



2012 Minerals Yearbook

FERROALLOYS

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Ferroalloys are alloys of iron employed to add chemical elements into molten metal, usually during steelmaking. The alloying elements delivered by ferroalloys impart distinctive qualities to steel and cast iron or serve important functions during production. The leading ferroalloy-producing countries in 2012 were, in decreasing order of production, China (59%), South Africa (8%), India (6%), Russia (4%), and Kazakhstan (4%) (table 7). These five countries accounted for 81% of world ferroalloy production. World production of bulk ferroalloys—chromium, manganese, and silicon—was estimated to have been 37.5 million metric tons (Mt) in 2012, a slight increase compared with the revised figure of 37.1 Mt for 2011 (table 7).

Twelve companies in the United States produced 7 ferroalloys at 12 plants (table 1). Production statistics were concealed for most domestically produced ferroalloys after 2010 to avoid disclosing company proprietary data (table 7). U.S. reported consumption of the bulk ferroalloys in 2012 was approximately 993,000 metric tons (t) of manganese and silicon ferroalloys (table 3) and about 256,000 t of contained chromium in ferrochromium (table 4). Comparing reported consumption in 2012 with that of 2011, ferrochromium increased slightly, ferromanganese (including silicomanganese) decreased slightly, and ferrosilicon decreased by 12%. The United States was a net importer of ferroalloys and ferroalloy metals in 2012. On a gross-weight basis, U.S. total ferroalloy and ferroalloy metal imports increased slightly and exports decreased by 16% compared with that of 2011, which resulted in a 2.7% increase in net imports (table 6).

Ferrochromium

The leading world chromite-ore-producing countries in 2012 were South Africa (11 Mt), Kazakhstan (4.0 Mt), and India (3.9 Mt). More than 95% of chromite ore production was smelted in electric arc furnaces to produce ferrochromium for the metallurgical industry. The leading world ferrochromium-producing countries were South Africa (3 Mt), China (2.8 Mt), and Kazakhstan (1.3 Mt). India produced more than 0.8 Mt of ferrochromium. Of the 8.98 Mt of ferrochromium produced, most was consumed in the manufacture of stainless steel. The leading stainless-steel-producing areas of the world—Asia (primarily China, India, Japan, the Republic of Korea, and Taiwan), Europe (primarily Belgium, Finland, France, Germany, Italy, Spain, Sweden, and the United Kingdom), and the Americas (primarily Brazil and the United States)—accounted for most of world stainless steel production. World stainless steel production was estimated to be about 34 Mt in 2012, based on the average of multiple reports. China accounted for 45% of global stainless steel production.

In response to anticipated increases in demand, new ferrochromium-producing plants were under construction or planned in Kazakhstan and South Africa. Several industry trends were evolving—ferrochromium was being increasingly produced using ecological, energy- and recovery-efficient, prerreduction, closed-furnace processes; chromium was being increasingly recovered from ferrochromium slag; and the ferrochromium and stainless steel production industries were consolidating ownership, and strategic alliances between these two industries were being developed.

Ferromanganese

Two manganese ferroalloys, ferromanganese and silicomanganese, are key ingredients for steelmaking. In the United States, two companies produced manganese ferroalloys—Eramet Marietta Inc. (owned by France's Eramet Group) and Felman Production Inc. (owned by Miami-based Georgian American Alloys, Inc.) (table 1). In addition to domestic production in 2012, the United States imported 749,000 t of ferromanganese and silicomanganese (gross weight). Of that amount, 45% was imported from South Africa (336,000 t), 15% from Georgia (114,000 t), 9.2% from Norway (68,900 t), and 7.8% from Australia (58,700 t) (Corathers, 2013a, tables 3, 4). China was the leading world producer of manganese ferroalloys, with output about 270% greater than that of the next three major producers—India, South Africa, and Ukraine—combined (table 7).

Ferromolybdenum

Chile, China, and the United States accounted for about 77% of world production of molybdenite ore in 2012. Three other molybdenite-ore-producing countries—Canada, Mexico, and Peru—supplied an additional 14% of world production. Molybdenite concentrates are roasted to form molybdic oxide, which can then be converted into ferromolybdenum, molybdenum chemicals, or molybdenum metal. About 43% of the total reported molybdenum materials consumed in the United States (18,400 t) was in the form of molybdic oxides, and about 27% was consumed as ferromolybdenum. Although the United States was the second leading molybdenum-producing country in the world, it imported more than one-half of its ferromolybdenum requirements in 2012 (Polyak, 2014). The steel industry accounted for most of the ferromolybdenum consumed in the United States in 2012, principally in the production of stainless and full alloy steels (table 4).

Ferronickel

In 2012, more than 85% of ferronickel consumed in the United States was used in stainless, heat-resistant, and certain alloy steels. No ferronickel was produced in the United States from lateritic ores in 2012. The International Metals Reclamation Co. produced a remelt alloy from recycled materials, which was used as a substitute for ferrochromium and ferronickel in the production of austenitic stainless steel. In 2012, excluding China, the major ferronickel-producing countries were Japan (372,000 t gross weight), New Caledonia (142,000 t), Brazil (135,000 t) and Colombia (128,000 t). China produced large tonnages of conventional ferronickel grades, ranging from 15% to as much as 80% nickel content based on customer end use, plus nickel pig iron (NPI), a nickel-iron alloy containing less than 15% nickel, for an estimated output exceeding 1.4 Mt gross weight.

In Brazil, Anglo American Brasil Limitada's Barro Alto plant produced 21,600 t of nickel content of ferronickel in 2012, more than triple the 6,200 t output of 2011, and was scheduled to reach full production—41,000 metric tons per year (t/yr) of nickel content of ferronickel—in early 2013 (Anglo American plc, 2013, p. 80–89).

Vale S.A suspended operations at its Onça Puma ferronickel smelting complex in June 2012 after both furnaces developed problems and were damaged during ramp up. The company decided to rebuild one of the damaged furnaces at an estimated cost of \$188 million and planned to resume ramp up of the rebuilt furnace in the fourth quarter of 2013. With only one furnace operating, the complex would have a nominal capacity of 25,000 t/yr of nickel content of ferronickel (Vale S.A., 2013, p. 16, 21, 40, 42, 64, F–29).

In November 2012, the Government of Venezuela refused to renew the mining concessions and operating permits held by Minera Loma de Niquel C.A., and took control of the laterite mining and ferronickel operation. The Government had already canceled 13 of Loma de Niquel's concessions, forcing the parent company, Anglo American plc, to halt mining in September. Petr6leos de Venezuela, S.A., the parastatal oil company, was given responsibility for the operation (Anglo American plc, 2013, p. 81–82, 88; Le6n, 2012).

According to the China Nonferrous Metals Industry Association, China produced 308,000 t of nickel contained in NPI in 2012, up from 254,300 t in 2011 (Beijing Antaike Information Development Co., Ltd., 2013). At yearend 2012, at least 10 greenfield NPI plants were in varying stages of construction. One of these, the 600,000-t/yr NPI project of the Fujian Haihe Industry Co., started two 30,000-kilovolt-ampere (KVA) furnaces in May. Four 60,000-KVA furnaces were to be constructed in Phase 2 of the project (Beijing Antaike Information Development Co., Ltd., 2012).

