe, 2006).

Ukraine.—At yearend 2005, Stakhanov Ferroalloy Plant JSC, the country's leading ferrosilicon producer, had invested about $15 million to convert three of its ferrosilicon furnaces to silicomanganese production. Stakhanov began converting a fourth furnace to silicomanganese production in December 2006. The company expected the furnace to restart by mid-May 2007 at a cost of $1.9 million. After this conversion, Stakhanov's production mix would be one-half ferrosilicon and one-half silicomanganese (Metal-Pages, 2005; 2007a).

Pupchenko (2007) reported silicomanganese and ferromanganese production in Ukraine was 1.0 Mt and 332,000 t, respectively. The major silicomanganese producers in 2006 were OAO Zaporozhsky Ferro-Alloy Works (47%) and Nikopol Ferroalloy Plant (NFZ) (16%). NFZ, Zaporozhsky, Stakhanov, and Kramatorsky Metallurgical Plant accounted for 47%, 39%, 6%, and 3% of the Ukrainian ferromanganese domestic market, respectively.

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 will 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 2006 USGS Minerals Yearbook, volume I, Metals and Minerals. Raw steel production increased by 3.5% in the United States while increasing 9% globally from that of 2005.

World apparent consumption of finished steel products increased by 9% to 1.121 billion metric tons in 2006 from that of 2005. This increase was primarily attributed to steel consumption in Asia, particularly in China. Asia accounted for 54% of steel consumed worldwide in 2006, up by 9.4% to

607.2 Mt from that of 2005. China alone consumed about 374 Mt, a 14.4% increase from that of 2005. Steel consumption in 2006 was forecast to increase in all other regions of the world. Brazil, China, India, and Russia accounted for about 41% of the total (International Iron and Steel Institute, 2006). Global steel apparent consumption was projected to increase by 6.8% in 2007 and 2008. Brazil, China, India, and Russia were expected to lead this growth with a combined increase in steel consumption of 12.8% and 11.1% in 2007 and 2008, respectively. Steel consumption in North America was forecast to decrease by about 5% to about 148 Mt in 2007 compared with that in 2006 because of a downturn in residential construction, but increase by 4% between 2007 and 2008 (International Iron and Steel Institute, 2007).

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 2006 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 4.3% annually through 2011 to $14.9 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 4% through 2011 (Freedonia Group, Inc., The, 2007).

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TABLE 1
SALIENT MANGANESE STATISTICS[1]

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

	2002	2003	2004	2005	2006
United States:					
Manganese ore (35% or more Mn):					
Exports	15	18	123	13	2
Imports for consumption	427	347	451	656	572
Consumption[2]	360	398	441	368	365
Stocks, December 31, consumers[2]	151	156	159	337	159
Ferromanganese:					
Exports	9	11	9	14	22
Imports for consumption	275	238	429	255	358
Consumption	253	248	315	286	297
Stocks, December 31, consumers and producers	21	20	25 r	30	31
Consumption, apparent, manganese content[3]	696	643	1,030 r	773 r	1,050
Ore price, c.i.f.[4] U.S. ports, dollars per metric ton unit	2.30	2.41	2.89	4.39	3.51
World, production of manganese ore	22,100 r	24,200 r	27,900 r	31,100 r	33,400 e

eEstimated. rRevised.

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

[2]Exclusive of iron and steel plants.

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

[4]Cost, insurance, and freight.

TABLE 2
U.S. GOVERNMENT DISPOSAL AUTHORITIES AND INVENTORIES FOR MANGANESE MATERIALS AS OF YEAREND 2006[1]

(Metric tons, gross weight)

		Physical inventory[e]				
		Uncommitted			Sold,	
Material	Disposal authority	Stockpile grade	Nonstockpile grade	Total	pending shipment	Grand total
Synthetic manganese dioxide	--	--	--	--	2,610	2,610
Natural battery ore	--	--	--	--	17,600	17,600
Chemical ore	--	--	--	--	868	868
Metallurgical ore	332,000	--	332,000	332,000	39,800	372,000
High-carbon ferromanganese	517,000	517,000	--	517,000	35,000	552,000
Electrolytic metal	--	--	--	--	--	--

eEstimated. -- Zero.

