



2018 Minerals Yearbook

MANGANESE [ADVANCE RELEASE]

MANGANESE

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In 2018, U.S. manganese apparent consumption was estimated to be 800,000 metric tons (t) on a manganese-content basis, a 12% increase from consumption in 2017 (table 1). The increase in apparent consumption was primarily a reflection of the 30%, 20%, and 17% increases in ferromanganese, manganese ore, and silicomanganese imports (manganese-content basis), respectively, in 2018 compared with those in 2017 (table 6).

Exports of all types of manganese increased by 3% to 29,600 t (gross weight) compared with 28,700 t in 2017 (table 5). Total manganese imports (gross weight) increased by 29% to 1,310,000 t in 2018 compared with 1,020,000 t in 2017 (table 6).

In 2018, average U.S. spot-market price for high-carbon ferromanganese decreased slightly from that in 2017; average U.S. spot-market price for medium-carbon ferromanganese increased by 3%. The average domestic spot-market price for manganese metal increased by 22% from that in 2017. The average U.S. spot-market price for silicomanganese decreased slightly from that in 2017 (table 1).

World production of manganese ore in 2018 on a gross-weight basis increased by 5% compared with that in 2017. On a manganese-content basis, world production increased by 9% (table 7). South Africa (28%), Australia (15%), and China (15%) were the leading producers of manganese ore on a gross-weight basis. South Africa (31%), Australia (18%), and Gabon (12%) were the leading producers of manganese ore on a manganese-content basis. Combined world production of ferromanganese and silicomanganese, excluding U.S. production, increased by 19% to 20.0 million metric tons (Mt) on a gross-weight basis compared with the revised amount of 16.9 Mt in 2017 (table 8). China was the leading producer of manganese ferroalloys, accounting for 57% of world 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. Globally, steel production accounted for more than 90% of manganese consumption, nonferrous alloys and batteries each accounted for about 2%, and multiple smaller applications accounted for the remaining consumption (Roskill Information Services Ltd., 2018). 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 2018 that the Defense Logistics Agency Strategic Materials (DLA Strategic Materials), U.S. Department of Defense, issued on October 1, 2017, covered the period from October 1, 2017, through September 30, 2018. 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, 2017). 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.

In 2018, the DLA Strategic Materials disposed of (sold) 7,000 t of high-carbon ferromanganese. The amount of metallurgical-grade manganese ore and high-carbon ferromanganese in the National Defense Stockpile at the calendar yearend was 292,000 t and 199,000 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 chemicals and ferroalloys 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 2018, U.S. manganese apparent consumption was estimated to be 800,000 t on a manganese-content basis (table 1). Reported domestic consumption of manganese ore decreased slightly to 370,000 t (gross weight), and corresponding yearend stocks increased by 25% to 185,000 t compared with those in 2017 (table 1). Reported consumption (gross weight) of ferromanganese increased slightly and consumption of silicomanganese decreased slightly compared with consumption in 2017 (tables 1, 4). Reported manganese metal consumption in 2018 was 19,900 t (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, were collected by means of the “Manganese Ore and Products” survey. In 2018, eight companies were canvassed that processed ore by such methods as grinding and roasting or used ore in the manufacture of dry cell batteries, manganese chemicals, ferroalloys, or metals. Of those eight companies, all used manganese ore in their processes in 2018. The collective consumption of these companies was considered to constitute all the manganese ore consumption in the United States in 2018, excluding that consumed directly by the steel industry. Full-year responses or a basis upon which to estimate these data were obtained for all these companies for 2018 (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 75% or 85% manganese. Manganese plays an important alloying role in aluminum applications to increase corrosion resistance. The leading use of aluminum-manganese alloys was in the manufacture of beverage cans. Other uses included, but were not limited to, aircraft components, automobiles, and building products (Roskill Information Services Ltd., 2020).

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 (Roskill Information Services Ltd., 2020). 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 2018, 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 Group, was \$7.16 per metric ton unit, a 20% increase from \$5.97 per metric ton unit in 2017. CRU Group discontinued reporting the average c.i.f. price in China for metallurgical-grade ore containing 46% manganese 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 different end uses (ferroalloy production, blast furnace ironmaking, manufacture of manganese chemicals) had different ore-quality requirements.

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 also are 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 S&P Global 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 \$1,471.36 per gross (long) ton for high-carbon ferromanganese, 113.31 cents per pound for medium-carbon ferromanganese, and 64.96 cents per pound for silicomanganese (table 1). These prices were slightly less for high-carbon ferromanganese and silicomanganese and 3% more for medium-carbon ferromanganese compared with those in 2017. The annual

average North American transaction price for manganese metal as reported by CRU Group was 137.27 cents per pound, which was 22% more than that in 2017.