Ferrosilicon

Silicon ferroalloy consumption is driven by cast iron and steel production, where silicon alloys are used as deoxidizers. Silicon metal was also used as an alloying agent with iron. Starting in 2011, domestic data for silicon metal containing less than 99.9% silicon—silicon metal used as feedstocks for

chemical, electronic, and metallurgical applications—were aggregated with those of ferrosilicon to avoid disclosing company proprietary data for both material categories. In 2012, total domestic ferrosilicon and silicon metal production was 357,000 t on a gross-weight basis, which was slightly less than the revised amount (370,000 t) in 2011 (table 7). In addition to domestic production in 2012, the United States imported 387,000 t of ferrosilicon and silicon metal (gross weight). Of that amount, 70% was imported from Russia (112,000 t), Canada (62,500 t), Brazil (46,200 t), and China (49,400 t) (Corathers, 2013b, table 6). China produced more ferrosilicon and silicon metal than the rest of the world combined and about four times more than that of the next three major producing countries—Russia, Norway, and the United States—combined. China's ferrosilicon and silicon metal production consisted of 69% and 67% of the world total, respectively, excluding net production in the United States (table 7).

Ferrotitanium

Titanium is used in steelmaking for deoxidation, grain-size control, and carbon and nitrogen control and stabilization. During steelmaking, titanium is usually introduced as ferrotitanium, because it has a lower melting temperature and higher density than titanium scrap. Steels with relatively high titanium content include interstitial-free, stainless, and high-strength low-alloy steels. Ferrotitanium is typically produced by induction melting of titanium scrap with iron or steel; however, it also is produced directly from titanium mineral concentrates. The standard grades of ferrotitanium are 30% and 70% titanium. U.S. producers of ferrotitanium were Global Titanium Inc. (Detroit, MI), with 10,000 t/yr of ferrotitanium production capacity, and RTI International Metals, Inc. (Canton, OH), with 7,260 t/yr of ferrotitanium and specialty alloy production capacity. The leading ferrotitanium-producing countries were China, India, Russia, and the United States.

In the United States, reported domestic consumption of titanium products in steel and other alloys was 12,900 t (gross weight), a 3% increase compared with that of 2011. Increased global steel production in 2012 increased the demand for ferrotitanium. In 2012, the average U.S. spot-market price range for 70%-grade ferrotitanium reported by Platts Metals Week decreased to \$3.20 to \$3.25 per pound from \$3.45 to \$3.55 per pound in 2011.

Ferrotungsten

Tungsten is an important alloying element in high-speed and other tool steels and is used to a lesser extent in some stainless and structural steels. Tungsten can be added to steel melts as (1) ferrotungsten, which is a master alloy containing between 75% and 80% tungsten; (2) tungsten melting base, which is a master alloy containing as much as 38% tungsten; (3) tungsten metal scrap; or (4) scheelite ore concentrates (Lassner and Schubert, 1999, p. 307–312; Roskill Information Services Ltd., 2007, p. 167–168, 174, 178–179).

World ferrotungsten production was dominated by China, where production was estimated to be 6,000 to 7,500 t, gross weight, during 2010–11. During the first half of 2012, China's

production of ferrotungsten was 34% lower than that of the first half of 2011. China's full-year 2012 ferrotungsten exports decreased by 53% to 459 t from 984 t in 2011. Although low in quantity (19 t, gross weight), China's imports of ferrotungsten increased in 2012 (Fang, 2012, p. 12, 18, 44; Liu, 2013, p. 36).

Minpro AB (Strassa, Sweden) introduced a new type of ferrotungsten to the market. The ferrotungsten was produced from secondary (scrap) materials and was porous, which allowed it to dissolve more quickly in steel melts in spite of having a higher tungsten content than ferrotungsten produced by smelting ore concentrates. Minpro's plant in Strassa had a production capacity of about 1,000 t/yr of ferrotungsten, which was estimated to be sufficient to supply about one-third of European consumption (Advantage Environment, 2013).

Vietnam Youngsun Tungsten Industry Co., Ltd.'s plant in Halong City, Quang Ninh Province, reportedly shipped 2,700 t of ferrotungsten, mainly to Europe, but also to Japan, the Republic of Korea, and the United States. Vietnam Youngsun used domestic ore to produce the ferrotungsten (Hack, 2013; Metal Bulletin, 2013).

At yearend, Hazelwood Resources was securing feedstock from overseas suppliers for its majority-owned, 4,000-t/yr Asia Tungsten Products ferrotungsten plant in the Vinh Bao district near the port of Haiphong in Vietnam. Hazelwood planned to produce the first salable ferrotungsten in the early 2013 (Hazelwood Resources Ltd., 2012).

U.S. reported consumption of ferrotungsten increased from that of 2011. The Platts Metals Week average annual ferrotungsten price was slightly lower than that of 2011; during the year, weekly prices ranged between \$42 and \$59.50 per kilogram of contained tungsten.

Ferrovanadium

In 2012, China, Russia, and South Africa accounted for 96% of world vanadium mine production. In these countries, vanadium was primarily recovered from titanium-bearing magnetite ore processed to produce pig iron. The process produced a slag containing 20% to 24% vanadium pentoxide, which was further processed to ferrovanadium containing 40% to 50% vanadium (Polyak, 2013).

In 2012, vanadium recovered from various industrial waste materials, such as vanadium-bearing fly ash, petroleum residues, pig iron slag, and spent catalysts was the leading source of U.S. vanadium production. A small amount of vanadium was obtained as a coproduct from the mining of uraniumiferous sandstones on the Colorado Plateau (Polyak, 2013).

In 2012, most of U.S. reported vanadium consumption was for steelmaking, principally in carbon, full alloy, and high-strength low-alloy steels. Ferrovanadium supplied 79% of the 3,980 t of vanadium consumed in the United States (Polyak, 2013). Steel manufacturing consumed almost all of the ferrovanadium in 2012 (table 4).

Outlook

The near-term trend for domestic ferroalloy consumption was expected to follow closely that of U.S. steel production. Details of the outlook for the steel industry are discussed in

the Outlook section of the Iron and Steel chapter of the 2012 USGS Minerals Yearbook, volume I, Metals and minerals. Crude steel production in the United States increased slightly to 88.7 Mt in 2012 from 86.4 Mt in 2011 (Fenton, 2014, table 1). According to the World Steel Association (2013a), world raw steel production in 2012 increased slightly to 1.55 billion metric tons (Gt) from 1.53 Gt in 2011. Raw steel production in China, the world's leading producer of raw steel, increased by 3.1% to about 717 Mt.

Changes in steel production reflect changes in apparent use of steel. World apparent consumption of finished steel products increased slightly to 1.41 Gt in 2012. This was the smallest increase since 2009, when apparent consumption decreased by 6.5%, and was caused mainly by decreased apparent consumption in the European Union. Even in China, the leading world consumer of steel products, apparent steel consumption growth slowed, increasing slightly to 646 Mt in 2012. The combined steel consumption in the BRIC countries—Brazil, Russia, India, and China—also only increased slightly to 785 Mt; these countries accounted for about 55% of the world total. World steel apparent consumption was projected to increase 1.45 in 2013 and 1.5 in 2014. Apparent steel use in North America was expected to increase by 4.5% to 135 Mt in 2013 from that in 2012, and to 139 Mt in 2014, as a result of continued economic recovery (World Steel Association, 2013b).

Chromium, manganese, silicon, and other ferroalloy metals are discussed in more detail, including domestic data coverage, foreign trade by country, outlook, and U.S. Government stockpile information, in the respective mineral commodity chapters in the U.S. Geological Survey Minerals Yearbook, volume I, Metals and minerals.