[1]Data 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 2006

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.[2]	New Haven, WV		X		Do.
Tronox LLC	Henderson, NV			X	Electrolytic.

[1]FeMn, ferromanganese; SiMn, silicomanganese; MnO_2, synthetic manganese dioxide.

[2]Formerly Highlanders Alloys LLC. Product information obtained from various industry trade publications.

TABLE 4
U.S. CONSUMPTION, BY END USE, AND INDUSTRY STOCKS OF MANGANESE FERROALLOYS AND METAL IN 2006[1]

(Metric tons, gross weight)

End use	Ferromanganese			Silicomanganese	Manganese metal
	High carbon	Medium and low carbon	Total		
Steel:					
Carbon	131,000	87,100	218,000	53,400	843
High-strength, low-alloy	17,100	7,500	24,600	3,490	(2)
Stainless and heat-resisting	7,720	(2)	7,720	13,600	1,050
Full alloy	18,200	5,700	23,900	19,500	(2)
Unspecified[3]	1,450	1,560	3,010	777	1,950
Total	175,000	102,000	277,000	90,700	3,840
Cast irons	6,760	445	7,210	390	(4)
Superalloys	W	W	W	--	434
Alloys (excluding alloy steels)	6,660	6,270	12,900	(4)	13,300 [5]
Miscellaneous and unspecified	W	W	W	(4)	(4)
Grand total	189,000	109,000	297,000	91,100 [6]	17,500
Total manganese content[7]	147,000	86,800	234,000	60,100	17,500
Stocks, December 31, consumers and producers	12,000	19,300	31,300	10,400	716

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

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

[2]Withheld to avoid disclosing company proprietary data; included with "Steel: Unspecified."

[3]Includes electrical and tool steel, and items indicated by footnote (2).

[4]Withheld to avoid disclosing company proprietary data.

[5]Approximately 87% of this combined total was for consumption in aluminum alloys.

[6]Internal evaluation indicates that silicomanganese consumption is considerably understated.

[7]Estimated based on typical percentage manganese content.

TABLE 5

U.S. EXPORTS OF MANGANESE ORE, FERROALLOYS, AND METAL, BY COUNTRY[1]

Country	2005		2006	
	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	3,000	$893	1,470	$506
China	6,390	1,820	35	15
France	3,300	99	--	--
Germany	172	407	180	365
Indonesia	39	48	23	25
Japan	--	--	103	43
Mexico	101	161	--	--
Poland	193	91	21	20
Sweden	94	244	19	49
Venezuela	--	--	361	71
Other	176 r	181 r	22	24
Total	13,500	3,940	2,240	1,120
Ferromanganese, all grades:				
Canada	10,400	12,000	6,340	5,250
Mexico	4,060 r	2,850	1,560	1,220
Netherlands	2	6	13,700	7,550
Other	28 r	33 r	78	77
Total	14,400 r	14,900	21,700	14,100
Silicomanganese:				
Brazil	41 r	97	123	103
Canada	300	351	596	533
France	101	164	--	--
Mexico	359	409	129	135
Other	98 r	195 r	100	117
Total	900 r	1,220	947	888
Metal, including alloys and waste and scrap:				
Belgium	1,100	1,590	1,370	2,440
Canada	273	805	547	1,430
China	--	--	157	342
France	1	284	347	1,370
Germany	292	924	154	425
Japan	564	1,170	846	2,250
Mexico	197	435	38	111
Sweden	124	87	50	107
Other	126 r	673 r	395	1,140
Total	2,670	5,960	3,900	9,610
Manganese dioxide:				
Belgium	292	368	283	373
Canada	3,400	1,630	3,340	1,960
Germany	358	576	502	980
Korea, Republic of	140	217	78	207
Mexico	635	641	708	628
Poland	95	168	120	225
Russia	198	214	251	284
Other	782 r	1,220 r	539	915
Total	5,900	5,040 r	5,820	5,580

rRevised. -- Zero.