Foreign Trade

U.S. net import reliance, as a percentage of apparent consumption, was 100% for manganese (excluding the negligible amount of manganiferous materials extracted in South Carolina to color bricks), 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 2018, U.S. exports (gross weight) of most manganese products increased from those in 2017, except for silicomanganese. Exports of ferromanganese (all grades) increased by 13% to 10,400 t; manganese dioxide, by 34% to 7,740 t; manganese ore, by 154% to 2,920 t. Exports of silicomanganese decreased by 49% to 4,340 t (table 5). Canada was the leading destination for many manganese product exports in 2018, accounting for 98% of ferromanganese, 67% of manganese dioxide, and 97% of silicomanganese exports. Manganese ore was exported predominantly to Mexico (80%), and manganese metal was exported primarily to Malaysia (76%).

In 2018, U.S. imports (gross weight) of manganese products that increased compared with those in 2017 included ferromanganese (all grades) (by 29%), manganese ore (all grades) (by 48%), potassium permanganate (by 56%), and silicomanganese (by 17%). All other manganese-product imports decreased compared with those in 2017 including manganese dioxide (by 29%), manganese metal waste and scrap (by 54%), unwrought manganese metal (by 12%), and other manganese metal (wrought) (by 8%) (table 6).

World Industry Structure

World manganese ore production was 53.5 Mt (gross weight) and 18.9 Mt (manganese content) in 2018, 5% and 9% more, respectively, than the amounts in 2017 (table 7). On a manganese-content basis, the leading manganese ore-producing countries were South Africa (31%), Australia (18%), Gabon (12%), Brazil and Ghana (7% each), and China (6%), together accounting for 81% of world production.

Excluding the United States, total world manganese alloy production was 20.0 Mt (gross weight) in 2018, 19% more than the revised amount in 2017 (table 8). On a gross-weight basis, the leading producers of manganese alloys were China (57%), India (14%), and Ukraine (5%).

The International Manganese Institute (IMnI) estimated that world apparent consumption of manganese ferroalloys (gross weight) increased by 13% to 21.7 Mt in 2018 compared with 19.1 Mt in 2017. Of the 21.7 Mt consumed in 2018, 15.7 Mt was silicomanganese, 4.3 Mt was high-carbon ferromanganese, and 1.7 Mt was refined (medium- and low-carbon) ferromanganese. The IMnI estimated world manganese ferroalloy production in 2018 was 22.0 Mt, about equal to its estimate for ferroalloy apparent consumption (21.7 Mt). The IMnI estimated world manganese ore apparent consumption in 2018 was about 17.9 Mt (contained weight), which was slightly more than the

estimate of 17.4 Mt in 2017 (Aloys d'Hambure, Executive Director, International Manganese Institute, unpub. data, 2018).

Outlook

Domestic and global consumption of manganese are expected to closely follow trends in steel production. Details for the outlook for the steel industry are discussed in the Iron and Steel chapter of the 2018 USGS Minerals Yearbook. Although some growth rates for nonmetallurgical manganese consumption, especially batteries, may be higher than for steel production, this is expected to have only a minor effect on overall manganese demand owing to the small percentage of global consumption attributed to batteries.

U.S. crude steel production in 2018 was 86.6 Mt, a 6% increase compared with 81.6 Mt produced in 2017. Global crude steel production in 2018 was 1.81 billion metric tons (Gt), a 5% increase compared with 1.73 Gt in 2017 (World Steel Association, 2019, p. 9).

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TABLE 1
SALIENT MANGANESE STATISTICS¹

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

	2014	2015	2016	2017	2018	
United States:						
Manganese ore (20% or more Mn):						
Production	--	--	--	--	--	
Exports	1	1	1	1	3	
Imports for consumption	387	441	281	297	440	
Consumption ^{2,3}	508	451	410	378	370	
Stocks, December 31, consumers ^{2,3}	189	187	207	148	185	
Ferromanganese:						
Production	W	W	W	W	W	
Exports	6	5	7	9	10	
Imports for consumption	365	292	229	331	427	
Consumption ³	360	344	342	345	348	
Stocks, December 31, consumers and producers ³	23	21	21	17	27	
Silicomanganese:						
Production	W	W	W	W	W	
Exports	3	1	2	8	4	
Imports for consumption	448	301	264	351	412	
Consumption ^{3,4}	146	138	139	141	139	
Stocks, December 31, consumers and producers ³	10	21	10	13	21	
Consumption, apparent, manganese content ^{3,5}	834	697 ^r	540	714 ^r	800	
Price, average:						
Ferromanganese, high-carbon ⁶	dollars per gross ton	1,063.24 ^r	915.36	888.83	1,488.74	1,471.36
Ferromanganese, medium-carbon ⁶	cents per pound	94.39	93.49	80.80	110.46	113.31
Manganese metal ⁷	do.	126.98 ^r	114.86 ^r	97.31	112.17	137.27
Manganese ore ⁸	dollars per metric ton unit	4.60 ^r	3.08 ^r	4.34 ^r	5.97	7.16
Silicomanganese ⁶	cents per pound	58.72	49.60	43.37	65.59	64.96
World, production of manganese ore		57,600 ^r	47,000 ^r	46,700 ^r	51,000 ^r	53,500

¹Revised. do. Ditto. W Withheld to avoid disclosing company proprietary data. -- Zero.

