



# 2017 Minerals Yearbook

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## MANGANESE [ADVANCE RELEASE]

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# MANGANESE

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In 2017, U.S. manganese apparent consumption was estimated to be 715,000 metric tons (t) on a contained-weight basis, a 32% increase from revised consumption in 2016 (table 1). The increase in apparent consumption was primarily a reflection of the 49%, 33%, and 22% increases in ferromanganese, silicomanganese, and manganese ore imports (contained-weight basis), respectively, in 2017 compared with those in 2016 (table 6).

Exports of all types of manganese increased by 42% to 28,700 t (gross weight) compared with 20,200 t in 2016 (table 5). Total manganese imports (gross weight) increased by 26% to 1,020,000 t in 2017 compared with 804,000 t in 2016 (table 6).

In 2017, average U.S. spot-market prices for high- and medium-carbon ferromanganese increased by 67% and 37%, respectively, from those in 2016. The average domestic spot-market price for manganese metal increased by 15% from that in 2016. The average U.S. spot-market price for silicomanganese increased by 51% from that of 2016 (table 1).

World production of manganese ore in 2017 on a gross-weight basis increased by 4% compared with the amount in 2016. On a contained-weight basis, world production increased by 12% (table 7). China and South Africa were the leading producers of manganese ore on a gross-weight basis, but the manganese content of ore from South Africa was more than triple that of ore from China. South Africa, Australia, and Gabon, in descending order, were the leading producers of manganese ore on a contained-weight basis. Combined world production of ferromanganese and silicomanganese, excluding U.S. production, increased slightly to 17.2 million metric tons (Mt) on a gross-weight basis compared with the revised amount of 16.9 Mt in 2016 (table 8). China was the leading producer of manganese ferroalloys, accounting for 57% of production.

Manganese is essential to iron and steel production because of its sulfur-fixing, deoxidizing, and alloying properties. Steelmaking, including its ironmaking component, accounted for most of the domestic manganese consumption, currently in the range of 80% to 90% of U.S. apparent consumption. Among a variety of uses, manganese is a key component of certain widely used aluminum alloys and is used in oxide form in dry cell batteries.

## Legislation and Government Programs

**Stockpile.**—The Annual Materials Plan (AMP) for fiscal year 2017 that the Defense Logistics Agency Strategic Materials (DLA Strategic Materials), U.S. Department of Defense, issued on October 1, 2016, covered the period from October 1, 2016, through September 30, 2017. Under this AMP, the maximum disposal authority for manganese materials was 292,000 t for metallurgical-grade manganese ore and 45,400 t for high-carbon ferromanganese (Defense Logistics Agency Strategic Materials, 2016). The maximum disposal authority under an AMP is the

maximum quantity of material that may be disposed of in a given fiscal year as authorized by Congress (table 2).

In 2017, the DLA Strategic Materials disposed of (sold) 13,000 t of high-carbon ferromanganese. The amount of high-carbon ferromanganese and metallurgical-grade manganese ore that was in the National Defense Stockpile at the calendar yearend was 212,000 t and 292,000 t, respectively (gross weight) (table 2).

## Production

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

**Chemicals and Ferroalloys.**—Production statistics for these materials were withheld to avoid disclosing company proprietary data. Domestic producers of manganese ferroalloys and synthetic manganese dioxide are listed in table 3.

## Consumption and Stocks

In 2017, U.S. manganese apparent consumption was estimated to be 715,000 t on a contained-weight basis (table 1). Metallurgical applications accounted for most domestic manganese consumption, 80% to 90% of which was for steelmaking. Reported domestic consumption of manganese ore decreased by 8% to 378,000 t (gross weight), and corresponding yearend stocks decreased by 29% to 148,000 t compared with the amounts in 2016 (table 1). Reported consumption (gross weight) of ferromanganese was essentially unchanged and consumption of silicomanganese increased slightly compared with consumption in 2017 (tables 1, 4). Reported manganese metal consumption in 2017 was 17,900 t in 2017 compared with 17,800 t in 2016 (table 4).

Reported consumption statistics were derived from U.S. Geological Survey (USGS) voluntary surveys of U.S. operations. Data on domestic consumption of manganese ore, excluding that consumed by the steel industry, are collected by means of the “Manganese Ore and Products” survey. In 2017, eight firms were canvassed that process ore or had processed ore in the past by such methods as grinding and roasting, or that used it in the manufacture of dry cell batteries and manganese chemicals, ferroalloys, and metals. Of those eight companies, all used manganese ore in their processes in 2017. The collective consumption of these firms was considered to constitute all the manganese ore consumption in the United States, excluding that consumed directly by the steel industry. Full-year responses on a basis upon which to estimate these data were obtained from all these firms for 2017 (table 1).

A second survey covered a broad range of metal-consuming companies, such as aluminum, nonferrous-alloy, and steel producers. More than 180 manganese consumers were canvassed on an annual basis in this survey. Reported consumption and stocks data for ferromanganese, silicomanganese, and manganese metal in tables 1 and 4 include estimates to account for nonrespondents.

Relatively small quantities of manganese were used for alloying with nonferrous metals, chiefly in the aluminum industry as manganese-aluminum briquets that typically contained either 75% or 85% manganese. Manganese plays an important alloying role in aluminum applications to increase corrosion resistance. The leading use of aluminum-manganese alloys is in the manufacture of beverage cans. Other uses include, but are not limited to, aircraft components, automobiles, building products, cooking utensils, and railway and truck carriage bodies (Roskill Information Services Ltd., 2015, p. 224–225).

Comparatively small amounts of manganese were used domestically in animal feed, brick, frits, glass and tile colorants, dry cell batteries, soft ferrites, fertilizers, manganese chemicals (including water treatment), and welding fluxes. These were among the many nonmetallurgical applications of manganese (Roskill Information Services Ltd., 2015, p. 231–254). The source of manganese for these applications was mainly manganese ore.