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

[2]Free alongside ship.

Source: U.S. Census Bureau.

TABLE 6

U.S. IMPORTS FOR CONSUMPTION OF MANGANESE ORE, FERROALLOYS, METAL, AND SELECTED CHEMICALS, BY COUNTRY[1]

Country	2005			2006		
	Quantity		Value,	Quantity		Value,
	Gross weight (metric tons)	Mn content (metric tons)	customs (thousands)	Gross weight (metric tons)	Mn content (metric tons)	customs (thousands)
Ore and concentrates with 20% or more manganese:						
All grades:						
Australia	41,100	21,300	$5,700	25,000	12,800	$3,900
Belgium	172	114	129	2,090	1,100	305
Brazil	12,400	7,020	2,230	9,400	5,800	1,520
Canada	--	--	--	6,510	1,850	309
China	14,000	5,490	833	6,700	3,120	617
Colombia	--	--	--	39,200	17,500	675
Gabon	485,000	252,000	39,100	230,000	120,000	26,600
Ghana	90	57	7	41,200	15,400	2,410
Mexico	8,810	4,320	1,030	5,900	1,320	708
Namibia	26,000	10,400	1,950	--	--	--
South Africa	68,000	33,100	7,170	206,000	91,200	16,800
Other	232 r	138 r	25 r	38	29	15
Total	656,000	334,000	58,200	572,000	270,000	53,900
More than 20% but less than 47% manganese:						
Brazil	--	--	--	1,790	812	280
Canada	--	--	--	6,510	1,850	309
China	5,140	1,050	35	2,410	858	115
Colombia	--	--	--	39,200	17,500	675
Gabon	4,060 2	4,950 2	684 r	--	--	--
Ghana	18	7	2	41,200	15,400	2,410
Mexico	8,810	4,320	1,030	2,950	1,030	353
Namibia	26,000	10,400	1,950	--	--	--
South Africa	--	--	--	107,000	40,600	7,660
Other	87 r	40 r	6 r	--	--	--
Total	44,100	20,800	3,710 r	201,000	78,000	11,800
47% or more manganese:						
Australia	41,100	21,300	5,700	25,000	12,800	3,900
Belgium	172	114	129	2,090	1,100	305
Brazil	12,400	7,020	2,230	7,600	4,990	1,240
China	8,890	4,440	798	4,300	2,260	502
Gabon	481,000 3	247,000 3	38,400 r	230,000	120,000	26,600
Ghana	72	50	4	--	--	--
Mexico	--	--	--	2,950	287 2	354
South Africa	68,000	33,100	7,170	98,300	50,700	9,140
Other	145 r	97 r	19 r	38	29	15
Total	612,000	313,000	54,500 r	371,000	192,000	42,100
Ferromanganese:						
All grades:						
Australia	4,960	3,810	2,630	4,000	3,090	2,240
Brazil	19,900	15,700 3	12,300 r	10,800	8,480	7,110
China	26,900	22,000	34,500	67,000	53,400	61,400
France	4,100	3,200	2,830	1,500	1,170	764
Georgia	--	--	--	1,470	1,160	637
Hong Kong	3,360	2,550	1,960	500	375	327
India	--	--	--	3,000	2,280	2,170
Japan	3,300	2,650	3,830	3,500	2,810	3,690
Korea, Republic of	15,700	12,400	14,300	38,200	30,400	32,600
Mexico	22,400	17,800	23,500	19,500	15,600	16,500
Norway	2,170	1,770 r	3,090	4,370	3,580	5,200
South Africa	149,000	117,000	99,300	193,000	151,000	133,000

See footnotes at end of table.