¹Table includes data available through October 22, 2019. Data are rounded to no more than three significant digits, except prices.

²Exclusive of iron and steel plants.

³Includes U.S. Geological Survey (USGS) estimates.

⁴USGS evaluation indicates that silicomanganese consumption is considerably understated.

⁵Based on estimates of average content for all significant components.

⁶S&P Global Platts Metals Week based on monthly averages.

⁷CRU Group North American transaction prices based on monthly averages.

⁸CRU Group, cost, insurance, and freight, China, 44% manganese metallurgical ore.

TABLE 2
U.S. GOVERNMENT NATIONAL DEFENSE STOCKPILE MANGANESE STATISTICS IN 2018^{1,2}

(Metric tons, gross weight)

Material	Inventory, yearend		Annual Materials Plan ³	Sales		Inventory changes ⁴	
	Fiscal year ³	Calendar year		Fiscal year ³	Calendar year	Fiscal year ³	Calendar year
Metallurgical ore	292,000	292,000	292,000	--	--	--	--
High-carbon ferromanganese	203,000	199,000	45,400	13,000	7,030	-9,910	-13,200
Total	495,000	491,000	337,000	13,000	7,030	-9,910	-13,200

¹Table includes data available through October 22, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes stockpile- and nonstockpile-grade materials.

³Twelve-month period ending September 30, 2018.

⁴From previous year.

Source: Defense Logistics Agency Strategic Materials.

TABLE 3
DOMESTIC PRODUCERS OF PRINCIPAL MANGANESE PRODUCTS IN 2018

Company	Plant location	Products ¹			Type of process
		FeMn	SiMn	MnO ₂	
Borman Specialty Materials ²	Henderson, NV			X	Electrolytic.
Energizer Battery Inc.	Marietta, OH			X	Do.
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.

Do., do. Ditto.

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

²Formerly Tronox Inc.

TABLE 4
ESTIMATED U.S. CONSUMPTION, BY END USE, AND INDUSTRY STOCKS OF MANGANESE FERROALLOYS AND METAL IN 2018^{1,2}

(Metric tons, gross weight)

End use	Ferromanganese		Silicomanganese	Manganese metal
	High carbon	Medium and low carbon		
Steel:				
Carbon	W	W	90,100	W
High-strength, low-alloy	W	W	W	W
Stainless and heat-resisting	7,150	2,660	15,600	1,070
Full alloy	W	W	16,700	36
Unspecified ³	189,000	142,000	13,300	11,500
Total	196,000	145,000	136,000	12,600
Cast irons	6,310	416	289	(4)
Superalloys	--	(4)	--	88
Alloys (excluding alloy steels)	11	(4)	--	(4) ⁵
Miscellaneous and unspecified	349	138	2,810	7,160
Grand total	203,000	145,000	139,000 ⁶	19,900
Total manganese content ⁷	162,000	122,000	91,700	19,900
Stocks, December 31, 2018, consumers and producers	8,610	18,800	20,900	1,220 ⁸

W Withheld to avoid disclosing company proprietary data; included with "Steel: Unspecified." -- Zero.

¹Table includes data available through October 22, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes USGS estimates.

³Includes electrical and tool steel.

⁴Withheld to avoid disclosing company proprietary data; included with "Miscellaneous and unspecified."

⁵Primarily aluminum alloys.

⁶USGS evaluation indicates that silicomanganese consumption is considerably understated.

⁷Estimated 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%).

⁸Consumer stocks only.

TABLE 5

U.S. EXPORTS OF MANGANESE ORE, FERROALLOYS, METAL, AND MANGANESE DIOXIDE, BY COUNTRY OR LOCALITY^{1,2}

Country or locality	2017		2018	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Ore and concentrates with 20% or more manganese:				
Belgium	468	\$534	38	\$152
Canada	47	43	363	361
China	48	61	--	--
Germany	205	168	--	--
Mexico	48	47	2,330	1,940
Netherlands	254	1,000	177	812
Poland	18	22	--	--
Russia	--	--	7	7
Taiwan	(3)	6	(3)	6
United Kingdom	59	43	--	--
Other [1 country and (or) locality]	4 ^r	3 ^r	--	--
Total	1,150	1,930	2,920	3,270
Ferromanganese, all grades:				
Canada	8,570	13,300	10,200	14,000
China	19	30	10	23
Costa Rica	--	--	6	28
Germany	6	14	3	7
Honduras	--	--	2	11
Iraq	--	--	16	46
Mexico	500	531	146	210
Morocco	--	--	4	8
Taiwan	--	--	21	40
United Kingdom	14	42	25	71
Other [15 countries and (or) localities]	144 ^r	334 ^r	3	7
Total	9,250	14,200	10,400	14,500
Silicomanganese:				
Canada	8,320	11,700	4,200	6,040
Costa Rica	--	--	2	3
Ecuador	--	--	125	162
Georgia	128	120	--	--
Mexico	--	--	8	16
United Kingdom	4	6	--	--
Total	8,460	11,900	4,340	6,220
Metal, including alloys and waste and scrap:				
Canada	75	225	32	84
France	1	4	9	36
India	930	623	314	286
Japan	111	378	83	303
Malaysia	2,320	1,090	3,150	1,680
Mexico	192	795	167	1,340
Norway	--	--	10	472
Pakistan	93	72	143	44
South Africa	92	80	216	192
Venezuela	--	--	7	6
Other [20 countries and (or) localities]	229 ^r	1,490 ^r	17	218
Total	4,050	4,760	4,140	4,660