## Prices

**Manganese Ore.**—The only spot-market prices reported for manganese ore were for deliveries to China. In 2017, the average spot-market price for metallurgical-grade ore containing 44% manganese, based on weekly averages of China's cost, insurance, and freight (c.i.f.) transaction prices as reported by CRU Ryan's Notes, was \$5.97 per metric ton unit, up from \$4.34 per metric ton unit in 2016. The average c.i.f. price in China for metallurgical-grade ore containing 46% manganese was discontinued by CRU at the end of 2016. [A metric ton unit is 1 t of ore containing 1% or 10 kilograms of manganese. The price of 1 t of ore (gross weight) is obtained by multiplying the metric-ton-unit price by the percentage manganese content of the ore; for example, multiplying by 46 when the manganese content is 46%.] The ore market consisted of a number of submarkets because of differences in ore-quality requirements by end use—ferroalloy production, blast furnace ironmaking, and manufacture of manganese chemicals.

**Manganese Ferroalloys and Metal.**—Prices for manganese ferroalloys tend to vary in response to changes in demand by the steel and ferrous foundry industries, whereas prices for 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 various manganese ferroalloys are largely interchangeable with each other.

Annual average import prices for manganese ferroalloys are reported by Platts Metals Week. These prices are based on free market spot prices per unit of measurement, duty-paid in a U.S. warehouse. Annual average import prices were \$1,488.74 per gross (long) ton for high-carbon ferromanganese, 110.46 cents per pound for medium-carbon ferromanganese, and 65.59 cents per pound for silicomanganese (table 1). These

prices were 67%, 37%, and 51% higher, respectively, compared with those in 2016. The increases in these average manganese ferroalloys prices reflected the 4% increases in domestic and global raw steel production (Tuck, 2020). The annual average North American transaction price for manganese metal was 112.17 cents per pound, which was 15% more than that of 2016.

## Foreign Trade

Excluding the negligible amount of manganese materials extracted in South Carolina to color bricks and in the absence of recycling specifically for manganese, U.S. net import reliance, as a percentage of apparent consumption, was 100% for manganese, the same as it had been for the past 31 years. The ensuing comparisons of foreign trade data were made based on gross weight.

In 2017, U.S. exports (gross weight) of most manganese products increased from those in 2016. Exports of ferromanganese (all grades) increased by 41% (2,670 t) to 9,250 t; manganese dioxide, by 40% (1,640 t) to 5,770 t; manganese ore, by 83% (521 t) to 1,150 t; and exports of silicomanganese more than tripled in 2017 to 8,460 t from 2,410 t in 2016. Exports of manganese metal decreased by 37% (2,410 t) to 4,050 t compared with exports in 2016 (table 5). Canada was the leading destination for many manganese product exports in 2017, accounting for 98% of silicomanganese exports, 93% of ferromanganese exports, and 56% of manganese dioxide exports. Manganese ore and metal were predominantly exported to Belgium and Malaysia, respectively.

In 2017, U.S. imports (gross weight) of most manganese products increased compared with those in 2016, including ferromanganese (all grades) (by 44%), manganese dioxide (by 36%), manganese metal (by 27%), manganese ore (all grades) (by 5%), potassium permanganate (by 27%), and silicomanganese (by 33%) (table 6). The most significant year-to-year change, on a quantity basis, was for imports of silicomanganese and ferromanganese (more than 4% carbon), which were, on a gross weight basis, 87,100 t and 70,300 t more, respectively, than those in 2016.

## World Industry Structure

World manganese ore production was 50.9 Mt (gross weight) and 17.3 Mt (contained manganese) in 2017, 4% and 12% more, respectively, than the amounts in 2016 (table 7). In 2017, 15 countries accounted for more than 98% of world production. On a manganese-content basis, the leading producing countries of manganese ore were South Africa (31%), Australia (16%), Gabon (13%), China (10%), and Brazil (7%).

Total world manganese ferroalloy production, excluding U.S. production, was 17.2 Mt (gross weight) in 2017, slightly more than the revised amount in 2016 (table 8). On a gross-weight basis, the leading producer of manganese ferroalloys was China (57%), followed by India (14%), Ukraine (5%), Norway (4%), and Japan (3%).

The International Manganese Institute (IMnI) estimated that world apparent consumption of manganese ferroalloys (gross weight) increased by 10% to 19.6 Mt in 2017 compared with about 17.7 Mt in 2016. Of the 19.6 Mt in 2017, 14.0 Mt was

silicomanganese, 4.0 Mt was high-carbon ferromanganese, and 1.6 Mt was refined (medium- and low-carbon) ferromanganese. IMnI's estimate for world manganese ferroalloys production in 2017 was also 19.6 Mt, equal to its estimate for ferroalloys apparent consumption. IMnI's estimate for world manganese ore apparent consumption in 2017 was about 16.8 Mt (contained weight), which was 8% more than the estimate of 15.5 Mt in 2016 (International Manganese Institute, 2018).

## Outlook

Domestic and global consumption of manganese is expected to closely follow the trend in steel production, for which the annual rate of growth has been typically in the range of 1% to 2% in the United States. Although rates of growth for some nonmetallurgical components of manganese consumption, especially batteries, may be higher than for steel production, this situation should have only a minor effect on overall manganese demand. U.S. raw steel production increased by 4% in 2017 to 81.6 Mt from 78.5 Mt in 2016. World steel production in 2017 increased by 4% to 1.69 billion metric tons (Gt) from 1.63 Gt in 2016 (Tuck, 2020).

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## GENERAL SOURCES OF INFORMATION

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- United Nations commodity trade statistics.