TABLE 6—Continued

U.S. IMPORTS FOR CONSUMPTION OF MANGANESE ORE, FERROALLOYS, METAL, AND SELECTED CHEMICALS, BY COUNTRY[1]

Country	2005			2006		
	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	2,860	2,250	$1,270	10,800	8,300	$7,500
Other	100 r	78 r	122 r	1,050	809	1,050
Total	255,000	201,000 r	200,000	358,000	282,000	275,000
1% or less carbon:						
China	14,700	12,600	24,100	21,100	17,900	25,700
Japan	3,300	2,650	3,830	3,500	2,810	3,690
Korea, Republic of	2,650	2,050	2,990	9,310	7,670	9,420
Mexico	7,940	6,360	8,610	6,920	5,580	7,230
Norway	240	197	385	1,080	869	1,350
South Africa	3,250	2,730	5,340	2,790	2,560	4,100
Other	53 r	42 r	72 r	42	37	58
Total	32,200	26,600	45,300	44,800	37,500	51,500
More than 1% to 2% or less carbon:						
Brazil	14	9	25	1,550	1,250	1,500
China	3,150	2,520	4,490	13,200	10,700	13,200
Korea, Republic of	13,000	10,400	11,400	15,700	12,700	14,000
Mexico	13,700	10,800	14,200	12,500	10,000	9,260
Norway	1,810	1,480	2,610	3,270	2,690	3,830
South Africa	28,700	23,300	30,800	32,500	26,400	28,700
Other	-- r	-- r	-- r	255	204	288
Total	60,300	48,500	63,400	79,000	63,900	70,800
More than 2% but not more than 4% carbon:						
Brazil	--	--	--	19	14	19
Georgia	--	--	--	1,470	1,160	637
South Africa	61	48	31	--	--	--
Total	61	48	31	1,490	1,170	656
More than 4% carbon:						
Australia	4,960	3,810	2,630	4,000	3,090	2,240
Brazil	19,900	15,700 [3]	12,200	9,200	7,220	5,590
China	9,040	6,890	5,940	32,700	24,800	22,600
France	4,100	3,200	2,830	1,500	1,170	764
Hong Kong	3,360	2,550	1,960	500	375	327
India	--	--	--	3,000	2,280	2,170
Korea, Republic of	--	--	--	13,200	10,000	9,190
Mexico	800	625	729	44	35	53
Norway	114	92	100	21	18	25
South Africa	117,000	90,900	63,100	157,000	122,000	101,000
Ukraine	2,860	2,250	1,270	10,800	8,300	7,500
Other	47 r	36 r	50 r	749	569	700
Total	162,000	126,000	90,900	233,000	180,000	152,000
Silicomanganese:						
Australia	35,400	23,500	20,900	29,000	19,400	19,400
Georgia	14,500	10,900	8,890	49,400 [2]	36,000 [2]	32,600
Korea, Republic of	5,220	3,410	3,280	13,000	8,330	9,920
Mexico	27,300	18,100	18,600	17,300	11,300	12,000
Norway	53,400	33,700	52,000	77,800	48,300	68,200
Romania	71,100	48,100	51,500	32,300	21,400	22,700
Russia	14,500	9,960	11,400	3,960 [2]	2,030 [2]	2,920
Saudi Arabia	--	--	--	7,510	4,820	4,370
South Africa	101,000	66,600	61,100	168,000	111,000	115,000

See footnotes at end of table.

TABLE 6—Continued

U.S. IMPORTS FOR CONSUMPTION OF MANGANESE ORE, FERROALLOYS, METAL, AND SELECTED CHEMICALS, BY COUNTRY[1]

