

SILICON

(Data in thousand metric tons of silicon content unless otherwise noted)

Domestic Production and Use: Estimated value of silicon alloys produced in the United States in 2010 was \$770 million. Three companies produced silicon materials in seven plants. Of those companies, two produced ferrosilicon in four plants. Metallurgical-grade silicon metal was produced by two companies in four plants. One of the three companies produced both products at two plants. All of the ferrosilicon and silicon metal plants were east of the Mississippi River. Most ferrosilicon was consumed in the ferrous foundry and steel industries, predominantly in the eastern United States. The main consumers of silicon metal were producers of aluminum and aluminum alloys and the chemical industry. The semiconductor and solar industries, which manufacture chips for computers and photovoltaic cells from high-purity silicon, respectively, accounted for only a small percentage of silicon demand.

Salient Statistics—United States:	2006	2007	2008	2009	2010^e
Production:					
Ferrosilicon, all grades ¹	146	155	178	139	170
Silicon metal ²	W	W	W	W	W
Imports for consumption:					
Ferrosilicon, all grades ¹	223	208	190	70	150
Silicon metal	146	147	168	113	130
Exports:					
Ferrosilicon, all grades ¹	5	7	10	9	15
Silicon metal	27	28	35	38	42
Consumption, apparent:					
Ferrosilicon, all grades ¹	363	359	350	217	290
Silicon metal ²	W	W	W	W	W
Price, ³ average, cents per pound Si:					
Ferrosilicon, 50% Si	62.9	74.0	116	76.9	110
Ferrosilicon, 75% Si	54.9	65.6	109	68.9	110
Silicon metal ²	79.3	113	162	116	140
Stocks, producer, yearend:					
Ferrosilicon, all grades ¹	16	14	21	4	13
Silicon metal ²	W	W	W	W	W
Net import reliance ⁴ as a percentage of apparent consumption:					
Ferrosilicon, all grades ¹	59	58	49	36	44
Silicon metal ²	<50	<50	<50	<50	<50

Recycling: Insignificant.

Import Sources (2006–09): Ferrosilicon: China, 46%; Russia, 24%; Venezuela, 14%; Canada, 9%; and other, 7%. Silicon metal: Brazil, 44%; South Africa, 28%; Canada, 17%; Australia, 10%; and other, 1%. Total: China, 26%; Brazil, 21%; Norway, 13%; Russia, 13%; and other, 27%.

Tariff: Item	Number	Normal Trade Relations 12-31-10
Silicon, more than 99.99% Si	2804.61.0000	Free.
Silicon, 99.00%–99.99% Si	2804.69.1000	5.3% ad val.
Silicon, other	2804.69.5000	5.5% ad val.
Ferrosilicon, 55%–80% Si:		
More than 3% Ca	7202.21.1000	1.1% ad val.
Other	7202.21.5000	1.5% ad val.
Ferrosilicon, 80%–90% Si	7202.21.7500	1.9% ad val.
Ferrosilicon, more than 90% Si	7202.21.9000	5.8% ad val.
Ferrosilicon, other:		
More than 2% Mg	7202.29.0010	Free.
Other	7202.29.0050	Free.

Depletion Allowance: Quartzite, 14% (Domestic and foreign); gravel, 5% (Domestic and foreign).

Government Stockpile: None.

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Events, Trends, and Issues: The global economic recovery, as measured by the expansion of global gross domestic product (estimated 2.7% increase from that of 2009 by the World Bank), coincided with growth in the silicon market during 2010. Domestic ferrosilicon production in 2010, expressed in terms of contained silicon, was expected to be 22% greater than that of 2009. Greater domestic production, along with a doubling of ferrosilicon imports from those in 2009, increased U.S. ferrosilicon apparent consumption by 38%. This was in line with the projected 38% increase in domestic steel production in 2010 compared with that in 2009. Annual average U.S. spot market prices also significantly rose in 2010 from those of 2009, as silicon material suppliers increased output to meet consumers' needs.

Demand for silicon metal comes primarily from the aluminum and chemical industries. Domestic secondary aluminum production—the primary materials source for aluminum-silicon alloys—was projected to decrease by 6% in 2010 compared with that in 2009. However, domestic chemical production was projected to increase by 3% in 2010.

World production of silicon materials increased in 2010 compared with that in 2009, mainly as a result of restarting ferrosilicon smelters that had been shut down at the end of 2008 and in 2009. One ferrosilicon plant in the Inner Mongolia Autonomous Region of China added about 320,000 tons of production capacity in 2009 and 2010, making it the largest plant of its kind at 650,000 tons of capacity. Other ferrosilicon plant expansions took place in Brazil, China, and Russia.

World Production and Reserves:

	Production ^{e, 5}		Reserves ⁶
	2009	2010	
United States ⁷	139	170	The reserves in most major producing countries are ample in relation to demand. Quantitative estimates are not available.
Brazil	224	240	
Canada	53	59	
China	4,310	4,600	
France	66	69	
Iceland	81	93	
India ⁷	59	68	
Norway	301	330	
Russia	537	610	
South Africa	116	130	
Ukraine ⁷	98	120	
Venezuela ⁷	54	62	
Other countries	266	290	
World total (rounded)	6,310	6,900	

Ferrosilicon accounts for about four-fifths of world silicon production (gross-weight basis). The leading countries, in descending order of production, for ferrosilicon production were China, Russia, India, the United States, and Norway, and for silicon metal production, the leading countries were China, Norway, Brazil, and Russia. China was by far the leading producer of both ferrosilicon (3,900,000 tons) and silicon metal (780,000 tons) in 2010.

World Resources: World and domestic resources for making silicon metal and alloys are abundant and, in most producing countries, adequate to supply world requirements for many decades. The source of the silicon is silica in various natural forms, such as quartzite.

Substitutes: Aluminum, silicon carbide, and silicomanganese can be substituted for ferrosilicon in some applications. Gallium arsenide and germanium are the principal substitutes for silicon in semiconductor and infrared applications.

^eEstimated. W Withheld to avoid disclosing company proprietary data.

¹Ferrosilicon grades include the two standard grades of ferrosilicon—50% and 75%—plus miscellaneous silicon alloys.

²Metallurgical-grade silicon metal.

³Based on U.S. dealer import price.

⁴Defined as imports – exports + adjustments for Government and industry stock changes.

⁵Production quantities are combined totals of estimated silicon content for ferrosilicon and silicon metal, as applicable, except as noted.

⁶See Appendix C for resource/reserve definitions and information concerning data sources.

⁷Ferrosilicon only.