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TABLE 1
DOMESTIC PRODUCERS OF FERROALLOYS IN 2012

| Company | Plant location | Products ¹ | | | | | | | |
|---------------------------------------|------------------|-----------------------|------|------|------|------|-----|------|--|
| | | FeMo | FeMn | FeNb | FeSi | FeTi | FeV | SiMn | |
| Bear Metallurgical Co. | Butler, PA | X | | | | | X | | |
| CC Metals & Alloys, LLC ² | Calvert City, KY | | | | X | | | | |
| Core Metals Group ³ | Bridgeport, AL | | | | X | | | | |
| Eramet Marietta Inc. | Marietta, OH | | X | | | | | X | |
| Felman Production Inc. ² | Letart, WV | | | | | | | X | |
| Global Titanium Inc. | Detroit, MI | | | | | X | | | |
| Globe Metallurgical Inc. ³ | Beverly, OH | | | | X | | | | |
| Metallurg Vanadium Corp. | Cambridge, OH | | | | | | X | | |
| Reading Alloys Inc. | Robesonia, PA | | | X | | | | | |
| RTI International Metals, Inc. | Canton, OH | | | | | X | | | |
| Stratcor, Inc. | Butler, PA | | | | | | X | | |
| Thompson Creek Metals Co. Inc. | Langeloth, PA | X | | | | | | | |

¹FeMo, ferromolybdenum; FeMn, ferromanganese; FeNb, ferroniobium; FeSi, ferrosilicon; FeTi, ferrotitanium; FeV, ferrovandium; SiMn, silicomanganese.

²Subsidiary of Georgian American Alloys, Inc.

³Owned by Globe Specialty Metals.

TABLE 2
GOVERNMENT INVENTORY OF FERROALLOYS, DECEMBER 31, 2012^{1,2}

(Metric tons of alloys)

| Alloy | Inventory |
|-----------------------------|-----------|
| Ferrochromium: | |
| High-carbon | 94,300 |
| Low-carbon | 49,400 |
| Ferromanganese, high-carbon | 348,000 |

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

²Data are uncommitted inventory.

Source: Defense Logistics Agency, DLA Strategic Materials.

TABLE 3
 REPORTED U.S. CONSUMPTION OF FERROALLOYS AS ALLOYING ELEMENTS BY END USE IN 2012^{1,2}

(Metric tons of alloys)

| End use | FeB | FeMn | SiMn | FeP | FeSi | FeTi |
|---|---------------------------|-----------------------------|-------------------------------|--------------|-----------------------------|----------------------------|
| Steel: | | | | | | |
| Carbon and high-strength low-alloy | 468 | 311,000 | 107,000 | 4,040 | 77,200 | 7,330 |
| Stainless and heat-resisting | 207 | 9,660 | 15,700 | (3) | 48,500 | 3,360 |
| Other alloy | (3) | 50,500 | 23,200 | (3) | 19,300 | 413 |
| Tool | (3) | (3) | (3) | (3) | (3) | (4) |
| Unspecified | 198 | 983 | 963 | 840 | 33,700 | (4) |
| Total steel | 873 | 373,000 | 147,000 | 4,880 | 179,000 | 11,100 |
| Cast irons | (5) | 8,870 | 381 | 441 | 91,800 | 16 |
| Superalloys | 36 | (6) | -- | (5) | 972 | 568 |
| Alloys (excluding alloy steels and superalloys) | (5) | 702 | 2,920 | (5) | 29,600 | 1,060 |
| Miscellaneous and unspecified | 605 | (6) | (6) | 462 | 160,000 | 135 |
| Grand total | 1,510 | 382,000 | 150,000 ⁷ | 5,790 | 461,000 | 12,900 |
| Total 2011 | 1,390 ^r | 394,000 ^r | 154,000 ^{r,7} | 5,750 | 526,000 ^r | 12,500 ^r |
| Percentage of 2011 | 109 | 97 | 97 | 101 | 88 | 103 |
| Consumer stocks, December 31 | 158 | 17,700 ⁸ | 4,230 ⁸ | 651 | 14,200 | 1,770 |

^rRevised. -- Zero.

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

²FeB, ferroboron, including other boron materials; FeMn, ferromanganese, including manganese metal; SiMn, silicomanganese; FeP, ferrophosphorus, including other phosphorus materials; FeSi, ferrosilicon, including silicon metal, silvery pig iron, silicon carbide, and inoculant alloys; FeTi, ferrotitanium, including titanium scrap and other titanium materials.

³All or part included with "Steel, unspecified."

⁴All or part included with "Steel, other alloy."

⁵All or part included with "Miscellaneous and unspecified."

⁶All or part included with "Alloys (excluding alloy steels and superalloys)."

⁷Internal evaluation indicates that silicomanganese consumption is considerably understated.

⁸Consumer and producer stocks.

TABLE 4
 REPORTED U.S. CONSUMPTION OF FERROALLOYS AS ALLOYING ELEMENTS BY END USE IN 2012^{1,2}

(Metric tons of contained alloying elements)

| End use | FeCr | FeMo | FeNb | FeNi | FeV | FeW |
|---|----------------------|--------------------|--------------------|---------------------|--------------------|-----|
| Steel: | | | | | | |
| Carbon | 4,020 | 283 | 1,570 | -- | 737 | (3) |
| High-strength low-alloy | 1,760 | 123 | (3) | (3) | (4) | -- |
| Stainless and heat-resisting | 213,000 | 684 | 811 | (3) | 62 | (3) |
| Other alloy | 15,300 | 3,440 | 318 | (3) | 2,320 | (3) |
| Tool | (4) | (5) | 17 | (3) | (4) | (3) |
| Unspecified | 8,700 | -- | 3,320 | 12,700 ^P | -- | 165 |
| Total | 243,000 | 4,530 | 6,030 | 12,700 ^P | 3,120 | 165 |
| Cast irons | (6) | 345 | -- | -- | (5) | -- |
| Superalloys | 9,450 | (5) | 1,620 | (5) | 5 | (3) |
| Alloys (excluding alloy steels and superalloys) | 3,220 | (5) | 20 | (5) | (5) | (3) |
| Miscellaneous and unspecified | (6) | 139 | -- | 2,080 ^P | 14 | -- |
| Grand total | 256,000 | 5,010 | 7,670 | 14,800 ^P | 3,140 | 165 |
| Total 2011 | 253,000 ^r | 5,470 ^r | 9,330 ^r | 13,900 ^r | 4,140 ^r | 115 |
| Percentage of 2011 | 101 | 92 | 82 | 106 | 76 | 143 |
| Consumer stocks, December 31 | 7,620 | 331 | 388 | 996 ^P | 209 | W |

^PPreliminary. ^rRevised. W Withheld to avoid disclosing company proprietary data. -- Zero.

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

²FeCr, ferrochromium, including other chromium ferroalloys and chromium metal; FeMo, ferromolybdenum, including calcium molybdate; FeNb, ferriobium, including nickel niobium; FeNi, ferronickel; FeV, ferrovanadium, including other vanadium-carbon-iron ferroalloys; and FeW, ferrotungsten.

³All or part included with "Steel, unspecified."

⁴All or part included with "Steel, other alloy."

⁵All or part included with "Miscellaneous and unspecified."

⁶All or part included with "Grand total."