Country	2005			2006		
	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:						
Spain	4,000	2,670	$2,770	--	--	--
Other	1,210	917 r	713 r	2,200 [2]	1,450 [2]	$1,080
Total	327,000	218,000	231,000	400,000	264,000	288,000
Metal:						
Unwrought[4]:						
China	14,900 r	XX	22,500 r	21,200	XX	28,000
Germany	2,550	XX	4,900	836	XX	1,580
South Africa	11,000	XX	20,500	7,800	XX	13,400
Spain	2,780	XX	6,570	496	XX	827
Other	18 r	XX	30 r	112	XX	253
Total	31,300 r	XX	54,500 r	30,400	XX	44,000
Other manganese, wrought:						
Brazil	--	XX	--	463	XX	601
China	320	XX	522	710	XX	883
Mexico	5	XX	9	223	XX	376
Other	125 r	XX	649 r	97	XX	439
Total	451	XX	1,180	1,490	XX	2,300
Waste and scrap:						
Canada	639	XX	178	1,010	XX	349
Germany	(5)	XX	5	--	XX	--
Total	639	XX	183	1,010	XX	349
Manganese dioxide:						
Australia	15,900	XX	21,000	13,700	XX	19,300
Brazil	589	XX	544	344	XX	322
China	10,300	XX	10,900	15,100	XX	16,000
Japan	4,210	XX	5,770	6,480	XX	8,940
Other	497 r	XX	1,240 r	869	XX	2,060
Total	31,500	XX	39,500	36,400	XX	46,600
Potassium permanganate:						
Czech Republic	666	XX	1,410	584	XX	1,290
India	317	XX	634	582	XX	1,370
Other	65	XX	140	130	XX	293
Total	1,050	XX	2,190	1,300	XX	2,950

rRevised. XX Not applicable. -- Zero.

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

[2]All or part of these data have been referred to the U.S. Census Bureau for verification.

[3]Part of these data were revised by the U.S. Census Bureau.

[4]Imports of unwrought metal include flake, powder, and other.

[5]Less than ½ unit.

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

TABLE 7
MANGANESE ORE: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons)

Country[3]	Mn content, percentage[e, 4]	2002	2003	2004	2005	2006
Australia:[5]						
Gross weight		2,189 [r]	2,564 [r]	3,431 [r]	3,136 [r]	4,556
Mn content	37-53	983	1,247	1,570 [r]	1,500 [r]	2,192
Brazil:[6]						
Gross weight		2,529	2,544	3,143	3,200 [r]	3,128 [p]
Mn content	37-51	1,095	1,286	1,346	1,370 [r]	1,370 [p]
China:[e, 7, 8]						
Gross weight		4,500	4,600	5,500	7,500 [r]	8,000
Mn content	20-30	900	920	1,100	1,500 [r]	1,600
Gabon:[9]						
Gross weight		1,856	2,000	2,460	2,859 [r]	3,000
Mn content[e]	45-53	810	873	1,090	1,290	1,350
Ghana:						
Gross weight		1,136	1,509	1,597 [r]	1,715 [r]	1,700 [e]
Mn content[e]	32-34	363	528 [r]	559 [r]	600 [r]	600
India:[10]						
Gross weight		1,553 [r]	1,650	1,776 [r]	2,386 [r]	2,003 [p]
Mn content	10-54	601 [r]	620	630	927 [r]	811 [p]
Kazakhstan, crude ore:						
Gross weight		1,792	2,361	2,318	2,208	2,250
Mn content[e]	20-30	440	580	570	540	550
Mexico:[11]						
Gross weight		245	320	377	369 [r]	370 [e]
Mn content	36-37[r]	88	115	136	133 [r]	133 [e]
South Africa:[9]						
Gross weight		3,322	3,501	4,282	4,612	5,213
Mn content	30-48+	1,504	1,585	1,905	2,100	2,300
Ukraine:						
Gross weight		2,470	2,591	2,362	2,260	2,400
Mn content[e]	30-35	840	880	810	770	820
Other:[e, 12]						
Gross weight		526 [r]	529 [r]	696 [r]	829 [r]	750
Mn content	XX	149 [r]	144 [r]	198 [r]	250 [r]	213
Total:						
Gross weight		22,100 [r]	24,200 [r]	27,900 [r]	31,100 [r]	33,400
Mn content	XX	7,770 [r]	8,780 [r]	9,910 [r]	10,980 [r]	11,900

[e]Estimated. [p]Preliminary. [r]Revised. XX Not applicable.

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

[2]Table includes data available through July 29, 2007. 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.

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

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

[5]Metallurgical ore.

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

[7]Includes manganiferous ore.

[8]The 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; and 2006—11,000,000 and 2,200,000.

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

[10]Reported on a fiscal year-basis. Much of India's production grades below 35% Mn; content averaged 38.3% Mn for fiscal years 2002-03 through 2006-07.