TABLE 1  
SALIENT MANGANESE STATISTICS<sup>1</sup>

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

	2013	2014	2015	2016	2017	
United States:						
Manganese ore (20% or more Mn):						
Production	--	--	--	--	--	
Exports	1	1	1	1	1	
Imports for consumption	558	387	441	281	297	
Consumption <sup>2</sup>	523	508	451	410	378	
Stocks, December 31, consumers <sup>2</sup>	190	189	187	207	148	
Ferromanganese:						
Production	W	W	W	W	W	
Exports	2	6	5	7	9	
Imports for consumption	335	365	292	229	331	
Consumption	368	360	344	342	345	
Stocks, December 31, consumers and producers	27	23	21	21	17	
Silicomanganese:						
Production	W	W	W	W	W	
Exports	6	3	1	2	8	
Imports for consumption	329	448	301	264	351	
Consumption	152	146	138	139	141	
Stocks, December 31, consumers and producers	6	10	21	10	13	
Consumption, apparent, manganese content <sup>e, 3</sup>	794	834	610 <sup>r</sup>	540 <sup>r</sup>	715	
Price, average:						
Ferromanganese, high-carbon <sup>4</sup>	dollars per gross ton	1,053.83	1,062.24	915.36	888.83	1,488.74
Ferromanganese, medium-carbon <sup>4</sup>	cents per pound	86.87	94.39	93.49	80.80	110.46
Manganese metal <sup>5</sup>	do.	130.50	126.97	115.10	97.31 <sup>r</sup>	112.17
Manganese ore price, c.i.f. <sup>6</sup>	dollars per metric ton unit	4.61	4.49	3.53	3.10	NA
Silicomanganese <sup>4</sup>	cents per pound	52.11	58.72	49.60	43.37	65.59
World, production of manganese ore		54,500 <sup>r</sup>	57,800 <sup>r</sup>	52,100 <sup>r</sup>	49,000	50,900

<sup>e</sup>Estimated. <sup>r</sup>Revised. do. Ditto. NA Not available. W Withheld to avoid disclosing company proprietary data. -- Zero.

<sup>1</sup>Table includes data available through November 6, 2018. Data are rounded to no more than three significant digits, except prices.

<sup>2</sup>Exclusive of iron and steel plants.

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

<sup>4</sup>Platts Metals Week, dealer import prices.

<sup>5</sup>CRU Ryan's Notes North American transaction prices.

<sup>6</sup>Cost, insurance, and freight, U.S. ports. Estimated by the U.S. Geological Survey.

TABLE 2  
U.S. GOVERNMENT NATIONAL DEFENSE STOCKPILE MANGANESE STATISTICS IN 2017<sup>1,2</sup>

(Metric tons, gross weight)

Material	Inventory, yearend		Annual Materials Plan <sup>3</sup>	Sales		Inventory changes <sup>4</sup>	
	Fiscal year <sup>3</sup>	Calendar year		Fiscal year <sup>3</sup>	Calendar year	Fiscal year <sup>3</sup>	Calendar year
Metallurgical ore	292,000	292,000	292,000	--	--	--	--
High-carbon ferromanganese	213,000	212,000	45,400	24,100	13,000	-25,500	-11,600
Total	505,000	505,000	337,000	24,100	13,000	-25,500	-11,600

-- Zero.

<sup>1</sup>Table includes data available through November 1, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Includes stockpile- and nonstockpile-grade materials.

<sup>3</sup>Twelve-month period ending September 30, 2017.

<sup>4</sup>From previous year.

Source: Defense Logistics Agency Strategic Materials.

TABLE 3  
DOMESTIC PRODUCERS OF PRINCIPAL MANGANESE PRODUCTS IN 2017

Company	Plant location	Products <sup>1</sup>			Type of process
		FeMn	SiMn	MnO <sub>2</sub>	
Energizer Holdings, Inc., Eveready Battery Co.	Marietta, OH			X	Electrolytic.
Eramet Marietta, Inc.	do.	X	X		Electric furnace.
Felman Production, LLC	Letart, WV		X		Do.
Prince Erachem Inc.	Baltimore, MD			X	Chemical.
Do.	New Johnsonville, TN			X	Electrolytic.
Tronox Ltd.	Henderson, NV			X	Do.

Do., do. Ditto.

<sup>1</sup>FeMn, ferromanganese; SiMn, silicomanganese; MnO<sub>2</sub>, synthetic manganese dioxide.

TABLE 4  
U.S. CONSUMPTION, BY END USE, AND INDUSTRY STOCKS OF MANGANESE FERROALLOYS AND METAL IN 2017<sup>1</sup>

(Metric tons, gross weight, unless otherwise specified)

End use	Ferromanganese			Silicomanganese	Manganese metal
	High carbon	Medium and low carbon	Total		
<b>Steel:</b>					
Carbon	114,000	109,000	224,000	90,000	8,800
High-strength, low-alloy	35,600	11,300	46,900	11,600	--
Stainless and heat-resisting	7,160	2,660	9,820	15,600	1,020
Full alloy	27,300	19,600	46,900	17,600	30
Unspecified <sup>2</sup>	5,020	5,280	10,300	3,040	1,700
Total	190,000	148,000	338,000	138,000	11,600
Cast irons	6,060	477	6,530	255	W
Superalloys	--	W	W	--	122
Alloys (excluding alloy steels)	342	200	542	2,690	6,180 <sup>3</sup>
Miscellaneous and unspecified	W	--	W	W	W
Grand total	196,000	149,000	345,000	141,000 <sup>4</sup>	17,900
Total manganese content <sup>5</sup>	157,000	125,000	282,000	92,900	17,900
Stocks, December 31, 2017, consumers and producers	9,210	7,850	17,100	13,400	1,050 <sup>6</sup>

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

<sup>1</sup>Table includes data available through November 1, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Includes electrical and tool steel.

<sup>3</sup>Approximately 75% of this combined total was for consumption in aluminum alloys.

<sup>4</sup>Internal evaluation indicates that silicomanganese consumption is considerably understated.

<sup>5</sup>Estimated based on the following typical percentages of manganese content: high-carbon ferromanganese (80%); medium- and low-carbon ferromanganese (84%); silicomanganese (66%); and manganese metal (100%).

<sup>6</sup>Consumer stocks only.

