2006 Minerals Yearbook

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, siliconmanganese, 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 siliconmanganese 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 siliconmanganese rose by 14% to 12.3 Mt on a gross weight basis compared with that in 2005 (table 8).

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.

Legislation and Government Programs

The revised Annual Materials Plan (AMP) for fiscal year 2006 that the Defense National Stockpile Center (DNOSC) 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 DNOSC 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 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.

Chemicals, Ferroalloys, and Metal

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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 siliconmanganese in 2006, as it had for the first time during January through March 2005. Felman Production Inc. sporadically produced siliconmanganese 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 siliconmanganese (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 siliconmanganese. 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 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 year-end 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 Manganeses 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 Nanxinger 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, 2006).

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, RINMOIL 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 Sebso (30%), Mindev (25%), PGR Investent (25%), and Atoll (20%). Bateman Engineering N.V. acquired whole ownership of Atoll in 2006, and Sebso 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 Grobe, 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 ferrochromium 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).

References Cited


International Trade Administration, 2006b, Silicomanganese from Brazil—Final results of antidumping duty administrative review: Federal Register, v. 71, no. 10, January 17, p. 2516–2517.


Metal-Pages, 2006a, China outlines Mn industry restructuring: Metal-Pages, August 11. (Accessed August 18, 2007, via http://www.metal-pages.com/)


Metal-Pages, 2006c, Mexico extends FeMn AD duty: Metal-Pages, October 30. (Accessed March 18, 2008, via http://www.metal-pages.com/)


Ryan’s Notes, 2006a, China raises export duties on bulk alloys: Ryan’s Notes, v. 12, no. 43, October 30, p. 3.

Ryan’s Notes, 2006b, DLA free to sell HC ferromanganese: Ryan’s Notes, v. 12, no. 40, October 9, p. 2.

Ryan’s Notes, 2006c, Ezros blazing new path for Chinese FeSi: Ryan’s Notes, v. 12, no. 29, July 24, p. 4.

Ryan’s Notes, 2006d, Felman attracts Eramet strikers: Ryan’s Notes, v. 12, no. 37, September 18, p. 2.

Ryan’s Notes, 2006e, Strike at Marietta with no immediate effect—EC Mn dumping suit pending: Ryan’s Notes, v. 12, no. 35, September 4, p. 1.

Ryan’s Notes, 2006f, New Brazilian Mn smelter: Ryan’s Notes, v. 12, no. 15, April 10, p. 1.


GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications


Manganese. Ch. in Mineral Commodity Summaries, annual.


Other

Company news releases and reports.

Roskill Information Services Ltd. (last reported on manganese in 2003).


United Nations commodity trade statistics.
### TABLE 1

SALIENT MANGANESE STATISTICS

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

<table>
<thead>
<tr>
<th>Material</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manganese ore (35% or more Mn):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exports</td>
<td>15</td>
<td>18</td>
<td>123</td>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>Imports for consumption</td>
<td>427</td>
<td>347</td>
<td>451</td>
<td>656</td>
<td>572</td>
</tr>
<tr>
<td>Consumption</td>
<td>360</td>
<td>398</td>
<td>441</td>
<td>368</td>
<td>365</td>
</tr>
<tr>
<td>Stocks, December 31, consumers</td>
<td>151</td>
<td>156</td>
<td>159</td>
<td>337</td>
<td>159</td>
</tr>
</tbody>
</table>

Ferromanganese:

<table>
<thead>
<tr>
<th>Material</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exports</td>
<td>9</td>
<td>11</td>
<td>9</td>
<td>14</td>
<td>22</td>
</tr>
<tr>
<td>Imports for consumption</td>
<td>275</td>
<td>238</td>
<td>429</td>
<td>255</td>
<td>358</td>
</tr>
<tr>
<td>Consumption</td>
<td>253</td>
<td>248</td>
<td>315</td>
<td>286</td>
<td>297</td>
</tr>
<tr>
<td>Stocks, December 31, consumers and producers</td>
<td>21</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>31</td>
</tr>
<tr>
<td>Consumption, apparent, manganese content</td>
<td>696</td>
<td>643</td>
<td>1,030</td>
<td>773</td>
<td>1,050</td>
</tr>
<tr>
<td>Ore price, c.i.f, U.S. ports, dollars per metric ton unit</td>
<td>2.30</td>
<td>2.41</td>
<td>2.89</td>
<td>4.39</td>
<td>3.51</td>
</tr>
<tr>
<td>World, production of manganese ore</td>
<td>22,100</td>
<td>24,200</td>
<td>27,900</td>
<td>31,100</td>
<td>33,400</td>
</tr>
</tbody>
</table>

1Estimated. 2Revised.

