

MAGNESIUM METAL¹

(Data in thousand metric tons unless otherwise noted)

Domestic Production and Use: In 2012, magnesium was produced by one company at a 63,500-ton-per-year plant in Utah by an electrolytic process that recovered magnesium from brines from the Great Salt Lake. Magnesium used as a constituent of aluminum-based alloys that were used for packaging, transportation, and other applications was the leading use for primary magnesium, accounting for 43% of primary metal use. Structural uses of magnesium (castings and wrought products) accounted for 40% of primary metal consumption. Desulfurization of iron and steel accounted for 11% of U.S. consumption of primary metal, and other uses were 6%.

Salient Statistics—United States:	2008	2009	2010	2011	2012^e
Production:					
Primary	W	W	W	W	W
Secondary (new and old scrap)	88	69	72	75	75
Imports for consumption	83	47	53	48	53
Exports	14	20	15	12	18
Consumption:					
Reported, primary	65	51	56	59	60
Apparent	² 130	³ 80	² 100	² 110	² 110
Price, yearend:					
U.S. spot Western, dollars per pound, average	3.15	2.30	2.43	2.13	2.20
China free market, dollars per metric ton, average	2,665	2,950	2,925	3,025	3,250
Stocks, producer and consumer, yearend	W	W	W	W	W
Employment, number ^e	400	400	400	400	400
Net import reliance ⁴ as a percentage of apparent consumption	50	33	38	33	31

Recycling: In 2012, about 24,000 tons of secondary production was recovered from old scrap.

Import Sources (2008–11): Israel, 32%; Canada, 25%; China, 13%; and other, 30%.

Tariff:	Item	Number	Normal Trade Relations
			12–31–12
	Unwrought metal	8104.11.0000	8.0% ad val.
	Unwrought alloys	8104.19.0000	6.5% ad val.
	Wrought metal	8104.90.0000	14.8¢/kg on Mg content + 3.5% ad val.

Depletion Allowance: Dolomite, 14% (Domestic and foreign); magnesium chloride (from brine wells), 5% (Domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: The U.S. Department of Commerce, International Trade Administration (ITA), revised the final results of its decision regarding imports of pure magnesium from a specific Chinese firm into the United States from May 1, 2006, through April 30, 2007, because the review was “tainted by fraud.” The ITA had originally calculated a dumping margin of 0.63% ad valorem, but amended the duty to 111.73% ad valorem. The U.S. Court of International Trade (CIT) denied an appeal from the U.S. magnesium producer that contested a 2011 decision by the U.S. International Trade Commission (ITC) to revoke antidumping duties on pure magnesium from Russia. In a 5-year sunset review of imports of magnesium from China and Russia, the ITC had determined that the duties on magnesium from China should be maintained, but the duties on magnesium from Russia should be discontinued. The U.S. producer challenged the ITC’s decision not to cumulate imports from China and Russia. The CIT determined that although there was some overlap in uses for the two different types of imports, the interchangeability was limited.

A U.S.-based aluminum and magnesium diecasting firm planned to add two new production lines at its Mexico, MO, facility by 2017 at a cost of \$12.5 million. One of the production lines would be to manufacture oil sumps and head covers for a German automobile manufacturer, and the other to make battery cases for a U.S. auto manufacturer’s electric vehicles. The firm also expected to increase production of parts for a Japanese auto manufacturer.

Production resumed at the primary magnesium plant in Perak, Malaysia, in mid-February after the plant had been shut down for maintenance in mid-2011. The plant was expected to produce at its full capacity of 15,000 tons per year by mid-2013.

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Construction of a new 10,000-ton-per-year primary magnesium plant in Gangneung, Gangwon Province, Republic of Korea, was completed in July, and, after trial production, the plant shipped its first magnesium ingot at the beginning of October. Magnesium produced at the new plant was projected to be supplied to a magnesium plate operation in Suncheon, Jeonnam Province, and to South Korean diecasting companies.

In Australia, the company that planned to construct a magnesium-from-coal-fly-ash plant would reduce the size of its proposed plant to 5,000 tons per year from 10,000 tons per year. This reduction in capacity would also reduce the capital cost to \$37 to \$42 million from \$106 million. Construction of the plant was scheduled to begin in Victoria in July 2013, with production to begin a year later.

According to the China Non-Ferrous Metals Industry Association, China's reported magnesium production was 322,000 tons in the first half of 2012, 8.5% lower than that in the first half of 2011. Forty-nine percent of the output was from Shaanxi Province, 33% from Shanxi Province, and 5% from Ningxia Province. Production has shifted from Shanxi Province to Shaanxi Province because of lower energy costs; in Shaanxi Province, magnesium production plants use residual gas from coking operations as a fuel source. Analysts estimated that the cost of magnesium production in Shaanxi Province was \$1,970 per ton compared with \$2,610 per ton in Shanxi Province.

Considerable research and development work is taking place to adapt magnesium and its alloys for new applications, including a new family of alloys that shows potential as a bioabsorbable material. Because they have properties close to those of bone, magnesium alloys show promise as medical orthopedic implants, and they could be used as vascular stents. A consortium from academia and private industry received \$2.7 million from the U.S. Department of Energy to develop a diecasting process to produce thin-walled magnesium alloy vehicle doors. This project was expected to develop an integrated supervacuum diecasting process using a new magnesium alloy to achieve a 50% energy savings compared to the multipiece, multistep, stamping and joining process currently used to manufacture car doors. By substituting magnesium for steel inner panels, car doors could weigh 60% less, resulting in fuel economy improvements and carbon emission savings. A U.S. auto manufacturer began testing a thermal forming process and a proprietary corrosion-resistance treatment that would enable magnesium alloy sheet to be used as a substitute for steel and aluminum in some automotive applications. The company planned to use the magnesium alloy sheet as a rear-deck inner-lid panel to reduce vehicle weight.

World Primary Production and Reserves:

	Primary production		Reserves ⁵
	2011	2012 ^e	
United States	W	W	Magnesium metal is derived from seawater, natural brines, dolomite, and other minerals. The reserves for this metal are sufficient to supply current and future requirements. To a limited degree, the existing natural brines may be considered to be a renewable resource wherein any magnesium removed by humans may be renewed by nature in a short span of time.
Brazil	16	16	
China	661	640	
Israel	30	30	
Kazakhstan	21	21	
Malaysia	2	5	
Russia	37	37	
Serbia	2	2	
Ukraine	2	2	
World total ⁶ (rounded)	771	750	

World Resources: Resources from which magnesium may be recovered range from large to virtually unlimited and are globally widespread. Resources of dolomite and magnesium-bearing evaporite minerals are enormous. Magnesium-bearing brines are estimated to constitute a resource in the billions of tons, and magnesium can be recovered from seawater at places along world coastlines.

Substitutes: Aluminum and zinc may substitute for magnesium in castings and wrought products. For iron and steel desulfurization, calcium carbide may be used instead of magnesium.

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

¹See also Magnesium Compounds.

²Rounded to two significant digits to protect proprietary data.

³Rounded to one significant digit to protect proprietary data.

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

⁵See Appendix C for resource/reserve definitions and information concerning data sources.

⁶Excludes U.S. production.