TABLE 5  
U.S. EXPORTS OF MANGANESE ORE, FERROALLOYS, METAL AND MANGANESE DIOXIDE, BY COUNTRY OR LOCALITY<sup>1</sup>

Country or locality	2016		2017	
	Quantity, gross weight (metric tons)	Value, f.a.s. <sup>2</sup> (thousands)	Quantity, gross weight (metric tons)	Value, f.a.s. <sup>2</sup> (thousands)
<b>Ore and concentrates with 20% or more manganese:</b>				
Belgium	--	--	468	\$534
Canada	287	\$238	47	43
Netherlands	239	1,020	254	1,000
Other [10 countries and (or) localities]	104 <sup>r</sup>	179 <sup>r</sup>	382	350
Total	630	1,440	1,150	1,930
<b>Ferromanganese, all grades:</b>				
Canada	6,240	6,030	8,570	13,300
Mexico	125	278	500	531
Other [23 countries and (or) localities]	213 <sup>r</sup>	541 <sup>r</sup>	182	419
Total	6,580	6,850	9,250	14,200
<b>Silicomanganese:</b>				
Canada	2,270	2,040	8,320	11,700
Georgia	85	120	128	120
Mexico	52	119	--	--
Other [3 countries and (or) localities]	5	8	4	6
Total	2,410	2,290	8,460	11,900
<b>Metal, including alloys and waste and scrap:</b>				
Canada	161	198	75	225
China	476	1,990	96	745
India	214	724	930	623
Japan	108	360	111	378
Malaysia	3,850	1,360	2,320	1,090
Mexico	838	2,300	192	795
Vietnam	377	82	--	--
Other [26 countries and (or) localities]	435 <sup>r</sup>	2,290 <sup>r</sup>	321	903
Total	6,460	9,300	4,050	4,760
<b>Manganese dioxide:</b>				
Canada	1,860	1,510	3,200	2,840
El Salvador	52	63	326	391
Estonia	341	1,800	245	1,320
Germany	283	596	224	1,030
Mexico	238	276	280	331
United Kingdom	618	735	716	823
Other [32 countries and (or) localities]	741 <sup>r</sup>	2,260 <sup>r</sup>	776	2,550
Total	4,130	7,240	5,770	9,280

<sup>r</sup>Revised. -- Zero.

<sup>1</sup>Table includes data available through November 1, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>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 OR LOCALITY<sup>1</sup>

Country or locality	2016			2017		
	Quantity		Value, customs (thousands)	Quantity		Value, customs (thousands)
	Gross weight (metric tons)	Mn content (metric tons)		Gross weight (metric tons)	Mn content (metric tons)	
<b>Ore and concentrates with 20% or more manganese:</b>						
All grades:						
Australia	17,600	8,650	\$2,780	20,400	9,770	\$8,340
Brazil	522	290	276	625	340	412
Gabon	205,000	107,000	32,400	216,000	135,000	51,800
Mexico	19,600	8,820	2,680	24,100	10,700	5,330
South Africa	38,600	15,000	3,500	35,400	14,400	7,060
Other [6 countries and (or) localities]	307 <sup>r</sup>	153 <sup>r</sup>	404 <sup>r</sup>	662	369	415
<b>Total</b>	<b>281,000</b>	<b>140,000</b>	<b>42,000</b>	<b>297,000</b>	<b>170,000</b>	<b>73,300</b>
More than 20% but less than 47% manganese:						
China	100	31	9	--	--	--
Côte d'Ivoire	--	--	--	332	133	20
Gabon	10,500	4,530	823	13,100	5,640	2,390
Mexico	8,650	3,240	1,280	13,200	5,100	2,480
South Africa	37,500	14,400	3,080	33,000	13,200	6,260
<b>Total</b>	<b>56,800</b>	<b>22,200</b>	<b>5,190</b>	<b>59,600</b>	<b>24,100</b>	<b>11,100</b>
47% or more manganese:						
Australia	17,600	8,650	2,780	20,400	9,770	8,340
Brazil	522	290	276	625	340	412
Gabon	194,000	102,000	31,500	202,000	129,000	49,400
Georgia	--	--	--	122	88	138
Mexico	10,900	5,580	1,400	10,900	5,590	2,850
Morocco	154	87	202	187	135	245
South Africa	1,170	568	419	2,440	1,200	805
Other [3 countries and (or) localities]	52 <sup>r</sup>	35 <sup>r</sup>	193 <sup>r</sup>	20	14	13
<b>Total</b>	<b>225,000</b>	<b>117,000</b>	<b>36,800</b>	<b>237,000</b>	<b>146,000</b>	<b>62,200</b>
<b>Ferromanganese:</b>						
All grades:						
Australia	62,000	44,700	42,000	65,800	47,000	80,800
China	11,000	10,100	17,200	8,150	7,590	15,800
Korea, Republic of	35,500	28,500	41,200	35,100	29,000	57,200
Mexico	8,900	7,100	10,600	6,130	4,840	9,510
Norway	38,800	30,600	41,000	57,300	46,600	93,700
South Africa	51,300	37,000	44,100	85,200	65,900	123,000
Spain	312	238	207	17,700	13,400	20,900
Ukraine	11,200	5,460 <sup>r</sup>	6,150	17,300	13,200	18,300
Other [15 countries and (or) localities]	10,400 <sup>r</sup>	7,820 <sup>r</sup>	10,100 <sup>r</sup>	37,800	28,100	46,200
<b>Total</b>	<b>229,000</b>	<b>172,000</b>	<b>213,000</b>	<b>331,000</b>	<b>256,000</b>	<b>465,000</b>
1% or less carbon:						
China	10,500	9,760	16,700	8,100	7,560	15,700
France	--	--	--	3,300	2,680	5,410
Korea, Republic of	2,350	2,050	3,320	9,300	8,310	18,300
Mexico	704	566	839	2,170	1,760	2,910
Norway	25,100	20,300	29,900	32,500	26,400	55,500
Other [6 countries and (or) localities]	1,420 <sup>r</sup>	1,230 <sup>r</sup>	2,660 <sup>r</sup>	725	674	1,630
<b>Total</b>	<b>40,000</b>	<b>33,900</b>	<b>53,400</b>	<b>56,100</b>	<b>47,400</b>	<b>99,500</b>
More than 1% but not more than 2% carbon:						
Australia	7,850	6,180	6,510	--	--	--
Korea, Republic of	29,800	24,200	34,800	25,300	20,300	38,400
Mexico	8,190	6,530	9,770	3,690	2,890	6,370
Norway	4,960	4,030	5,230	23,200	18,900	36,400
South Africa	7,200	5,790	10,200	20,900	16,900	37,000
Other [6 countries and (or) localities]	611 <sup>r</sup>	482 <sup>r</sup>	867 <sup>r</sup>	446	360	741
<b>Total</b>	<b>58,600</b>	<b>47,200</b>	<b>67,300</b>	<b>73,600</b>	<b>59,300</b>	<b>119,000</b>

See footnotes at end of table.