See footnotes at end of table.

TABLE 5—Continued

U.S. EXPORTS OF MANGANESE ORE, FERROALLOYS, METAL, AND MANGANESE DIOXIDE, BY COUNTRY OR LOCALITY^{1,2}

Country or locality	2017		2018	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Manganese dioxide:				
Canada	3,200	2,840	5,160	4,500
El Salvador	326	391	74	89
Estonia	245	1,320	238	1,250
Germany	224	1,030	353	780
Israel	173	210	445	541
Italy	64	266	86	347
Mexico	280	331	329	427
Netherlands	142	778	197	906
Poland	82	293	64	290
United Kingdom	716	823	552	902
Other [25 countries and (or) localities]	315 ^r	999 ^r	245	720
Total	5,770	9,280	7,740	10,700

^rRevised. -- Zero.¹Table includes data available through October 22, 2019. Data are rounded to no more than three significant digits.²Presentation of data is based on the annual quantities (gross weight) of the leading countries for 2017 or 2018.³Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 6

U.S. IMPORTS FOR CONSUMPTION OF MANGANESE ORE, FERROALLOYS, METAL, AND SELECTED CHEMICALS, BY COUNTRY OR LOCALITY^{1,2}

Country or locality	2017			2018		
	Quantity		Value, customs (thousands)	Quantity		Value, customs (thousands)
	Gross weight (metric tons)	Mn content (metric tons)		Gross weight (metric tons)	Mn content (metric tons)	
Ore and concentrates with 20% or more manganese:						
All grades:						
Australia	20,400	9,770	\$8,340	13,500	6,430	\$5,220
Brazil	625	340	412	8,860	3,890	2,540
China	--	--	--	2	2	4
Côte d'Ivoire	332	133	20	27	12	11
Gabon	216,000	135,000	51,800	276,000	141,000	85,300
Georgia	122	88	138	--	--	--
Mexico	24,100	10,700	5,330	29,800	15,300	7,480
Morocco	187	135	245	116	66	153
South Africa	35,400	14,400	7,060	111,000	38,200	21,400
Turkey	--	--	--	417	288	203
Other [1 country and (or) locality]	20 ^r	14 ^r	13 ^r	--	--	--
Total	297,000	170,000	73,300	440,000	205,000	122,000
More than 20% but less than 47% manganese:						
Brazil	--	--	--	6,570	2,630	1,620
Côte d'Ivoire	332	133	20	27	12	11
Gabon	13,100	5,640	2,390	9,610	4,130	1,910
Mexico	13,200	5,100	2,480	15,500	5,450	3,560
South Africa	33,000	13,200	6,260	108,000	36,500	20,000
Turkey	--	--	--	57	26	28
Total	59,600	24,100	11,100	139,000	48,800	27,100
47% or more manganese:						
Australia	20,400	9,770	8,340	13,500	6,430	5,220
Brazil	625	340	412	2,290	1,260	919
China	--	--	--	2	2	4
Gabon	202,000	129,000	49,400	266,000	137,000	83,400
Georgia	122	88	138	--	--	--
Korea, Republic of	20	14	13	--	--	--
Mexico	10,900	5,590	2,850	14,200	9,840	3,930
Morocco	187	135	245	116	66	153
South Africa	2,440	1,200	805	3,430	1,670	1,460
Turkey	--	--	--	361	263	175
Total	237,000	146,000	62,200	300,000	156,000	95,300
Ferromanganese:						
All grades:						
Australia	65,800	47,000	80,800	76,000	57,000	93,900
China	8,150	7,590	15,800	5,700	5,310	12,500
Korea, Republic of	35,100	29,000	57,200	49,900	41,000	87,200
Malaysia	9,740	7,360	12,500	65,200	49,500	83,000
Mexico	6,130	4,840	9,510	10,300	8,200	16,300
Norway	57,300	46,600	93,700	66,500	53,800	108,000
Russia	6,670	5,100	6,490	28,100	21,400	27,500
South Africa	85,200	65,900	123,000	81,300	63,200	118,000
Spain	17,700	13,400	20,900	20,300	15,400	25,400
Ukraine	17,300	13,200	18,300	6,580	5,020	6,540
Other [13 countries and (or) localities]	21,400 ^r	15,700 ^r	27,200 ^r	17,500	12,700	23,300
Total	331,000	256,000	465,000	427,000	333,000	602,000
1% or less carbon:						
China	8,100	7,560	15,700	5,550	5,190	12,200
France	3,300	2,680	5,410	19	15	59
Germany	447	415	1,080	264	233	657
Japan	15	12	35	340	267	568
Korea, Republic of	9,300	8,310	18,300	11,100	10,200	25,700
Mexico	2,170	1,760	2,910	3,420	2,770	5,180