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 2006

(Metric tons, gross weight)

| Material                                | Physical inventory
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposal authority</td>
<td>Uncommitted</td>
</tr>
<tr>
<td>Stockpile grade</td>
<td>Nonstockpile grade</td>
</tr>
<tr>
<td>Synthetics manganese dioxide</td>
<td></td>
</tr>
<tr>
<td>Natural battery ore</td>
<td></td>
</tr>
<tr>
<td>Chemical ore</td>
<td></td>
</tr>
<tr>
<td>Metallurgical ore</td>
<td></td>
</tr>
<tr>
<td>High-carbon ferromanganese</td>
<td></td>
</tr>
<tr>
<td>Electrolytic metal</td>
<td></td>
</tr>
</tbody>
</table>

1Estimated. 2Zero.

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 2006

<table>
<thead>
<tr>
<th>Company</th>
<th>Plant location</th>
<th>Products</th>
<th>Type of process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energizer Holdings, Inc., Eveready Battery Co.</td>
<td>Marietta, OH</td>
<td>FeMn X SiMn X MnO₂</td>
<td>Electrolytic.</td>
</tr>
<tr>
<td>Erachem Comilog</td>
<td>Baltimore, MD</td>
<td>FeMn X</td>
<td>Chemical.</td>
</tr>
<tr>
<td>Do. New Johnsonville, TN</td>
<td></td>
<td>X</td>
<td>Electrolytic.</td>
</tr>
<tr>
<td>Eramet Marietta Inc.</td>
<td>Marietta, OH</td>
<td>X</td>
<td>Electric furnace.</td>
</tr>
<tr>
<td>Felman Productions, Inc.</td>
<td>New Haven, WV</td>
<td>X</td>
<td>Do.</td>
</tr>
<tr>
<td>Tronox LLC</td>
<td>Henderson, NV</td>
<td>X</td>
<td>Electrolytic.</td>
</tr>
</tbody>
</table>

¹FeMn, ferromanganese; SiMn, silicomanganese; MnO₂, synthetic manganese dioxide.
²Formerly 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 2006¹

(Metric tons, gross weight)

<table>
<thead>
<tr>
<th>End use</th>
<th>Ferromanganese</th>
<th>Medium and low carbon</th>
<th>Total</th>
<th>Silicomanganese</th>
<th>Manganese metal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbon</td>
<td>131,000</td>
<td>87,100</td>
<td>218,000</td>
<td>53,400</td>
<td>843</td>
</tr>
<tr>
<td>High-strength, low-alloy</td>
<td>17,100</td>
<td>7,500</td>
<td>24,600</td>
<td>3,490</td>
<td>(2)</td>
</tr>
<tr>
<td>Stainless and heat-resisting</td>
<td>7,720</td>
<td>7,720</td>
<td>15,400</td>
<td>1,050</td>
<td>(2)</td>
</tr>
<tr>
<td>Full alloy</td>
<td>18,200</td>
<td>5,700</td>
<td>23,900</td>
<td>19,500</td>
<td>(2)</td>
</tr>
<tr>
<td>Unspecified¹</td>
<td>1,450</td>
<td>1,560</td>
<td>3,010</td>
<td>777</td>
<td>1,950</td>
</tr>
<tr>
<td>Total</td>
<td>175,000</td>
<td>102,000</td>
<td>277,000</td>
<td>90,700</td>
<td>3,840</td>
</tr>
<tr>
<td>Cast irons</td>
<td>6,760</td>
<td>445</td>
<td>7,210</td>
<td>390</td>
<td>(4)</td>
</tr>
<tr>
<td>Superalloys</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>--</td>
<td>434</td>
</tr>
<tr>
<td>Alloys (excluding alloy steels)</td>
<td>6,660</td>
<td>6,270</td>
<td>12,900</td>
<td>(4)</td>
<td>13,300³</td>
</tr>
<tr>
<td>Miscellaneous and unspecified</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>(4)</td>
<td>(4)</td>
</tr>
<tr>
<td>Grand total</td>
<td>189,000</td>
<td>109,000</td>
<td>297,000</td>
<td>91,100⁵</td>
<td>17,500</td>
</tr>
</tbody>
</table>