TABLE 5
SELECTED FERROALLOY PRICES IN 2012

| | High | Low | Average |
|--|----------|----------|----------|
| Chromium: | | | |
| Ferrochromium: | | | |
| 0.05% carbon ¹ | 236.29 | 232.46 | 234.37 |
| 0.10% carbon ¹ | 219.34 | 215.42 | 217.38 |
| 0.15% carbon ¹ | 210.91 | 208.39 | 209.65 |
| Over 4% carbon: | | | |
| 49–51% chromium ¹ | 110.17 | 105.65 | 107.91 |
| 60–65% chromium ¹ | 112.03 | 108.00 | 110.02 |
| Manganese: | | | |
| Medium-carbon ferromanganese ¹ | 92.53 | 89.61 | 91.07 |
| Standard high-carbon ferromanganese ² | 1,232.06 | 1,210.32 | 1,221.19 |
| Silicomanganese ³ | 63.35 | 60.87 | 62.11 |
| Molybdenum: | | | |
| Ferromolybdenum ⁴ | 14.85 | 14.58 | 14.72 |
| Molybdenum oxide ⁴ | 12.85 | 12.63 | 12.74 |
| Silicon: | | | |
| 50% ferrosilicon ¹ | 101.65 | 99.23 | 100.44 |
| 75% ferrosilicon ¹ | 92.70 | 90.26 | 91.48 |
| Silicon metal ¹ | 129.08 | 123.19 | 126.13 |
| Vanadium, ferrovanadium ⁴ | 15.73 | 14.04 | 14.88 |

¹Cents per pound of contained element.

²Dollars per gross ton.

³Cents per pound.

⁴Dollars per pound of contained element.

Sources: Platts Metals Week and Ryan's Notes.

TABLE 6
U.S. IMPORTS FOR CONSUMPTION AND EXPORTS OF FERROALLOYS AND FERROALLOY METALS IN 2012¹

| Alloy | Imports | | | Exports | | |
|---|-------------------------------|-----------------------------------|----------------------|-------------------------------|-----------------------------------|----------------------|
| | Gross weight (metric tons) | Contained weight (metric tons) | Value (thousands) | Gross weight (metric tons) | Contained weight (metric tons) | Value (thousands) |
| Ferroalloys: | | | | | | |
| Chromium ferroalloys: | | | | | | |
| Ferrochromium containing: | | | | | | |
| More than 4% carbon | 449,000 | 257,000 | \$526,000 | 4,460 | 2,240 | \$5,790 |
| Not more than 4% carbon | XX | XX | XX | 768 | 347 | 1,350 |
| More than 3% but not more than 4% carbon | 411 | 222 | 221 | XX | XX | XX |
| More than 0.5% but not more than 3% carbon | 7,580 | 5,150 | 18,500 | XX | XX | XX |
| Not more than 0.5% carbon | 43,900 | 30,300 | 146,000 | XX | XX | XX |
| Ferrochromium-silicon | 25,800 | 9,730 | 36,500 | 64 | 22 | 105 |
| Total | 526,000 | 302,000 | 728,000 | 5,300 | 2,610 | 7,250 |
| Manganese ferroalloys: | | | | | | |
| Ferromanganese containing: | | | | | | |
| More than 4% carbon | 300,000 | 231,000 | 316,000 | XX | XX | XX |
| More than 2% but not more than 4% carbon | 177 | 146 | 414 | XX | XX | XX |
| More than 1% but not more than 2% carbon | 66,500 | 53,500 | 98,200 | XX | XX | XX |
| Not more than 1% carbon | 34,700 | 29,200 | 67,300 | XX | XX | XX |
| Ferromanganese, all grades | XX | XX | XX | 5,350 | XX | 6,540 |
| Silicomanganese | 348,000 | 231,000 | 419,000 | 5,850 | XX | 8,220 |
| Total | 749,000 | 545,000 | 901,000 | 11,200 | XX | 14,800 |
| Silicon ferroalloys: | | | | | | |
| Ferosilicon containing: | | | | | | |
| More than 55% silicon | XX | XX | XX | 15,200 | 9,750 | 22,800 |
| 55% to 80% silicon and more than 3% calcium | 3,440 | 2,520 | 5,930 | XX | XX | XX |
| Magnesium ferrosilicon | 17,500 | 7,890 | 35,800 | XX | XX | XX |
| Ferosilicon, other ^{2,3} | 229,000 | 163,000 | 331,000 | 5,370 | 2,470 | 11,600 |
| Total | 250,000 | 173,000 | 373,000 | 20,600 | 12,200 | 34,000 |
| Other ferroalloys: | | | | | | |
| Ferrocerium and other pyrophoric alloys | 1,390 | XX | 11,800 | XX | XX | XX |
| Ferromolybdenum | 6,450 | 4,320 | 138,000 | 1,440 | 996 | 33,100 |
| Ferronickel | 39,000 | 13,000 | 228,000 | 314 | 182 | 5,190 |
| Ferroniobium | 11,400 | XX | 324,000 | 512 | XX | 5,630 |
| Ferrophosphorus | 7,070 | XX | 4,340 | 161 | XX | 358 |
| Ferrotitanium and ferrosilicon-titanium | 2,410 | XX | 12,000 | 3,610 | XX | 17,300 |
| Ferrotungsten and ferrosilicon-tungsten | 410 | 316 | 14,200 | 3 | 2 | 32 |
| Ferrovandium | 5,230 | 4,190 | 108,000 | 454 | 337 | 11,000 |
| Ferrozirconium | 6 | XX | 72 | 2,560 | XX | 6,420 |
| Ferroalloys, other | 8,160 | XX | 32,200 | 3,240 | XX | 7,900 |
| Total | 81,500 | 21,800 | 873,000 | 12,300 | 1,520 | 86,900 |
| Total ferroalloys | 1,610,000 | 1,040,000 | 2,880,000 | 49,400 | 16,300 | 143,000 |
| Metals: | | | | | | |
| Chromium (total, all grades) | 15,300 | XX | 203,000 | 462 | XX | 13,000 |
| Manganese: | | | | | | |
| Metal, including alloys and waste and scrap | XX | XX | XX | 2,580 | XX | 7,510 |
| Unwrought | 43,300 | XX | 125,000 | XX | XX | XX |
| Other manganese, wrought | 55 | XX | 457 | XX | XX | XX |
| Silicon: | | | | | | |
| Less than 99% silicon | 25,400 | 24,900 | 67,500 | 10,900 | 10,200 | 37,300 |
| Less than 99.99% but not less 99% silicon | 109,000 | 109,000 | 328,000 | 9,700 | 9,300 | 27,000 |
| More than 99.99% silicon | 2,580 | XX | 157,000 | 55,600 | XX | 1,840,000 |
| Total metals | 196,000 | 133,000 | 881,000 | 79,200 | 19,500 | 1,920,000 |
| Grand total | 1,800,000 | 1,180,000 | 3,760,000 | 129,000 | 35,900 | 2,070,000 |

XX Not applicable.

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

²Includes less than 55% silicon and 55% to 80% silicon, other.

³Includes imports of ferrosilicon containing 80% to 90% silicon and more than 90% silicon.

Source: U.S. Census Bureau.