TABLE 6—Continued  
 U.S. IMPORTS FOR CONSUMPTION OF MANGANESE ORE,  
 FERROALLOYS, METAL, AND SELECTED CHEMICALS, BY COUNTRY OR LOCALITY<sup>1</sup>

Country or locality	2016			2017		
	Quantity		Value, customs (thousands)	Quantity		Value, customs (thousands)
	Gross weight (metric tons)	Mn content (metric tons)		Gross weight (metric tons)	Mn content (metric tons)	
<b>Ferromanganese:—Continued</b>						
More than 2% but not more than 4% carbon:						
Brazil	--	--	--	108	81	96
China	323	254	160	--	--	--
South Africa	51	40	160	--	--	--
Spain	--	--	--	34	25	51
Total	374	294	320	142	106	147
More than 4% carbon:						
Australia	54,200	38,500	35,500	65,800	47,000	80,800
Malaysia	--	--	--	9,740	7,360	12,500
Norway	8,770	6,320	5,870	1,640	1,280	1,780
Russia	1,980	1,310	1,620	6,640	5,070	6,430
South Africa	44,000	31,100	33,700	64,000	48,800	85,500
Ukraine	11,200	5,470	6,150	17,300	13,200	18,300
Other [12 countries and (or) localities]	10,000 <sup>r</sup>	7,290 <sup>r</sup>	8,430 <sup>r</sup>	17,900	12,700	20,700
Total	130,000	90,200	91,500	201,000	149,000	247,000
<b>Silicomanganese:</b>						
Australia	52,200	36,200	41,100	66,000	43,800	86,500
Georgia	72,500	52,100	54,400	90,200	66,800	89,600
Malaysia	--	--	--	13,600	8,950	15,300
Mexico	27,700	17,800	17,500	26,800	17,000	28,000
Norway	26,700	15,700	22,400	18,200	10,900	27,500
Russia	14	7	20	18,100	12,300	22,500
Saudi Arabia	--	--	--	14,700	9,310	16,300
South Africa	71,600	47,100	49,700	78,100	50,800	81,600
Spain	4,890	3,200	4,050	14,800	9,710	19,100
Other [6 countries and (or) localities]	8,550 <sup>r</sup>	5,630 <sup>r</sup>	6,100 <sup>r</sup>	10,800	6,540	15,200
Total	264,000	178,000	195,000	351,000	236,000	401,000
<b>Metal:</b>						
Unwrought: <sup>2</sup>						
China	10,700	XX	20,900	17,500	XX	31,000
Germany	1,000	XX	1,840	1,490	XX	3,090
Japan	451	XX	1,530	172	XX	2,500
South Africa	9,180	XX	19,300	7,900	XX	19,100
Other [10 countries and (or) localities]	823 <sup>r</sup>	XX	1,820 <sup>r</sup>	647	XX	1,630
Total	22,100	XX	45,400	27,700	XX	57,400
Other manganese, wrought:						
Germany	183	XX	1,840	226	XX	2,470
Mexico	35	XX	118	254	XX	676
Other [10 countries and (or) localities]	80 <sup>r</sup>	XX	247 <sup>r</sup>	48	XX	206
Total	298	XX	2,210	528	XX	3,350
Waste and scrap:						
Canada	521	XX	151	849	XX	228
China	1 <sup>r</sup>	XX	2	36	XX	60
Other [2 countries and (or) localities]	--	XX	--	4	XX	9
Total	522	XX	153	889	XX	297
<b>Manganese dioxide:</b>						
Japan	5,060	XX	10,900	6,940	XX	14,800
Other [14 countries and (or) localities]	455	XX	842	556	XX	1,130
Total	5,510	XX	11,700	7,500	XX	15,900
<b>Potassium permanganate:</b>						
India	709	XX	1,790	869	XX	2,200
Other [4 countries and (or) localities]	27	XX	54	65	XX	136
Total	736	XX	1,840	934	XX	2,330

<sup>r</sup>Revised. XX Not applicable. -- Zero.

<sup>1</sup>Table includes data available through November 1, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Imports of unwrought metal include flake, powder, and other.

Source: U.S. Census Bureau.

TABLE 7  
MANGANESE ORE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY<sup>1,2</sup>

(Thousand metric tons)