¹Withheld to avoid disclosing company proprietary data; included with "Alloys (excluding alloy steels)." -- Zero.
²Withheld to avoid disclosing company proprietary data; included with "Steel: Unspecified."
³Includes electrical and tool steel, and items indicated by footnote (2).
⁴Withheld to avoid disclosing company proprietary data.
⁵Approximately 87% of this combined total was for consumption in aluminum alloys.
⁶Internal evaluation indicates that silicomanganese consumption is considerably understated.
⁷Estimated based on typical percentage manganese content.
TABLE 5
U.S. EXPORTS OF MANGANESE ORE, FERROALLOYS, AND METAL, BY COUNTRY¹

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

¹Revised. -- Zero.  
¹¹Data 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 COUNTRY

<table>
<thead>
<tr>
<th>Country</th>
<th>Quantity</th>
<th>2005</th>
<th>Value, customs (thousands)</th>
<th>Quantity</th>
<th>2006</th>
<th>Value, customs (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gross weight (metric tons)</td>
<td>Mn content (metric tons)</td>
<td></td>
<td>Gross weight (metric tons)</td>
<td>Mn content (metric tons)</td>
<td></td>
</tr>
<tr>
<td>Ore and concentrates with 20% or more manganese:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All grades:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>41,100</td>
<td>21,300</td>
<td>5,700</td>
<td>25,000</td>
<td>12,800</td>
<td>3,900</td>
</tr>
<tr>
<td>Belgium</td>
<td>172</td>
<td>114</td>
<td>129</td>
<td>2,090</td>
<td>1,100</td>
<td>305</td>
</tr>
<tr>
<td>Brazil</td>
<td>12,400</td>
<td>7,020</td>
<td>2,230</td>
<td>9,400</td>
<td>5,800</td>
<td>1,520</td>
</tr>
<tr>
<td>Canada</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>6,510</td>
<td>1,850</td>
<td>309</td>
</tr>
<tr>
<td>China</td>
<td>14,000</td>
<td>5,490</td>
<td>833</td>
<td>6,700</td>
<td>3,120</td>
<td>617</td>
</tr>
<tr>
<td>Colombia</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>39,200</td>
<td>17,500</td>
<td>675</td>
</tr>
<tr>
<td>Gabon</td>
<td>485,000</td>
<td>252,000</td>
<td>39,100</td>
<td>230,000</td>
<td>120,000</td>
<td>26,600</td>
</tr>
<tr>
<td>Ghana</td>
<td>90</td>
<td>57</td>
<td>7</td>
<td>41,200</td>
<td>15,400</td>
<td>2,410</td>
</tr>
<tr>
<td>Mexico</td>
<td>8,810</td>
<td>4,320</td>
<td>1,030</td>
<td>5,900</td>
<td>1,320</td>
<td>708</td>
</tr>
<tr>
<td>Namibia</td>
<td>26,000</td>
<td>10,400</td>
<td>1,950</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>South Africa</td>
<td>68,000</td>
<td>33,100</td>
<td>7,170</td>
<td>206,000</td>
<td>91,200</td>
<td>16,800</td>
</tr>
<tr>
<td>Other</td>
<td>232</td>
<td>138</td>
<td>25</td>
<td>38</td>
<td>29</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>656,000</td>
<td>334,000</td>
<td>58,200</td>
<td>572,000</td>
<td>270,000</td>
<td>53,900</td>
</tr>
<tr>
<td>More than 20% but less than 47% manganese:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1,790</td>
<td>812</td>
<td>280</td>
</tr>
<tr>
<td>Canada</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>6,510</td>
<td>1,850</td>
<td>309</td>
</tr>
<tr>
<td>China</td>
<td>5,140</td>
<td>1,050</td>
<td>35</td>
<td>2,410</td>
<td>858</td>
<td>115</td>
</tr>
<tr>
<td>Colombia</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>39,200</td>
<td>17,500</td>
<td>675</td>
</tr>
<tr>
<td>Gabon</td>
<td>4,060</td>
<td>4,950</td>
<td>684</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Ghana</td>
<td>18</td>
<td>7</td>
<td>2</td>
<td>41,200</td>
<td>15,400</td>
<td>2,410</td>
</tr>
<tr>
<td>Mexico</td>
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See footnotes at end of table.
### TABLE 6—Continued