TABLE 7
FERROALLOYS: WORLD PRODUCTION, BY COUNTRY, FURNACE TYPE, AND ALLOY TYPE¹

(Metric tons, gross weight)

| Country, furnace type, and alloy type ² | 2008 | 2009 | 2010 | 2011 | 2012 ^e |
|---|----------------------|----------------------|----------------------|------------------------|------------------------|
| Albania, electric furnace, ferrochromium | 11,916 | 7,556 | 23,233 ^r | 28,694 ^r | 29,000 |
| Argentina, electric furnace: ^c | | | | | |
| Ferrosilicon | 10,400 | 11,300 | 11,000 | 11,000 | 11,000 |
| Silicomanganese | 9,172 ³ | 6,644 ³ | 10,900 | 11,000 ^r | 11,000 |
| Total | 19,600 | 17,900 | 21,900 | 22,000 ^r | 22,000 |
| Armenia, electric furnace, ferromolybdenum | 5,325 | 5,144 | 5,126 | 5,525 ^r | 5,600 |
| Australia, electric furnace: ^c | | | | | |
| Ferromanganese | 147,000 | 87,000 | 136,000 | 146,000 | 102,000 |
| Silicomanganese | 125,000 | 74,000 | 131,000 | 130,000 | 96,000 |
| Silicon metal | 35,000 | 30,000 | 30,000 | 30,000 | 30,000 |
| Total | 307,000 | 191,000 | 297,000 | 306,000 | 228,000 |
| Austria, electric furnace: | | | | | |
| Ferronickel, including ferronickel molybdenum ^c | 1,250 ^r | 1,750 | 1,500 | 1,750 ^r | 2,000 |
| Other | 305,750 ^r | 586,250 ^r | 635,500 ^r | 648,250 ^r | 598,000 |
| Total ^c | 307,000 ^r | 588,000 ^r | 637,000 ^r | 650,000 ^r | 600,000 |
| Bahrain, electric furnace: ⁴ | | | | | |
| Ferromanganese | -- | 5,700 | 5,600 | 35,300 | 35,100 |
| Silicomanganese | -- | 6,500 | 3,700 | 3,000 | 3,000 |
| Total | -- | 12,200 | 9,300 | 38,300 | 38,100 |
| Bhutan, electric furnace, ferrosilicon, exports | 30,824 | 90,798 | 97,528 | 94,000 | 94,000 |
| Bosnia and Herzegovina, electric furnace, net exports: ^c | | | | | |
| Ferrosilicon | 640 | 470 | 870 | 1,800 | -- |
| Silicon metal | 12,400 | 11,000 | 17,300 | 17,500 | 15,900 |
| Total | 13,000 | 11,500 | 18,200 | 19,300 | 15,900 |
| Brazil, electric furnace: | | | | | |
| Ferrochromium ⁵ | 194,324 | 131,048 | 277,114 | 145,122 ^r | 150,000 ^p |
| Ferrochromium silicon | 11,507 | 11,510 | 11,600 | 11,700 ^e | 11,700 |
| Ferromanganese ^c | 155,000 ^r | 42,300 ^r | 92,000 ^r | 88,000 ^r | 96,000 ^p |
| Ferronickel | 36,544 | 37,708 | 33,860 | 67,000 ^r | 135,400 ^{p,3} |
| Ferroniobium (ferrocolumbium) | 53,839 | 34,746 | 52,588 | 52,600 | 52,600 |
| Ferrosilicon ^c | 144,832 ³ | 145,000 | 145,000 | 145,000 | 145,000 |
| Ferrotitanium | 4,002 | 482 | 806 ^r | 59 ^r | 105 ^p |
| Silicomanganese ^c | 233,000 ^r | 112,000 ^r | 214,000 ^r | 227,000 ^r | 219,000 ^p |
| Silicon metal ^c | 131,940 ³ | 132,000 | 132,000 | 132,000 ^r | 133,000 |
| Other ^e | 19,344 ³ | 19,350 ³ | 19,400 | 19,500 | 19,500 |
| Total ^c | 984,000 | 666,000 | 978,000 ^r | 888,000 ^r | 962,000 |
| Bulgaria, electric furnace, ferrosilicon ^c | 6,000 ³ | 3,000 ³ | -- | -- | -- |
| Canada, electric furnace: ^c | | | | | |
| Ferroniobium (ferrocolumbium) | 7,000 ^r | 7,000 ^r | 7,000 ^r | 8,000 ^r | 8,000 |
| Ferrosilicon | 35,000 | 25,820 ³ | 36,786 ³ | 31,039 ³ | 31,979 ³ |
| Ferrovandium | 1,000 | 900 | 900 | 900 | 800 |
| Silicon metal | 50,000 | 30,000 | 30,000 | 30,000 | 35,000 |
| Total | 93,000 ^r | 63,700 ^r | 74,700 ^r | 69,900 ^r | 75,800 |
| Chile, electric furnace, ferromolybdenum | 16,918 | 10,820 | 12,485 | 17,177 | 15,000 |
| China: ^c | | | | | |
| Blast furnace: | | | | | |
| Ferromanganese | 600,000 | 350,000 | 350,000 | 350,000 | 350,000 |
| Other | 50,000 | 30,000 | 30,000 | -- ^r | -- |
| Electric furnace: | | | | | |
| Ferrochromium | 1,500,000 | 1,810,000 | 2,400,000 | 2,700,000 ^r | 2,800,000 |
| Ferromanganese | 2,100,000 | 2,070,000 | 2,300,000 | 2,600,000 ^r | 2,800,000 |
| Ferromolybdenum | 80,000 | 90,000 | 90,000 | 53,000 ^r | 80,000 |
| Ferronickel and high nickel pig iron | 590,000 | 600,000 | 900,000 | 1,280,000 ^r | 1,400,000 |
| Ferrosilicon | 4,900,000 | 5,100,000 | 5,300,000 | 5,400,000 | 5,500,000 |
| Ferrotitanium | 14,000 | 300 | 5,600 | 5,000 | 5,000 |

See footnotes at end of table.

TABLE 7—Continued
FERROALLOYS: WORLD PRODUCTION, BY COUNTRY, FURNACE TYPE, AND ALLOY TYPE¹

(Metric tons, gross weight)