Country or locality <sup>3</sup>	2013	2014	2015	2016	2017
<b>Australia:</b> <sup>4</sup>					
Gross weight	7,447	7,670	7,500	5,164 <sup>r,5</sup>	6,473 <sup>5</sup>
Mn content, 37% to 53% Mn	2,970 <sup>c</sup>	3,070 <sup>r,c</sup>	2,883	2,325 <sup>r,5</sup>	2,821 <sup>5</sup>
<b>Brazil:</b>					
Gross weight	2,883	2,723	2,817	2,437	2,676 <sup>5</sup>
Mn content, 33% to 51% Mn	1,180	1,094	1,226	1,075	1,162 <sup>5</sup>
<b>Bulgaria:</b> <sup>5</sup>					
Gross weight	45	70	191	67	33
Mn content, 25% to 35% Mn	13	20	53	19	9
<b>Burkina Faso:</b>					
Gross weight	50	50	50	--	--
Mn content, 46% Mn	23	23	23	--	--
<b>Burma:</b> <sup>5</sup>					
Gross weight	394	242	71 <sup>r</sup>	293	346
Mn content, 39% to 40% Mn	158	97	28	117	138
<b>China:</b> <sup>5,6</sup>					
Gross weight	17,478 <sup>r</sup>	19,590 <sup>r</sup>	13,011 <sup>r</sup>	15,484 <sup>r</sup>	11,333
Mn content, 15% to 20% Mn	2,796 <sup>r</sup>	3,134 <sup>r</sup>	2,082 <sup>r</sup>	2,323 <sup>r</sup>	1,700
<b>Côte d'Ivoire:</b> <sup>5</sup>					
Gross weight	220	328	296	211 <sup>r</sup>	470
Mn content, 42% to 45% Mn	99	148	133	47	212
<b>Egypt:</b> <sup>5</sup>					
Gross weight	85	50	34	19	36
Mn content, 30% to 40% Mn	28	17	11	6	12
<b>Gabon:</b> <sup>5</sup>					
Gross weight	3,997	3,781 <sup>r</sup>	4,112	3,379	4,717
Mn content, 45% to 53% Mn	1,871	1,767 <sup>r</sup>	1,929	1,622	2,193
<b>Georgia, concentrate:</b> <sup>c</sup>					
Gross weight	380	334	334	200 <sup>r</sup>	460
Mn content, 28% to 29% Mn	110	97	97	58 <sup>r</sup>	130
<b>Ghana:</b>					
Gross weight	1,812	1,497	1,478	1,967	3,000
Mn content, 27% to 34% Mn	510	418	416	553	810
<b>Hungary:</b>					
Gross weight	35	51	57	18 <sup>r</sup>	--
Mn content, 25% to 35% Mn	9	13	15 <sup>r,c</sup>	5 <sup>c</sup>	--
<b>India:</b> <sup>5</sup>					
Gross weight	3,112	2,200	2,300 <sup>r</sup>	2,100	2,100
Mn content, 10% to 58% Mn	1,118	792 <sup>r</sup>	810	745	734
<b>Indonesia:</b> <sup>5</sup>					
Gross weight	34	50	45	90	56
Mn content, 28% to 44% Mn	15	22	20 <sup>r</sup>	39 <sup>r</sup>	24
<b>Iran:</b> <sup>c</sup>					
Gross weight	163 <sup>r</sup>	140 <sup>r</sup>	87 <sup>r</sup>	79 <sup>r</sup>	96
Mn content, 30% to 43% Mn	70	57	35 <sup>r</sup>	32 <sup>r</sup>	39
<b>Kazakhstan, concentrate:</b>					
Gross weight	1,121	1,092	616	510 <sup>r</sup>	466
Mn content, 35% to 36% Mn <sup>c</sup>	404	390	222	183 <sup>r</sup>	168
<b>Malaysia:</b>					
Gross weight	1,125	835	502 <sup>r</sup>	701 <sup>r</sup>	1,226
Mn content, 32% to 45% Mn <sup>c</sup>	439	326	196 <sup>r</sup>	273 <sup>r</sup>	478
<b>Mexico:</b>					
Gross weight <sup>c</sup>	580	652	600	572	588
Mn content, 34% to 37% Mn <sup>7</sup>	212	236	217	206	212

See footnotes at end of table.

TABLE 7—Continued  
MANGANESE ORE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY<sup>1,2</sup>

(Thousand metric tons)

Country or locality <sup>3</sup>	2013	2014	2015	2016	2017
<b>Morocco:</b>					
Gross weight	111	91	72	68 <sup>r</sup>	70 <sup>e</sup>
Mn content <sup>e,8</sup>	59	48	38	36 <sup>r</sup>	56
<b>Namibia:<sup>5</sup></b>					
Gross weight	174	117	47	16	31
Mn content, 40% to 45% Mn	76	51	21	7	13
<b>Nigeria:</b>					
Gross weight	--	--	4	52	35
Mn content, 25% to 37% Mn <sup>e</sup>	--	--	1	19	13
<b>Oman:</b>					
Gross weight	51	38	16 <sup>r</sup>	15 <sup>r</sup>	14
Mn content, 21% to 27% Mn <sup>e</sup>	12	9	4 <sup>r</sup>	4 <sup>r</sup>	3
<b>Philippines:<sup>5</sup></b>					
Gross weight	3	7	--	--	--
Mn content, 33% to 44% Mn	1	3	--	--	--
<b>Romania:</b>					
Gross weight	21	17	39	5 <sup>r</sup>	--
Mn content, 20% to 30% Mn	5 <sup>e</sup>	4	9 <sup>r</sup>	1	--
<b>Russia, concentrate:</b>					
Gross weight	66 <sup>e</sup>	-- <sup>r</sup>	9 <sup>r</sup>	-- <sup>r</sup>	1
Mn content, 20% to 30% Mn <sup>e</sup>	5 <sup>r</sup>	-- <sup>r</sup>	1 <sup>r</sup>	-- <sup>r</sup>	--
<b>South Africa, metallurgical:</b>					
Gross weight, all forms <sup>9</sup>	10,958	14,051	15,952	13,736	14,144
Mn content, 30% to 48% Mn <sup>e</sup>	4,300	5,300	5,900	5,100 <sup>r</sup>	5,400
<b>Sudan:</b>					
Gross weight	3	20	31	34 <sup>r</sup>	42 <sup>e</sup>
Mn content, 29% to 33% Mn	1	6	9	10 <sup>r</sup>	12 <sup>e</sup>
<b>Thailand:</b>					
Gross weight	14	14	9	9	8
Mn content, 30% to 40% Mn	7	7	4	4	4
<b>Turkey:</b>					
Gross weight	322	246	143	150 <sup>e</sup>	170 <sup>e</sup>
Mn content, 30% to 40% Mn	116	89	51 <sup>r,e</sup>	54 <sup>e</sup>	61 <sup>e</sup>
<b>Ukraine:</b>					
Gross weight	1,525	1,526	1,477 <sup>r</sup>	1,328 <sup>r</sup>	1,899 <sup>5</sup>
Mn content, 30% to 35% Mn	515 <sup>e</sup>	519 <sup>e</sup>	502 <sup>r,e</sup>	451 <sup>r,e</sup>	735 <sup>5</sup>
<b>Vietnam:<sup>5</sup></b>					
Gross weight	163	193	110	187	283
Mn content, 43% Mn	70	83	47	80	122
<b>Zambia:<sup>e</sup></b>					
Gross weight	120	130	130	120	150
Mn content, 27% to 35% Mn	40	45	45	40	50
<b>Total:</b>					
Gross weight	54,500 <sup>r</sup>	57,800 <sup>r</sup>	52,100 <sup>r</sup>	49,000	50,900
Mn content	17,200	17,900 <sup>r</sup>	17,000	15,400 <sup>r</sup>	17,300