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

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

TABLE 8

FERROMANGANESE AND SILICOMANGANESE: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Metric tons, gross weight)

Country[3]	2002	2003	2004[e]	2005[e]	2006[e]
Argentina, electric furnace, silicomanganese[e]	5,000	5,000	5,000	5,000	5,000
Australia, electric furnace:[e]					
Ferromanganese	115,000	115,000	115,000	120,000	125,000
Silicomanganese	135,000	135,000	135,000	140,000	140,000
Total	250,000	250,000	250,000	260,000	265,000
Brazil, electric furnace:					
Ferromanganese	108,537 [r]	176,076 [r]	204,216 [r, 4]	182,400 [r, 4]	280,770 [4]
Silicomanganese	190,463 [r]	261,924 [r]	303,784 [r, 4]	297,600 [r, 4]	292,230 [4]
Total	299,000 [r]	438,000 [r]	508,000 [r, 4]	480,000 [r, 4]	573,000 [4]
China:[e]					
Blast furnace, ferromanganese	500,000	550,000	590,000	500,000 [r]	500,000
Electric furnace:					
Ferromanganese	490,000	700,000	1,120,000	1,150,000 [r]	1,300,000
Silicomanganese	1,580,000	1,800,000	2,600,000	3,000,000 [r]	3,800,000
Total	2,570,000	3,050,000	4,310,000	4,650,000 [r]	5,600,000
Egypt, electric furnace, ferromanganese[e]	30,000	30,000	30,000	30,000	30,000
France:					
Blast furnace, ferromanganese	163,000 [r]	162,000 [r]	--	--	--
Electric furnace:					
Ferromanganese	100,000 [r]	120,000 [r]	110,000 [r]	113,000 [r]	139,000
Silicomanganese[5]	66,215 [r]	60,700	64,100 [r]	52,300 [r]	63,300
Total	329,215 [r]	342,700 [r]	174,000 [r]	165,000 [r]	202,000
Georgia, electric furnace:[e]					
Ferromanganese	4,200 [r]	12,400 [r]	12,800 [r]	13,900 [r]	5,130
Silicomanganese	30,400 [r]	50,900 [r]	98,800 [r]	109,000 [r]	117,000
Total	34,600 [r]	63,300 [r]	112,000 [r]	123,000 [r]	122,000
India, electric furnace:[e]					
Ferromanganese	165,000	165,000	170,000	170,000	180,000
Silicomanganese	150,000	160,000	160,000	170,000	180,000
Total	315,000	325,000	330,000	340,000	360,000
Indonesia, electric furnace:[e]					
Ferromanganese	12,000	12,000	12,000	12,000	12,000
Silicomanganese	7,000	7,000	7,000	4,000	5,000
Total	19,000	19,000	19,000	16,000	17,000
Italy, electric furnace:[e]					
Ferromanganese	40,000	40,000	40,000	40,000	40,000
Silicomanganese	100,000 [r]	100,000 [r]	100,000 [r]	100,000 [r]	100,000
Total	140,000 [r]	140,000 [r]	140,000 [r]	140,000 [r]	140,000
Japan, electric furnace:					
Ferromanganese	356,717	371,831	437,389 [4]	448,616 [4]	406,489 [4]
Silicomanganese	70,965	58,043	73,041 [4]	94,725 [4]	59,604 [4]
Total	427,682	429,874	510,430 [4]	543,341 [4]	466,093 [4]
Kazakhstan, electric furnace:					
Ferromanganese	2,278	1,931	2,000	2,100	2,100
Silicomanganese	164,000	178,920	155,324 [4]	170,214 [4]	220,000
Total	166,278	180,851	157,324 [4]	172,314 [4]	222,000
Korea, North, electric furnace, ferromanganese[e]	-- [r]	-- [r]	-- [r]	-- [r]	--
Korea, Republic of, electric furnace:					
Ferromanganese	136,514 [r]	141,480 [r]	165,525 [4]	124,434 [r, 4]	165,000
Silicomanganese	93,622 [r]	90,942 [r]	82,917 [4]	74,193 [r, 4]	80,000
Total	230,136 [r]	232,422 [r]	248,442 [4]	198,627 [r, 4]	245,000
Mexico, electric furnace:[6]					
Ferromanganese	38,532	55,903	72,471 [4]	89,641 [4]	90,000
Silicomanganese	73,263	81,223	103,206 [4]	104,780 [4]	105,000
Total	111,795	137,126	175,677 [4]	194,421 [4]	195,000

See footnotes at end of table.