| Country, furnace type, and alloy type ² | 2008 | 2009 | 2010 | 2011 | 2012 ^e |
|---|-------------------------|--------------------------|--------------------------|--------------------------|-----------------------|
| China—Continued: ^c | | | | | |
| Electric furnace—Continued: | | | | | |
| Silicomanganese | 5,000,000 | 5,430,000 | 5,840,000 | 6,700,000 ^f | 6,900,000 |
| Silicon metal | 1,100,000 ^f | 993,000 ^f | 1,140,000 ^f | 1,050,000 ^f | 1,500,000 |
| Other | 3,230,000 | 6,620,000 | 7,600,000 | 8,000,000 | 7,000,000 |
| Total, blast and electric furnaces | 19,200,000 ^f | 23,100,000 ^f | 26,000,000 ^f | 28,100,000 ^f | 28,300,000 |
| Colombia, electric furnace, ferronickel | 126,638 | 153,628 | 145,239 | 103,371 ^f | 127,509 ³ |
| Czech Republic, electric furnace, other ^e | 2,800 | -- | -- | -- | -- |
| Dominican Republic, electric furnace, ferronickel | 47,408 | -- | -- | 34,610 | 38,938 ³ |
| Egypt, electric furnace: ^c | | | | | |
| Ferromanganese ⁴ | 28,800 ³ | 26,300 ³ | 20,000 ³ | 30,000 | 30,000 |
| Ferrosilicon | 59,000 | 78,000 | 78,000 | 78,000 | 78,000 |
| Total | 87,800 | 104,000 | 98,000 | 108,000 | 108,000 |
| Finland, electric furnace, ferrochromium ^e | 233,550 ³ | 123,310 ³ | 125,000 | 125,000 | 125,000 |
| France, electric furnace: | | | | | |
| Ferromanganese ⁴ | 46,600 | 46,000 | 138,100 | 130,500 | 101,000 |
| Ferrosilicon ^c | 30,000 | 18,300 | 27,000 | 59,000 | 71,000 |
| Silicomanganese ⁴ | 60,200 | 54,100 | 62,400 | 63,400 | 68,500 |
| Silicon metal ^e | 118,000 | 80,000 | 112,000 | 128,000 | 130,000 |
| Other ^e | 60,000 | 60,000 | 60,000 | 60,000 | 60,000 |
| Total ^c | 315,000 | 258,000 | 400,000 | 441,000 | 431,000 |
| Georgia, electric furnace: | | | | | |
| Ferromanganese | 11,342 ^f | 1,838 ^f | 824 ^f | -- ^f | -- |
| Silicomanganese | 113,455 ^f | 112,016 | 203,464 | 242,746 ^f | 257,421 ³ |
| Total | 124,797 ^f | 113,854 ^f | 204,288 ^f | 242,746 ^f | 257,421 ³ |
| Germany, electric furnace: | | | | | |
| Ferrochromium ^{e,5} | 26,960 ³ | 13,667 ³ | 17,300 | 17,800 | 17,500 |
| Silicon metal | 29,092 | 27,620 | 30,105 | 30,134 | 30,000 |
| Other ^e | 5,000 | 6,336 ³ | 9,200 | 9,000 | 9,000 |
| Total ^c | 61,100 | 47,623 ³ | 56,600 | 56,900 | 56,500 |
| Greece, electric furnace, ferronickel | 87,664 | 42,423 | 69,596 ^f | 93,905 ^f | 96,435 ^{p,3} |
| Iceland, electric furnace, ferrosilicon | 107,882 ^f | 112,993 | 114,231 | 120,076 | 115,000 |
| India, electric furnace: ^{e,6} | | | | | |
| Ferroaluminum | 8,170 ³ | 7,017 ³ | 7,000 | 7,000 | 7,100 |
| Ferroboron | 83 | 90 ³ | 95 | 98 | 95 |
| Ferrochromium ⁵ | 750,000 ³ | 873,385 ³ | 850,000 | 830,000 | 800,000 |
| Ferromanganese ⁴ | 386,200 ³ | 399,100 ³ | 413,000 ^f | 420,000 ^f | 463,900 |
| Ferromolybdenum | 2,162 ³ | 2,822 ³ | 3,000 | 3,200 | 3,100 |
| Ferronickel magnesium | 221 ³ | 209 ³ | 229 ^{f,3} | 255 ^{f,3} | 272 |
| Ferrosilicomagnesium | 13,400 ³ | 17,342 ³ | 17,000 | 18,000 | 18,000 |
| Ferrosilicon | 92,000 | 101,337 ³ | 101,000 | 105,000 | 108,000 |
| Ferrosilicözirconium | 87 ³ | 120 ³ | 150 | 170 | 180 |
| Ferrotitanium | 1,661 ³ | 2,379 ³ | 2,200 | 2,300 | 2,400 |
| Ferrotungsten | 150 ³ | 150 ³ | 150 ^{f,3} | 225 ^{f,3} | 230 |
| Ferrovanadium | 1,501 ³ | 1,769 ³ | 1,800 | 1,850 | 1,900 |
| Silicomanganese ⁴ | 848,700 ^{f,3} | 875,500 ³ | 1,170,000 ^{f,3} | 1,433,600 ^{f,3} | 1,522,600 |
| Total | 2,104,335 ^f | 2,281,220 ^{f,3} | 2,570,000 ^f | 2,820,000 ^f | 2,930,000 |
| Indonesia, electric furnace: ^c | | | | | |
| Ferromanganese | 12,000 | 12,000 | 12,000 | 12,000 | 13,000 |
| Ferronickel | 87,800 ³ | 62,700 ³ | 93,300 ³ | 98,200 | 91,500 |
| Silicomanganese | 7,000 | 7,000 | 8,000 | 8,000 | 9,000 |
| Total | 107,000 | 81,700 | 113,000 | 118,000 | 114,000 |

See footnotes at end of table.

TABLE 7—Continued
FERROALLOYS: WORLD PRODUCTION, BY COUNTRY, FURNACE TYPE, AND ALLOY TYPE¹

(Metric tons, gross weight)

| Country, furnace type, and alloy type ² | 2008 | 2009 | 2010 | 2011 | 2012 ^e |
|---|------------------------|------------------------|------------------------|------------------------|------------------------|
| Iran, electric furnace: | | | | | |
| Ferrochromium | NA ^r | NA ^r | NA ^r | NA ^r | NA |
| Ferrosilicon | NA ^r | NA ^r | NA ^r | NA ^r | NA |
| Total | NA ^r | NA ^r | NA ^r | NA ^r | NA |
| Italy, electric furnace: | | | | | |
| Ferromanganese ⁴ | 8,500 | 5,500 | 17,000 | 18,000 | 18,000 |
| Silicomanganese ⁴ | 25,500 | 17,000 | 22,900 | 24,600 | 42,000 |
| Other, excluding calcium-silicon ^c | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| Total ^c | 44,000 | 32,500 | 49,900 | 52,600 | 70,000 |
| Japan, electric furnace: | | | | | |
| Ferrochromium ⁷ | 13,888 | 7,698 | 16,208 | 17,217 ^r | 18,000 |
| Ferromanganese | 431,181 | 361,375 | 453,265 | 456,798 | 436,171 ³ |
| Ferromolybdenum | 4,554 | 3,598 | 4,615 | 5,167 ^r | 5,200 |
| Ferronickel | 301,361 | 284,884 | 348,420 | 279,944 ^r | 371,913 ³ |
| Ferrovandium | 3,477 | 2,560 | 4,190 | 3,980 ^r | 4,000 |
| Silicomanganese | 58,884 | 49,205 | 49,865 | 49,798 ^r | 52,287 ³ |
| Other | 14,478 | 12,957 | 16,374 | 20,913 ^r | 21,000 |
| Total | 827,823 | 722,277 | 892,937 | 833,817 ^r | 909,000 |
| Kazakhstan, electric furnace: | | | | | |
| Ferrochromium | 1,220,315 | 1,173,286 | 1,311,302 | 1,289,917 ^r | 1,305,566 ³ |
| Ferrochromium silicon | 133,828 | 60,829 | 159,765 | 143,296 ^r | 164,854 ³ |
| Ferrosilicon | 54,964 | 33,100 | 4,813 | 1,683 ^r | 496 ³ |
| Silicomanganese | 179,939 | 200,374 | 224,627 | 232,039 ^r | 251,445 ³ |
| Silicon metal | -- | -- | 1,500 | 8,000 | 18,000 ³ |
| Other | 1,473 | 1,205 | 1,283 | 1,754 | 1,845 ³ |
| Total | 1,590,519 ^r | 1,468,794 ^r | 1,703,290 ^r | 1,676,689 ^r | 1,742,206 ³ |
| Korea, North, electric furnace, other | | | | | |
| | NA ^r | NA ^r | NA ^r | NA ^r | NA |
| Korea, Republic of, electric furnace: | | | | | |
| Ferromanganese | 251,125 | 216,400 | 286,259 | 355,047 | 364,800 |
| Ferronickel | 6,600 | 56,911 | 55,215 | 50,069 | 51,300 ³ |
| Silicomanganese | 76,184 | 151,100 ⁴ | 120,779 | 195,650 | 184,700 ⁴ |
| Other | 4,000 ^e | -- | -- | -- | -- |
| Total | 338,000 ^e | 424,411 | 462,253 | 600,766 | 601,000 |
| Kosovo, ferronickel | | | | | |
| | 24,300 | 47,900 ^r | 41,300 ^r | 35,100 ^r | 20,100 |
| Laos, silicon metal, net exports^c | | | | | |
| | 3,020 | 7,350 | 7,770 | 3,001 ^r | 15,281 ³ |
| Macedonia, electric furnace: | | | | | |
| Ferromanganese | 12,623 | -- | -- | -- | -- |
| Ferronickel | 65,300 | 52,200 | 62,700 ^r | 75,200 ^r | 83,700 ³ |
| Ferrosilicon | 42,674 | 7,657 | 30,044 | 56,167 | 42,402 ³ |
| Silicomanganese | 54,931 | -- | 36,705 | 50,756 | 14,179 ³ |
| Total | 175,528 ^r | 59,857 ^r | 129,449 ^r | 182,123 ^r | 140,281 ³ |
| Mexico, electric furnace:⁴ | | | | | |
| Ferromanganese | 97,366 | 42,492 | 81,019 ^r | 73,684 ^r | 61,939 ³ |
| Silicomanganese | 114,320 | 85,065 | 134,470 ^r | 139,044 ^r | 161,336 ³ |
| Total | 211,686 | 127,557 | 215,489 ^r | 212,728 ^r | 223,275 ³ |
| New Caledonia, electric furnace, ferronickel | | | | | |
| | 123,600 ^r | 126,100 ^r | 131,300 ^r | 132,100 ^r | 142,000 |
| Norway, electric furnace: | | | | | |
| Ferromanganese ⁴ | 308,400 | 196,700 | 297,300 | 337,900 | 325,900 ³ |
| Ferrosilicon | 185,344 ^r | 233,974 ^r | 225,000 ^r | 170,102 ^r | 220,000 |
| Silicomanganese ⁴ | 262,400 | 231,300 | 248,700 | 266,000 | 271,400 ³ |
| Silicon metal ^c | 155,000 ^r | 150,000 ^r | 175,000 ^r | 175,000 ^r | 150,000 |
| Total ^c | 911,000 ^r | 812,000 ^r | 946,000 ^r | 949,000 ^r | 970,000 |
| Peru, electric furnace, ferrosilicon^c | | | | | |
| | 600 | 600 | 600 | 600 | 600 |