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^{1,2}

Country or locality	2017			2018		
	Quantity		Value, customs (thousands)	Quantity		Value, customs (thousands)
	Gross weight (metric tons)	Mn content (metric tons)		Gross weight (metric tons)	Mn content (metric tons)	
Ferromanganese:—Continued						
1% or less carbon:—Continued						
Norway	32,500	26,400	55,500	44,200	35,800	74,800
South Africa	216	201	401	374	325	623
Spain	--	--	--	1,580	1,260	2,600
Vietnam	--	--	--	280	252	629
Other [2 countries and (or) localities]	48 ^r	46 ^r	114 ^r	--	--	--
Total	56,100	47,400	99,500	67,100	56,300	123,000
More than 1% but not more than 2% carbon:						
China	45	34	113	145	119	318
France	400	324	625	2,900	2,360	4,600
Germany	1	1	2	--	--	--
Korea, Republic of	25,300	20,300	38,400	33,000	26,400	53,200
Mexico	3,690	2,890	6,370	6,760	5,330	10,900
Norway	23,200	18,900	36,400	19,200	15,600	29,600
South Africa	20,900	16,900	37,000	34,400	27,600	56,300
Total	73,600	59,300	119,000	96,300	77,400	155,000
More than 2% but not more than 4% carbon:						
Brazil	108	81	96	--	--	--
France	--	--	--	6	5	14
Spain	34	25	51	--	--	--
Total	142	106	147	6	5	14
More than 4% carbon:						
Australia	65,800	47,000	80,800	76,000	57,000	93,900
Georgia	2,400	1,860	2,230	3,100	2,410	3,930
India	2,550	1,890	3,240	5,120	3,210	6,110
Korea, Republic of	500	380	578	5,840	4,440	8,290
Malaysia	9,740	7,360	12,500	65,200	49,500	83,000
Norway	1,640	1,280	1,780	3,090	2,390	3,870
Russia	6,640	5,070	6,430	28,100	21,400	27,500
South Africa	64,000	48,800	85,500	46,600	35,200	60,900
Spain	17,600	13,400	20,800	18,700	14,200	22,800
Ukraine	17,300	13,200	18,300	6,580	5,020	6,540
Other [8 countries and (or) localities]	12,400 ^r	8,560 ^r	14,600 ^r	5,630	4,020	6,950
Total	201,000	149,000	247,000	264,000	199,000	324,000
Silicomanganese:						
Australia	66,000	43,800	86,500	87,600	56,800	110,000
Brazil	2,360	1,550	2,440	3,780	2,510	3,980
Georgia	90,200	66,800	89,600	116,000	84,900	143,000
Malaysia	13,600	8,950	15,300	29,300	19,000	34,300
Mexico	26,800	17,000	28,000	23,900	15,800	27,200
Norway	18,200	10,900	27,500	20,300	13,100	29,000
Russia	18,100	12,300	22,500	9,160	6,100	11,500
Saudi Arabia	14,700	9,310	16,300	8,980	5,940	10,100
South Africa	78,100	50,800	81,600	78,300	50,900	86,200
Spain	14,800	9,710	19,100	29,500	19,100	36,800
Other [7 countries and (or) localities]	8,410 ^r	5,000 ^r	12,700 ^r	4,960	3,120	6,490
Total	351,000	236,000	401,000	412,000	277,000	499,000
Metal:						
Unwrought:³						
China	17,500	XX	31,000	16,300	XX	32,800
Estonia	--	XX	--	20	XX	44
Gabon	200	XX	356	6	XX	15
Germany	1,490	XX	3,090	1,590	XX	3,620
Hong Kong	50	XX	96	102	XX	263