<sup>e</sup>Estimated. <sup>r</sup>Revised. -- Zero.

<sup>1</sup>Table includes data available through October 2, 2018. All data are reported unless otherwise noted. Totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>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.

<sup>3</sup>In addition to the countries and (or) localities listed, Cuba, Greece, Pakistan, Panama, and Peru may have produced manganese ore and (or) manganiferous ore, but available information was inadequate to make reliable estimates of output.

<sup>4</sup>Metallurgical ore.

<sup>5</sup>Reported by the International Manganese Institute.

<sup>6</sup>Includes manganiferous ore.

<sup>7</sup>Mostly oxide nodules; may include smaller quantities of direct-shipping carbonate and oxide ores for metallurgical and battery operations.

<sup>8</sup>Mn content, estimated at 84% of manganese dioxide (MnO<sub>2</sub>).

<sup>9</sup>Calculated manganese content includes allowance for assumed moisture content. Includes ore and sinter.

TABLE 8  
FERROMANGANESE AND SILICOMANGANESE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY<sup>1</sup>

(Metric tons, gross weight)

Country or locality <sup>2</sup>	2013	2014	2015	2016	2017
Argentina, silicomanganese <sup>3</sup>	13,000	10,000	8,000	10,000 <sup>r</sup>	--
Australia: <sup>3</sup>					
Ferromanganese	143,900 <sup>r</sup>	161,900 <sup>r</sup>	150,000 <sup>r</sup>	116,900 <sup>r</sup>	125,100
Silicomanganese	110,100	119,400	130,700	83,700 <sup>r</sup>	120,200
Total	254,000 <sup>r</sup>	281,300 <sup>r</sup>	280,700 <sup>r</sup>	200,600 <sup>r</sup>	245,300
Bahrain, silicomanganese <sup>3</sup>	6,000 <sup>r</sup>	6,000 <sup>r</sup>	6,000 <sup>r</sup>	5,000 <sup>r</sup>	--
Brazil: <sup>3</sup>					
Ferromanganese	106,980 <sup>r</sup>	110,270 <sup>r</sup>	84,160 <sup>r</sup>	83,780 <sup>r</sup>	123,470
Silicomanganese	228,000 <sup>r</sup>	214,000 <sup>r</sup>	141,540 <sup>r</sup>	166,680 <sup>r</sup>	202,520
Total	334,980 <sup>r</sup>	324,270 <sup>r</sup>	225,700 <sup>r</sup>	250,460 <sup>r</sup>	325,990
China:					
Ferromanganese:					
Blast furnace	452,600	457,000 <sup>e</sup>	446,000 <sup>e</sup>	340,000 <sup>e</sup>	340,000 <sup>e</sup>
Electric furnace	3,150,300	2,170,000 <sup>e</sup>	2,120,000 <sup>e</sup>	1,610,000 <sup>e</sup>	1,610,000 <sup>e</sup>
Silicomanganese	7,919,400	7,990,000 <sup>e</sup>	7,810,000 <sup>e</sup>	7,810,000 <sup>e</sup>	7,810,000 <sup>e</sup>
Total	11,522,300	10,600,000 <sup>e</sup>	10,400,000 <sup>e</sup>	9,760,000 <sup>e</sup>	9,760,000 <sup>e</sup>
Egypt, ferromanganese <sup>3</sup>	30,000	12,000	12,000	12,000	12,000
France: <sup>3</sup>					
Ferromanganese	104,000	116,000	126,000 <sup>r</sup>	119,000 <sup>r</sup>	95,400
Silicomanganese	64,900 <sup>r</sup>	64,800 <sup>r</sup>	65,100 <sup>r</sup>	58,200 <sup>r</sup>	58,400
Total	168,900 <sup>r</sup>	180,800 <sup>r</sup>	191,100 <sup>r</sup>	177,200 <sup>r</sup>	153,800
Gabon, silicomanganese <sup>3</sup>	--	4,000 <sup>e</sup>	14,500 <sup>r</sup>	14,900 <sup>r</sup>	21,300
Georgia, silicomanganese	253,361	256,677	217,300	244,228 <sup>r</sup>	284,034
India: <sup>3</sup>					
Ferromanganese	370,000 <sup>r</sup>	474,000 <sup>r</sup>	460,000 <sup>r</sup>	455,000 <sup>r</sup>	520,000
Silicomanganese	1,920,000 <sup>r</sup>	1,790,000 <sup>r</sup>	1,618,000 <sup>r</sup>	1,645,000 <sup>r</sup>	1,900,000
Total	2,290,000 <sup>r</sup>	2,264,000 <sup>r</sup>	2,078,000 <sup>r</sup>	2,100,000 <sup>r</sup>	2,420,000
Indonesia: <sup>3</sup>					
Ferromanganese	-- <sup>r</sup>	-- <sup>r</sup>	-- <sup>r</sup>	-- <sup>r</sup>	--
Silicomanganese	23,000 <sup>r</sup>	25,000 <sup>r</sup>	30,000 <sup>r</sup>	40,000 <sup>r</sup>	40,000
Total	23,000 <sup>r</sup>	23,000 <sup>r</sup>	23,000 <sup>r</sup>	23,000 <sup>r</sup>	23,000
Italy, ferromanganese <sup>3</sup>	6,000	--	--	--	--
Japan:					
Ferromanganese	460,936	463,345	465,952	473,740 <sup>r</sup>	456,460
Silicomanganese <sup>3</sup>	24,741	26,500	22,700	22,700	24,500
Total	485,677	489,845	488,652	496,440 <sup>r</sup>	480,960
Kazakhstan, silicomanganese	203,986	200,379	164,189	135,885	123,977
Korea, Republic of: <sup>3</sup>					
Ferromanganese	335,000 <sup>r</sup>	360,000 <sup>r</sup>	300,000	295,000 <sup>r</sup>	301,958
Silicomanganese	268,000 <sup>r</sup>	235,000 <sup>r</sup>	175,000 <sup>r</sup>	135,000 <sup>r</sup>	140,937
Total	603,000 <sup>r</sup>	595,000 <sup>r</sup>	475,000 <sup>r</sup>	430,000 <sup>r</sup>	442,895
Mexico: <sup>3</sup>					
Ferromanganese	62,504 <sup>r</sup>	67,506 <sup>r</sup>	67,920 <sup>r</sup>	84,530 <sup>r</sup>	90,013
Silicomanganese	152,475 <sup>r</sup>	164,855 <sup>r</sup>	139,361	134,251 <sup>r</sup>	148,130
Total	214,979 <sup>r</sup>	232,361 <sup>r</sup>	207,281 <sup>r</sup>	218,781 <sup>r</sup>	238,143
Norway: <sup>3</sup>					
Ferromanganese	306,700	295,400	309,200	329,100 <sup>r</sup>	400,800
Silicomanganese	301,400	314,300	309,900	306,100 <sup>r</sup>	284,500
Total	608,100	609,700	619,100	635,200 <sup>r</sup>	685,300
Poland:					
Ferromanganese	820	549	460	450 <sup>r,e</sup>	510 <sup>e</sup>
Silicomanganese	100	32 <sup>e</sup>	--	-- <sup>3</sup>	-- <sup>3</sup>
Total	920	581	460	450 <sup>r</sup>	510