See footnotes at end of table.

TABLE 7—Continued
FERROALLOYS: WORLD PRODUCTION, BY COUNTRY, FURNACE TYPE, AND ALLOY TYPE¹

(Metric tons, gross weight)

| Country, furnace type, and alloy type ² | 2008 | 2009 | 2010 | 2011 | 2012 ^e |
|--|------------------------------|------------------------------|------------------------------|------------------------------|---------------------------|
| Poland: | | | | | |
| Blast furnace, ferromanganese | 8,500 | 1,700 | 800 ^r | 800 ^{r,e} | 800 |
| Electric furnace: | | | | | |
| Ferrosilicon | 56,031 | 9,685 | 53,206 | 72,668 ^r | 73,000 |
| Silicomanganese | 25,100 | -- | 100 ^r | 100 ^{r,e} | 100 |
| Total, blast and electric furnaces | 89,631 | 11,385 | 54,106^r | 73,600^{r,e} | 73,900 |
| Romania, electric furnace: | | | | | |
| Ferrochromium | 6,000 | 15,000 | 14,000 | -- | -- |
| Silicomanganese ^e | 10,000 | -- | 20,000 ^r | 31,000 ^r | 16,500 |
| Total^c | 16,000 | 15,000 | 34,000^r | 31,000^r | 16,500 |
| Russia:^e | | | | | |
| Blast furnace: | | | | | |
| Ferromanganese | 110,000 | 88,000 ³ | 171,600 ³ | 146,000 ^r | 165,000 |
| Ferrophosphorus | 3,500 | 3,000 | 3,600 | 3,600 | 3,600 |
| Spiegeleisen | 7,000 | 6,500 | 5,500 | 6,000 ^r | 6,000 |
| Electric furnace: | | | | | |
| Ferrochromium | 490,000 | 378,000 ³ | 414,288 ^{r,3} | 501,700 ^{r,3} | 500,000 |
| Ferrochromium silicon | 4,000 | 3,500 | 4,200 ^r | 4,200 ^r | 4,200 |
| Ferronickel: | | | | | |
| High-nickel ^{3,8} | 17,971 | 18,312 ^r | 19,763 | 19,881 | 11,529 |
| Other ^e | 13,440 | 14,040 | 14,600 | 14,700 ^r | 8,520 |
| Ferriobium (ferrocolumbium) | 80 | 79 | 80 | 80 | 80 |
| Ferrosilicon | 850,000 | 745,000 | 916,000 | 1,030,000 ^r | 1,050,000 |
| Ferrotitanium | NA | NA | 4,000 | 4,000 | 4,000 |
| Ferrovandium | 12,000 | 8,029 ³ | 13,057 ³ | 13,500 | 13,500 |
| Silicomanganese | 40,000 | 98,700 ³ | 147,900 ³ | 150,000 | 160,000 |
| Silicon metal | 54,000 | 23,900 | 48,700 | 52,000 ^r | 52,000 |
| Other | 22,000 | 20,000 | 18,000 | 18,000 ^r | 18,000 |
| Total, blast and electric furnaces | 1,620,000 | 1,410,000 | 1,780,000 | 1,960,000^r | 2,000,000 |
| Saudi Arabia, electric furnace: | | | | | |
| Ferromanganese ⁴ | 38,500 | 37,500 | 26,000 | 26,000 | 26,000 |
| Silicomanganese ⁴ | 57,700 | 60,000 | 61,300 | 96,000 | 80,000 |
| Other ^e | 90,000 | 80,000 | 90,000 | 90,000 | 90,000 |
| Total^c | 186,000 | 178,000 | 177,000 | 212,000 | 196,000 |
| Slovakia, electric furnace: | | | | | |
| Ferromanganese | 61,194 | 21,000 | 35,449 | 18,180 | 12,862 ³ |
| Ferrosilicon | 10,844 | 8,622 | 37,034 | 38,771 | 24,658 ³ |
| Silicomanganese | 59,940 | 32,000 | 34,960 | 25,023 | 50,089 ³ |
| Total | 131,978 | 61,622 | 107,443 | 81,974 | 87,609³ |
| South Africa, electric furnace: | | | | | |
| Ferrochromium | 3,268,659 | 2,346,132 | 3,607,132 | 3,425,911 ^r | 3,000,000 |
| Ferromanganese | 503,000 | 273,000 ^r | 473,000 ^r | 714,000 ^r | 730,000 ³ |
| Ferronickel, high-nickel | 5,733 | 1,067 | 1,040 | 975 ^{r,e} | 940 |
| Ferrosilicon | 134,500 ^r | 110,400 ^r | 127,500 ^r | 124,300 ^r | 120,000 |
| Ferrovandium ^c | 19,000 | 14,000 | 19,000 | 19,000 ^r | 17,000 |
| Silicomanganese ⁴ | 237,100 | 135,100 | 274,400 | 313,600 | 148,800 ³ |
| Silicon metal | 51,800 ^r | 38,600 ^r | 46,400 ^r | 58,800 ^r | 55,000 |
| Total^c | 4,220,000^r | 2,920,000^r | 4,550,000^r | 4,660,000^r | 4,070,000 |
| Spain, electric furnace:^c | | | | | |
| Ferromanganese | 148,000 ^{r,3} | 23,400 ^{r,3} | 102,200 ^{r,3} | 92,100 ^{r,3} | 80,200 |
| Ferrosilicon | 74,000 | 44,000 | 64,400 | 57,000 | 42,000 |
| Silicomanganese | 111,400 ^{r,3} | 64,100 ^{r,3} | 134,200 ^{r,3} | 142,300 ^{r,3} | 148,100 |
| Silicon metal | 33,000 | 23,000 | 32,500 | 43,000 | 62,000 |
| Other | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 |
| Total | 371,000^r | 160,000^r | 338,000^r | 339,000^r | 337,000 |

See footnotes at end of table.