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^{1,2}

Country or locality	2017			2018		
	Quantity		Value, customs (thousands)	Quantity		Value, customs (thousands)
	Gross weight (metric tons)	Mn content (metric tons)		Gross weight (metric tons)	Mn content (metric tons)	
Metal:—Continued						
Unwrought: ³ —Continued						
Japan	172	XX	2,500	52	XX	2,960
Latvia	--	XX	--	10	XX	28
Mexico	288	XX	952	246	XX	831
South Africa	7,900	XX	19,100	6,120	XX	15,500
Spain	46	XX	91	3	XX	4
Other [6 countries and (or) localities]	63 ^r	XX	134 ^r	1	XX	11
Total	27,700	XX	57,400	24,500	XX	56,000
Other manganese, wrought:						
Canada	22	XX	7	5	XX	22
China	(4)	XX	3	1	XX	17
France	--	XX	--	(4)	XX	2
Germany	226	XX	2,470	309	XX	3,580
India	(4)	XX	2	(4)	XX	6
Japan	4	XX	47	(4)	XX	170
Malaysia	(4)	XX	4	(4)	XX	3
Mexico	254	XX	676	159	XX	530
Poland	--	XX	--	(4)	XX	9
Sweden	13	XX	122	9	XX	86
Other [2 countries and (or) localities]	10 ^r	XX	22 ^r	--	XX	--
Total	528	XX	3,350	484	XX	4,420
Waste and scrap:						
Canada	849	XX	228	408	XX	128
China	36	XX	60	--	XX	--
Mexico	3	XX	3	--	XX	--
United Kingdom	2	XX	6	--	XX	--
Total	889	XX	297	408	XX	128
Manganese dioxide:						
Belgium	74	XX	266	59	XX	158
Brazil	52	XX	77	32	XX	54
China	80	XX	136	72	XX	166
France	--	XX	--	14	XX	24
Germany	89	XX	176	48	XX	82
India	35	XX	65	23	XX	43
Japan	6,940	XX	14,800	4,990	XX	11,200
Morocco	19	XX	87	19	XX	87
Spain	12	XX	20	60	XX	102
Ukraine	74	XX	125	23	XX	39
Other [5 countries and (or) localities]	122 ^r	XX	178 ^r	(4)	XX	2
Total	7,500	XX	15,900	5,340	XX	11,900
Potassium permanganate:						
Australia	--	XX	--	1	XX	25
China	--	XX	--	19	XX	42
Germany	(4)	XX	4	--	XX	--
India	869	XX	2,200	1,430	XX	3,750
Japan	64	XX	132	1	XX	15
Total	934	XX	2,330	1,460	XX	3,830

^rRevised. XX Not applicable. -- Zero.¹Table includes data available through October 22, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.²Presentation of data is based on the annual quantities (gross weight) of the leading countries for 2017 or 2018.³Imports of unwrought metal include flake, powder, and other.⁴Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 7
MANGANESE ORE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Thousand metric tons, manganese content)

Country or locality ³	2014	2015	2016	2017	2018
Australia: ^{4,5}					
Gross weight	7,505 ^r	7,400 ^r	5,164	6,473	8,193
Mn content, 37% to 53% Mn	3,255 ^r	3,247 ^r	2,325	2,821	3,475
Brazil:					
Gross weight	2,723	2,868 ^r	2,817 ^r	3,273 ^r	3,058 ⁵
Mn content, 33% to 51% Mn	1,094	1,243 ^r	1,226 ^r	1,344 ^r	1,310 ⁵
Bulgaria: ⁵					
Gross weight	70	191	67	33	62
Mn content, 25% to 35% Mn	20	53	19	9	17
Burkina Faso:					
Gross weight	50	50	--	--	--
Mn content, 46% Mn	23	23	--	--	--
Burma: ⁵					
Gross weight	242	71	293	346	518
Mn content, 39% to 40% Mn	97	28	117	138	207
China: ^{5,6}					
Gross weight	19,590	13,011	15,484	11,333	7,977
Mn content, 15% to 20% Mn	3,134	2,082	2,323	1,700	1,196
Congo, Kinshasa, gross weight ⁷	--	--	--	--	15
Côte d'Ivoire: ⁵					
Gross weight	328	296	211	470	864
Mn content, 42% to 46% Mn	148	133	47	212	395
Egypt: ⁵					
Gross weight	50	34	110 ^r	36	40
Mn content, 30% to 40% Mn	17	11	36 ^r	12	13
Gabon: ⁵					
Gross weight	3,781	4,112	3,379	4,717	5,057
Mn content, 45% to 53% Mn	1,767	1,929	1,683 ^r	2,193	2,331
Georgia, concentrate ^e					
Gross weight	334	334	340 ^r	460	580
Mn content, 28% to 35% Mn	97	97	130 ^r	180 ^r	200
Ghana:					
Gross weight	1,497	1,478	1,967	3,000	4,850 ⁵
Mn content, 27% to 34% Mn	418	416	553	810	1,364 ⁵
Hungary:					
Gross weight	51	57	18	--	--
Mn content, 25% to 35% Mn	13	15 ^c	5 ^c	--	--
India: ⁵					
Gross weight	2,200	2,300	2,100	2,100	2,880
Mn content, 10% to 58% Mn	792	810	745	734	961
Indonesia: ⁵					
Gross weight	50	45	90	56	8
Mn content, 28% to 44% Mn	22	20	39	24	3
Iran: ^c					
Gross weight	140	87	79	96	112
Mn content, 30% to 43% Mn	57	35	32	39	45
Kazakhstan, concentrate:					
Gross weight	1,092	616	510	464 ^r	440 ^c
Mn content, 32% to 36% Mn ^c	390	222	183	167 ^r	140
Malaysia:					
Gross weight	835	502	701	1,226	1,000
Mn content, 32% to 45% Mn ^c	326	196	273	478	390
Mexico:					
Gross weight ^c	652	600	600 ^r	590 ^r	570
Mn content, 34% to 37% Mn ⁸	236	217	206	212	210 ^c
Morocco:					
Gross weight	91	72	68	99 ^r	53 ^c
Mn content, 47% to 53% Mn ^{c,9}	52 ^r	38	36	59 ^r	28

See footnotes at end of table.