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

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<td>(metric tons)</td>
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See footnotes at end of table.
### TABLE 6—Continued

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

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<td>Mn content (metric tons)</td>
<td>Value, customs (thousands)</td>
<td>Gross weight (metric tons)</td>
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1Revised. XX Not applicable. -- Zero.

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

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

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

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

5Less than ½ unit.

Source: U.S. Census Bureau, adjusted by the U.S. Geological Survey.
TABLE 7
MANGANESE ORE: WORLD PRODUCTION, BY COUNTRY1, 2

(Thousand metric tons)

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<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
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1Estimated. 2Preliminary. 3Revised. 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 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.

3In 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.

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; and 2006—11,000,000 and 2,200,000.

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 2002-03 through 2006-07.

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, 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 COUNTRY¹ ²

(Metric tons, gross weight)

<table>
<thead>
<tr>
<th>Country³</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
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<td>5,000</td>
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<th>2006</th>
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<tr>
<td><strong>Ukraine</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blast furnace, ferromanganese</td>
<td>85,000</td>
<td>85,000</td>
<td>79,000</td>
<td>30,000</td>
<td>30,000</td>
</tr>
<tr>
<td>Electric furnace:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ferromanganese</td>
<td>250,617</td>
<td>250,000</td>
<td>375,990</td>
<td>359,000</td>
<td>373,000</td>
</tr>
<tr>
<td>Silicomanganese</td>
<td>732,592</td>
<td>740,000</td>
<td>1,060,000</td>
<td>1,040,000</td>
<td>1,168,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,068,209</td>
<td>1,080,000</td>
<td>1,514,990</td>
<td>1,429,000</td>
<td>1,571,000</td>
</tr>
<tr>
<td><strong>United States, electric furnace, ferromanganese</strong></td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
</tr>
<tr>
<td><strong>Venezuela, electric furnace</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Ferromanganese</td>
<td>12,000</td>
<td>12,000</td>
<td>15,000</td>
<td>15,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Silicomanganese</td>
<td>36,974</td>
<td>30,632</td>
<td>35,000</td>
<td>35,000</td>
<td>35,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>48,974</td>
<td>42,632</td>
<td>50,000</td>
<td>50,000</td>
<td>50,000</td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td>7,970,000</td>
<td>8,670,000</td>
<td>10,700,000</td>
<td>10,800,000</td>
<td>12,300,000</td>
</tr>
<tr>
<td>Of which:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blast furnace, ferromanganese</td>
<td>854,000</td>
<td>899,000</td>
<td>824,000</td>
<td>646,000</td>
<td>665,000</td>
</tr>
<tr>
<td>Electric furnace, excluding United States:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ferromanganese</td>
<td>2,750,000</td>
<td>3,090,000</td>
<td>3,770,000</td>
<td>3,720,000</td>
<td>4,110,000</td>
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<tr>
<td>Silicomanganese</td>
<td>4,360,000</td>
<td>4,690,000</td>
<td>6,090,000</td>
<td>6,430,000</td>
<td>7,550,000</td>
</tr>
</tbody>
</table>

**Notes:**
1. Estimated. 2. Preliminary. 3. Revised. W. Withheld to avoid disclosing company proprietary data; not included in "Grand total." Zero. 4. World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown. 5. Table includes data available through July 20, 2007. 6. 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. 7. Reported figure. 8. Includes silicospiegeleisen, if any. 9. Salable products from Cía Minera Autlán S.A. de C.V. 10. U.S. output of ferromanganese includes silicomanganese. 11. Ferromanganese includes silicomanganese, if any, for North Korea. 12. Includes silicospiegeleisen, if any, for France.