See footnotes at end of table.

TABLE 8—Continued  
FERROMANGANESE AND SILICOMANGANESE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY<sup>1</sup>

(Metric tons, gross weight)

Country or locality <sup>2</sup>	2013	2014	2015	2016	2017
<b>Russia:</b>					
Ferromanganese	181,400	178,600	155,700 <sup>r</sup>	124,200 <sup>r</sup>	167,100
Silicomanganese	169,190	179,910	188,895 <sup>r</sup>	203,216 <sup>r</sup>	52,095
Total	350,590	358,510	344,595 <sup>r</sup>	327,416 <sup>r</sup>	219,195
Saudi Arabia, silicomanganese <sup>3</sup>	84,000 <sup>r</sup>	60,000	63,000	55,000 <sup>r</sup>	65,000
<b>Slovakia:</b>					
Ferromanganese	2,119	20,554	25,376	35,589	42,115
Silicomanganese	26,794	29,643	27,036	35,719	40,265
Total	28,913	50,197	52,412	71,308	82,380
<b>South Africa:<sup>3</sup></b>					
Ferromanganese	681,000	787,000 <sup>r</sup>	512,000	335,000 <sup>r</sup>	257,100
Silicomanganese	133,600	228,100	210,200	144,000 <sup>r</sup>	160,400
Total	814,600	1,015,100 <sup>r</sup>	722,200	479,000 <sup>r</sup>	417,500
<b>Spain:<sup>3</sup></b>					
Ferromanganese	106,900 <sup>r</sup>	133,500 <sup>r</sup>	126,200	120,100 <sup>r</sup>	132,100
Silicomanganese	136,100 <sup>r</sup>	128,700 <sup>r</sup>	134,400 <sup>r</sup>	123,100 <sup>r</sup>	138,700
Total	243,000 <sup>r</sup>	262,200	260,600 <sup>r</sup>	243,200 <sup>r</sup>	270,800
<b>Ukraine:</b>					
Ferromanganese	88,626	102,934	87,740	104,470	114,500
Silicomanganese	724,892	840,433	698,400	814,970	810,670
Total	813,518	943,367	786,140	919,440	925,170
United States, ferromanganese <sup>4</sup>	W	W	W	W	W
<b>Venezuela:<sup>3</sup></b>					
Ferromanganese	9,000	8,000	-- <sup>r</sup>	-- <sup>r</sup>	--
Silicomanganese	48,000 <sup>r</sup>	39,000	35,000	42,000 <sup>r</sup>	18,670
Total	57,000 <sup>r</sup>	47,000	35,000 <sup>r</sup>	42,000 <sup>r</sup>	18,670
Grand total	19,400,000 <sup>r</sup>	18,800,000 <sup>r</sup>	17,700,000 <sup>r</sup>	16,900,000 <sup>r</sup>	17,200,000
Of which:					
Ferromanganese	6,600,000 <sup>r</sup>	5,920,000 <sup>r</sup>	5,450,000 <sup>r</sup>	4,640,000 <sup>r</sup>	4,790,000
Silicomanganese	12,800,000 <sup>r</sup>	12,900,000 <sup>r</sup>	12,200,000 <sup>r</sup>	12,200,000 <sup>r</sup>	12,400,000

<sup>c</sup>Estimated. <sup>r</sup>Revised. W Withheld to avoid disclosing company proprietary data; not included in "Grand total." -- Zero.

<sup>1</sup>Table includes data available through November 6, 2018. All data are reported unless otherwise noted. Grand totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>In addition to the countries and (or) localities listed, Iran may have produced ferromanganese, but available information was inadequate to make reliable estimates of output.

<sup>3</sup>Reported by the International Manganese Institute.

<sup>4</sup>U.S. output of ferromanganese includes silicomanganese.