TABLE 7—Continued
MANGANESE ORE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Thousand metric tons, manganese content)

Country or locality ³	2014	2015	2016	2017	2018
Namibia:					
Gross weight ^c	105 ^r	110 ^r	48 ^r	80 ^r	66
Mn content, 35% to 45% Mn	37 ^r	38 ^r	17 ^r	28 ^r	23
Nigeria:					
Gross weight	--	4	70 ^r	35	160
Mn content, 25% to 37% Mn ^c	--	1	25 ^r	13	57
Oman:					
Gross weight	38	16	15	14	36
Mn content, 21% to 27% Mn ^c	9	4	4	3	9
Philippines:⁵					
Gross weight	7	--	--	--	--
Mn content, 33% to 44% Mn	3	--	--	--	--
Romania, concentrate:					
Gross weight	17	39	5	14 ^r	10
Mn content, 20% to 30% Mn	4	9	1	3 ^r	2 ^c
Russia, concentrate:					
Gross weight	--	9	--	1	1 ^c
Mn content, 20% to 30% Mn ^c	--	2 ^r	--	(10) ^r	(10) ^c
South Africa, metallurgical:					
Gross weight, all forms ¹¹	14,051	11,033 ^r	10,806 ^r	14,144	14,918
Mn content, 30% to 48% Mn ^c	5,500 ^r	4,300 ^r	4,200 ^r	5,500 ^r	5,800
Sudan:					
Gross weight	20	31	34	42 ^c	41 ^c
Mn content, 29% to 33% Mn	6	9	10	12 ^c	12 ^c
Thailand:					
Gross weight	14	9	9	8	4
Mn content, 40% to 50% Mn ^c	7	4	4	4	2
Turkey:					
Gross weight	246	143	150 ^c	40 ^{r,5}	41 ⁵
Mn content, 34% to 36% Mn	89	51 ^c	54 ^c	14 ^{r,5}	14 ⁵
Ukraine:					
Gross weight	1,526	1,203 ^r	1,250 ^r	1,425 ^r	1,521
Mn content, 30% to 35% Mn ^c	519	409 ^r	425 ^r	484 ^r	517
Vietnam:⁵					
Gross weight	193	110	187	283	333
Mn content, 43% Mn	83	47	80	122	143
Zambia:					
Gross weight	130 ^c	130 ^c	120 ^c	98 ^r	88
Mn content, 27% to 35% Mn ^c	45	45	40	37 ^r	29
Total:					
Gross weight	57,600 ^r	47,000 ^r	46,700 ^r	51,000 ^r	53,500
Mn content	18,300 ^r	15,700 ^r	14,800 ^r	17,400 ^r	18,900

^cEstimated. ^rRevised. -- Zero.

¹Table includes data available through September 24, 2019. 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.

²Data 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 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.

⁴Metallurgical ore.

⁵Reported by the International Manganese Institute.

⁶Includes manganiferous ore.

⁷Mn content estimated at 35% for manganese carbonate ore.

⁸Mostly oxide nodules; may include smaller quantities of direct-shipping carbonate and oxide ores for metallurgical and battery operations and sinter.

⁹Mn content estimated at 84% of manganese dioxide (MnO₂).

¹⁰Less than ½ unit.

¹¹Calculated manganese content includes allowance for assumed moisture content. Includes ore and sinter.

TABLE 8
FERROMANGANESE AND SILICOMANGANESE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY¹

(Metric tons, gross weight)