TABLE 7—Continued
FERROALLOYS: WORLD PRODUCTION, BY COUNTRY, FURNACE TYPE, AND ALLOY TYPE¹

(Metric tons, gross weight)

| Country, furnace type, and alloy type ² | 2008 | 2009 | 2010 | 2011 | 2012 ^e |
|---|--------------------------------|--------------------------------|--------------------------------|--------------------------------|------------------------|
| Sweden, electric furnace:^e | | | | | |
| Ferrochromium | 117,053 ³ | 31,345 ³ | 36,000 | 36,000 | 36,000 |
| Ferrosilicon | -- ^r | -- ^r | -- ^r | -- ^r | -- |
| Total | 117,053 ^{r,3} | 31,345 ^{r,3} | 36,000 ^r | 36,000 ^r | 36,000 |
| Turkey, electric furnace:^e | | | | | |
| Ferrochromium | 79,840 ³ | 41,028 ³ | 60,000 | 60,000 | 60,000 |
| Ferrosilicon | 4,500 | 4,000 | 4,000 | 4,000 | 4,000 |
| Total | 84,300 | 45,000 | 64,000 | 64,000 | 64,000 |
| Ukraine, electric furnace: | | | | | |
| Ferromanganese | 362,400 | 129,400 | 280,100 | 180,500 | 151,600 ³ |
| Ferronickel ³ | 89,825 | 61,449 | 102,940 ^r | 88,903 ^r | 119,652 |
| Ferrosilicon | 152,800 | 150,300 | 195,500 | 150,900 | 119,400 ³ |
| Silicomanganese | 894,900 | 741,900 | 940,400 | 843,500 | 724,600 ³ |
| Other ^e | 23,000 | 23,900 | 28,500 | 25,100 ^r | 25,000 |
| Total ^e | 1,520,000 | 1,110,000 | 1,550,000 | 1,290,000 ^r | 1,140,000 |
| United States, electric furnace:⁹ | | | | | |
| Ferrochromium ⁵ | W | W | -- | -- | -- |
| Ferrosilicon | 248,000 | 194,000 | 246,000 ^r | W | W |
| Other | W | W | W | W | W |
| Total | W | W | W | W | W |
| Uzbekistan, silicon metal | | | | | |
| | -- | -- | -- | -- | 1,700 |
| Venezuela, electric furnace:^e | | | | | |
| Ferromanganese ⁴ | 20,000 | 15,800 | 5,300 | 12,000 ³ | 9,000 ³ |
| Ferronickel | 42,300 | 40,113 | 45,200 | 51,800 | 31,300 |
| Ferrosilicon | 88,000 | 52,100 | 76,800 | 70,000 | 81,000 |
| Silicomanganese ⁴ | 52,000 | 45,800 | 16,500 | 24,000 ³ | 14,200 ³ |
| Total | 202,000 | 154,000 | 144,000 | 158,000 | 136,000 |
| Zimbabwe, electric furnace: | | | | | |
| Ferrochromium | 145,430 | 72,223 | 146,000 ^e | 140,000 ^e | 137,534 ^{p,3} |
| Ferrochromium silicon | 1,612 | 603 | -- | -- | -- |
| Total | 147,042 | 72,826 | 146,000 ^e | 140,000 ^e | 137,534 ^{p,3} |
| Grand total | 37,600,000 ^r | 38,300,000 ^r | 45,800,000 ^r | 48,300,000 ^r | 47,900,000 |
| Of which: | | | | | |
| Blast furnace: | | | | | |
| Ferromanganese | 719,000 | 440,000 | 522,000 ^r | 497,000 ^r | 516,000 |
| Spiegeleisen | 7,000 | 6,500 | 5,500 | 6,000 ^r | 6,000 |
| Other | 53,500 | 33,000 | 33,600 | 3,600 ^r | 3,600 |
| Electric furnace: | | | | | |
| Ferrochromium ⁷ | 8,060,000 ^r | 7,020,000 ^r | 9,300,000 ^r | 9,320,000 ^r | 8,980,000 |
| Ferrochromium silicon | 151,000 | 76,400 | 176,000 ^r | 159,000 ^r | 181,000 |
| Ferromanganese | 5,130,000 ^r | 4,010,000 ^r | 5,170,000 ^r | 5,750,000 ^r | 5,860,000 |
| Ferromolybdenum | 109,000 | 112,000 | 115,000 | 84,100 ^r | 109,000 |
| Ferronickel ⁸ | 1,670,000 ^r | 1,600,000 ^r | 2,070,000 ^r | 2,430,000 ^r | 2,730,000 |
| Ferroniobium (ferrocolumbium) | 60,900 ^r | 41,800 ^r | 59,700 ^r | 60,700 ^r | 60,700 |
| Ferrosilicon | 7,320,000 ^r | 7,280,000 ^r | 7,890,000 ^r | 7,820,000 ^r | 7,930,000 |
| Ferrovandium ^e | 37,000 | 27,300 | 38,900 | 39,200 ^r | 37,200 |
| Silicomanganese | 8,660,000 ^r | 8,590,000 ^r | 10,100,000 ^r | 11,400,000 ^r | 11,400,000 |
| Silicon metal | 1,770,000 ^r | 1,550,000 ^r | 1,800,000 ^r | 1,760,000 ^r | 2,230,000 |
| Other ¹⁰ | 3,830,000 ^r | 7,470,000 ^r | 8,530,000 ^r | 8,940,000 ^r | 7,890,000 |

^eEstimated. ^pPreliminary. ^rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. -- Zero.

¹World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown. Includes data available through March 4, 2015.

²To the extent possible, ferroalloy production of each country shown has been separated according to the furnace from which production is obtained; production derived from metallothermic operation is included with electric furnace production. Ferroalloys may be produced in other countries, but production information is inadequate for the formulation of estimates of output levels.

³Reported figure.

TABLE 7—Continued
FERROALLOYS: WORLD PRODUCTION, BY COUNTRY, FURNACE TYPE, AND ALLOY TYPE¹

⁴Reported by the International Manganese Institute.

⁵Includes high- and low-carbon ferrochromium.

⁶Reported on a fiscal year basis, which is from April 1 to March 31.

⁷Includes high- and low-carbon ferrochromium and ferrochromium silicon.

⁸May contain low-iron ferronickel containing greater than 85% nickel.

⁹U.S. production includes ferrochromium (before 2010), ferromanganese (including silicomanganese), ferromolybdenum, ferroniobium, ferrosilicon, ferrotitanium, ferrovanadium, and silicon metal; data for ferrochromium, ferromanganese (including silicomanganese), and silicon metal are excluded from “Grand total.”

¹⁰May include ferroboron, ferrocolumbium, ferrophosphorus, ferrotitanium, nickel columbium, and silvery pig iron.