

MAGNESIUM METAL¹

(Data in thousand metric tons unless otherwise noted)

Domestic Production and Use: In 2015, primary magnesium was produced by one company in Utah at an electrolytic process plant that recovered magnesium from brines from the Great Salt Lake. Production in 2015 was estimated to have increased from that of 2014. Statistical information regarding U.S. magnesium metal production in 2015 was withheld to avoid disclosing company proprietary data. The leading use for primary magnesium metal, which accounted for 34% of apparent consumption, was in aluminum-base alloys that were used for packaging, transportation, and other applications. Use as a reducing agent for the production of titanium and other metals accounted for 30% of primary magnesium metal consumption. Structural uses of magnesium (castings and wrought products) accounted for 18% of primary metal consumption, desulfurization of iron and steel, 12%, and other uses, 6%. Secondary production accounted for about two-thirds of apparent consumption.

Salient Statistics—United States:	2011	2012	2013	2014	2015^e
Production:					
Primary	W	W	W	W	W
Secondary (new and old scrap)	67	77	79	79	80
Imports for consumption	48	51	46	52	47
Exports	12	18	16	17	16
Consumption:					
Reported, primary	81	72	69	66	70
Apparent ²	110	110	120	120	120
Price, yearend:					
U.S. spot Western, dollars per pound, average	2.13	2.20	2.13	2.15	2.15
China free market, dollars per metric ton, average	3,025	3,170	2,615	2,325	2,060
Stocks, producer and consumer, yearend	W	W	W	W	W
Employment, number ^e	400	420	420	420	420
Net import reliance ³ as a percentage of apparent consumption	33	29	27	29	26

Recycling: In 2015, about 25,000 tons of secondary magnesium was recovered from old scrap and 55,000 tons were recovered from new scrap. Aluminum-base alloys accounted for 77% of the secondary magnesium recovered. Magnesium chloride produced as a waste product of titanium sponge production at a plant in Utah is returned to the primary magnesium supplier where it is reduced to produce metallic magnesium; however, this metal is not included in the secondary magnesium statistics.

Import Sources (2011–14): Israel, 32%; Canada, 22%; China, 10%; Mexico, 6%; and others, 30%.

Tariff:	Item	Number	Normal Trade Relations
			12–31–15
	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 use of magnesium in automobile parts continued to increase as automobile manufacturers seek to decrease vehicle weight in order to comply with fuel-efficiency standards. A plant in Mexico, MO, which manufactures die-cast magnesium parts for the automotive industry, was expanded by about 30% and rampup was expected to be completed in early 2016.

Because many magnesium consumers were concerned about diversity of supply, several projects were under development to increase primary magnesium metal capacity. The sole U.S. primary magnesium producer was expanding capacity by 20%, and the expansion is scheduled to be completed in 2017, with incremental capacity to be ramped up in 2016. Another company was seeking financing for a proposed plant to produce magnesium from dolomite in Nevada. A preliminary economic assessment of the dolomite deposit was completed in 2012, but permits

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had not been issued for the project. Two companies proposed producing magnesium from asbestos tailings in Quebec, Canada. One of the companies was building a pilot plant to test its process and, if the process proves economically feasible, proposed to build a 50,000-ton-per-year plant. The other company was in the planning stage of its project. A company in Australia was conducting a feasibility study for a 5,000-ton-per-year plant to recover magnesium from coal fly ash.

In China, production during the first half of the year decreased owing to the shutdown of older, smaller producers that had higher costs. More magnesium capacity is expected to be shut down in China as the Government enforces environmental regulations on energy-intensive industries. However, new capacity for producing magnesium from lake brines and from dolomite in locations with lower energy costs, such as Shaanxi Province, was expected to result in an increase in China's magnesium production.

Consumption of magnesium in the production of titanium metal by the Kroll process was expected to increase with increased use of titanium in aerospace applications. The aerospace industry was also expected to directly consume more magnesium as regulators have approved the use of magnesium for seat frames. The substitution of steel by aluminum in automobiles was also expected to increase consumption of magnesium in aluminum alloys used in automobile sheet.

Development of alloys that are resistant to ignition was expected to increase magnesium consumption as a substitute for other metals. Magnesium alloyed with calcium, gadolinium, neodymium, or yttrium has been shown to have higher ignition temperatures, making it suitable for new applications. Magnesium has been prohibited from structural components in commercial aircraft because of its low ignition point. Protective coatings to prevent corrosion of magnesium, especially when in contact with other metals, were also being developed to enable substitution for other materials in several applications.

World Primary Production and Reserves:

	Primary production		Reserves ⁴
	2014	2015 ^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.
Brazil	16	16	
China	874	800	
Israel	26	25	
Kazakhstan	20	20	
Korea, Republic of	10	10	
Malaysia	—	—	
Russia	18	30	
Serbia	2	2	
Ukraine	7	9	
World total ⁵ (rounded)	970	910	

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 could be recovered from seawater 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. The relatively light weight of magnesium is an advantage over aluminum and zinc in castings and wrought products; however, its high cost is a disadvantage relative to these substitutes. Magnesium is preferred to calcium carbide for desulfurization of iron and steel because calcium carbide produces acetylene in the presence of water.

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

¹See also Magnesium Compounds.

²Rounded to two significant digits to protect proprietary data.

³Defined as imports – exports.

⁴See [Appendix C](#) for resource/reserve definitions and information concerning data sources.

⁵Excludes U.S. production.