Country or locality ²	2014	2015	2016	2017	2018
Argentina, silicomanganese ³	10,000	8,000	10,000	--	--
Australia: ³					
Ferromanganese	161,900	150,000	116,900	125,100	148,300
Silicomanganese	119,400	130,700	83,700	120,200	112,900
Total	281,300	280,700	200,600	245,300	261,200
Bahrain, silicomanganese ³	6,000	6,000	5,000	--	--
Brazil: ³					
Ferromanganese	110,270	84,160	83,780	123,470	117,800
Silicomanganese	214,000	141,540	166,680	202,520	228,690
Total	324,270	225,700	250,460	325,990	346,490
China:					
Ferromanganese: ^c					
Blast furnace	457,000	446,000	340,000	220,000 ^r	270,000
Electric furnace	2,170,000	2,120,000	1,610,000	1,560,000 ^r	1,660,000
Silicomanganese ⁴	7,319,000 ^r	5,870,000 ^r	7,267,000 ^r	6,610,000 ^r	9,450,000
Total	9,946,000 ^r	8,436,000 ^r	9,217,000 ^r	8,390,000 ^r	11,380,000
Egypt, ferromanganese ³	12,000	12,000	12,000	12,000	13,000
France: ³					
Ferromanganese	116,000	126,000	119,000	95,400	125,400
Silicomanganese	64,800	65,100	58,200	58,400	56,700
Total	180,800	191,100	177,200	153,800	182,100
Gabon, silicomanganese ³	4,000 ^e	14,500	14,900	21,300	42,900
Georgia, silicomanganese ⁴	256,677	217,300	244,228	289,800 ^r	332,900
India: ³					
Ferromanganese	676,000 ^r	646,000 ^r	621,000 ^r	752,000 ^r	795,000
Silicomanganese	1,920,000 ^r	1,832,000 ^r	1,768,000 ^r	2,038,000 ^r	2,098,000
Total	2,596,000 ^r	2,478,000 ^r	2,389,000 ^r	2,790,000 ^r	2,893,000
Indonesia, silicomanganese ³	25,000	30,000	40,000	40,000	--
Japan:					
Ferromanganese ⁴	463,345	465,952	473,740	456,460	451,700
Silicomanganese ³	26,500	22,700	22,700	24,500	21,100
Total	489,845	488,652	496,440	480,960	472,800
Kazakhstan, silicomanganese ⁴	200,379	164,189	135,885	123,977	132,000 ^e
Korea, Republic of: ³					
Ferromanganese	535,000 ^r	500,000 ^r	425,000 ^r	360,000 ^r	320,000
Silicomanganese	235,000	175,000	135,000	117,000 ^r	117,000
Total	770,000 ^r	675,000 ^r	560,000 ^r	477,000 ^r	437,000
Malaysia: ³					
Ferromanganese	--	--	58,801	264,555	312,420
Silicomanganese	--	--	20,975	230,535	283,414
Total	--	--	79,776	495,090	595,834
Mexico: ³					
Ferromanganese	67,506	67,920	84,530	90,013	95,468
Silicomanganese	164,855	139,361	134,251	148,130	152,000
Total	232,361	207,281	218,781	238,143	247,468
Norway: ³					
Ferromanganese	295,400	309,200	329,100	400,800	327,600
Silicomanganese	314,300	309,900	306,100	284,500	330,000
Total	609,700	619,100	635,200	685,300	657,600
Russia: ⁴					
Ferromanganese	178,600	155,700	124,200	253,000 ^r	281,000
Silicomanganese	179,910	188,895	203,216	44,917 ^r	43,334
Total	358,510	344,595	327,416	297,917 ^r	324,334

See footnotes at end of table.

TABLE 8—Continued
 FERROMANGANESE AND SILICOMANGANESE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY¹

(Metric tons, gross weight)

Country or locality ²	2014	2015	2016	2017	2018
Saudi Arabia: ³					
Ferromanganese	8,000	7,000	10,000	10,000	23,000
Silicomanganese	60,000	63,000	55,000	65,000	85,400
Total	68,000	70,000	65,000	75,000	108,400
Slovakia: ⁴					
Ferromanganese	20,554	25,376	35,589	42,115	32,341
Silicomanganese	29,643	27,036	35,719	40,265	37,226
Total	50,197	52,412	71,308	82,380	69,567
South Africa: ³					
Ferromanganese	787,000	512,000	335,000	257,100	235,600
Silicomanganese	228,100	210,200	144,000	160,400	164,200
Total	1,015,100	722,200	479,000	417,500	399,800
Spain: ³					
Ferromanganese	133,500	126,200	120,100	132,100	86,200
Silicomanganese	128,700	134,400	123,100	138,700	156,100
Total	262,200	260,600	243,200	270,800	242,300
Ukraine: ⁴					
Ferromanganese	102,934	87,740	104,470	114,500	79,400
Silicomanganese	840,433	698,400	814,970	810,670	859,600
Total	943,367	786,140	919,440	925,170	939,000
United States, ferromanganese ⁵					
	W	W	W	W	W
Venezuela: ³					
Ferromanganese	8,000	--	--	--	--
Silicomanganese	39,000	35,000	42,000	18,670	--
Total	47,000	35,000	42,000	18,670	--
Grand total	18,700,000 ^r	16,300,000 ^r	16,800,000 ^r	16,900,000 ^r	20,100,000
Of which:					
Ferromanganese	6,300,000 ^r	5,840,000 ^r	5,000,000 ^r	5,270,000 ^r	5,370,000
Silicomanganese	12,400,000 ^r	10,500,000 ^r	11,800,000 ^r	11,600,000 ^r	14,700,000

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

¹Table includes data available through October 22, 2019. 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.

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

³Reported by the International Manganese Institute.

⁴Reported by the country or locality or producer(s).

⁵U.S. output of ferromanganese includes silicomanganese.