TABLE 8—Continued

FERROMANGANESE AND SILICOMANGANESE: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Metric tons, gross weight)

Country[3]	2002	2003	2004[e]	2005[e]	2006[e]
Norway, electric furnace:[e]					
Ferromanganese	240,000	245,000	245,000	250,000	245,000
Silicomanganese	230,000	230,000	230,000	230,000	230,000
Total	470,000	475,000	475,000	480,000	475,000
Poland:					
Blast furnace, ferromanganese	600	1,000	46,900 [r, 4]	7,800 [r, 4]	10,000
Electric furnace, silicomanganese	7,338 [r]	5,000 [r]	29,600 [r, 4]	10,242 [r, 4]	80,000
Total	7,938 [r]	6,000 [r]	76,500 [r, 4]	18,042 [r, 4]	90,000
Romania, electric furnace, silicomanganese	84,720	141,899	194,945 [4]	200,000	200,000
Russia:[e]					
Blast furnace, ferromanganese	105,000	101,000	108,000	108,000	125,000
Electric furnace, silicomanganese	127,000	83,000	143,000	145,000	170,000
Total	232,000	184,000	251,000	253,000	295,000
Slovakia, electric furnace:					
Ferromanganese[e]	20,000	20,000	20,000	20,000	20,000
Silicomanganese	62,084 [r]	52,733 [r]	64,842 [r, 4]	65,000 [r]	65,000
Total	82,084 [r]	72,733 [r]	84,842 [r, 4]	85,000 [r]	85,000
South Africa, electric furnace:					
Ferromanganese	618,954	607,362	611,914 [r, 4]	570,574 [r, 4]	670,000
Silicomanganese	315,802	313,152	340,000	280,000	330,000
Total	934,756	920,514	951,914 [r, 4]	850,574 [r, 4]	1,000,000
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]	85,000	85,000	79,000	30,000	30,000
Electric furnace:					
Ferromanganese	250,617	250,000 [e]	375,990 [4]	359,000 [r, 4]	373,000 [4]
Silicomanganese	732,592	740,000 [e]	1,060,000 [4]	1,040,000 [r, 4]	1,168,000 [4]
Total	1,068,209	1,080,000 [e]	1,514,990 [4]	1,429,000 [r, 4]	1,571,000 [4]
United States, electric furnace, ferromanganese[7]	W	W	W	W	W
Venezuela, electric furnace:					
Ferromanganese[e]	12,000 [4]	12,000	15,000	15,000	15,000
Silicomanganese	36,974	30,632	35,000	35,000	35,000
Total	48,974	42,632	50,000	50,000	50,000
Grand total	7,970,000 [r]	8,670,000 [r]	10,700,000	10,800,000 [r]	12,300,000
Of which:					
Blast furnace, ferromanganese	854,000 [r]	899,000 [r]	824,000 [r]	646,000 [r]	665,000
Electric furnace, excluding United States:					
Ferromanganese[8]	2,750,000 [r]	3,090,000 [r]	3,770,000 [r]	3,720,000 [r]	4,110,000
Silicomanganese[9]	4,360,000 [r]	4,690,000 [r]	6,090,000 [r]	6,430,000 [r]	7,550,000

[e]Estimated. [p]Preliminary. [r]Revised. W Withheld to avoid disclosing company proprietary data; not included in "Grand total." -- Zero.

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

[2]Table includes data available through July 20, 2007.

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

[4]Reported figure.

[5]Includes silicospiegeleisen, if any.

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

[7]U.S. output of ferromanganese includes silicomanganese.

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

[9]Includes silicospiegeleisen, if any, for France.