MAGNESIUM METAL[1]

(Data in thousand metric tons unless otherwise noted)

Domestic Production and Use: In 2016, 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 2016 was estimated to have increased from that of 2015. Information regarding U.S. magnesium metal production was withheld to avoid disclosing company proprietary data. The leading use for primary magnesium metal, which accounted for 33% of reported primary consumption, was as a reducing agent for the production of titanium and other metals. Use in aluminum-base alloys that were used for packaging, transportation, and other applications 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, 14%, and other uses, 5%. About 70% of the secondary magnesium consumed was used in aluminum alloys and about 30% of the secondary magnesium was consumed for structural uses.

Salient Statistics—United States:	**2012**	**2013**	**2014**	**2015**	**2016[e]**
Production:					
Primary	W	W	W	W	W
Secondary (new and old scrap)	77	79	80	80	91
Imports for consumption	51	46	55	54	50
Exports	18	16	17	15	15
Consumption:					
Reported, primary	72	69	66	65	74
Apparent	W	W	W	W	W
Price, yearend:					
U.S. spot Western, dollars per pound, average	2.20	2.13	2.15	2.15	2.15
China free market, dollars per metric ton, average	3,170	2,615	2,325	1,825	2,400
Stocks, producer and consumer, yearend	W	W	W	W	W
Employment, number[e]	420	420	420	420	420
Net import reliance[2] as a percentage of apparent consumption	<30	<30	<40	<40	<30

Recycling: In 2016, about 27,000 tons of secondary magnesium was recovered from old scrap and 64,000 tons were recovered from new scrap. Aluminum-base alloys accounted for 68% of the secondary magnesium recovered, and magnesium-based castings, ingot, and other materials accounted for about 32%. 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 (2012–15): Israel, 30%; Canada, 22%; China, 10%; Mexico, 7%; and others, 31%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–16**
Unwrought metal	8104.11.0000	8.0% ad val.
Unwrought alloys	8104.19.0000	6.5% ad val.
Scrap	8104.20.0000	Free.
Powders and granules	8104.30.0000	4.4% 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: A plant in Mexico, MO, which manufactures die-cast magnesium parts for the automotive industry, was expanded by about 30% and rampup was completed in early 2016. In October, citing increased demand from diecasters and secondary aluminum smelters, a secondary magnesium plant in Andersonville, IN, restarted 25,000 tons per year of capacity, doubling its active capacity. Rampup was expected to be completed by yearend 2016.

In China, production increased during the year after decreasing in 2015 for the first time since 2009. A new plant in Qinghai Province that would produce magnesium from lake brines was expected to ramp up to its full 100,000-ton-per-year capacity in 2017. Some plants producing magnesium using the Pidgeon (silicothermic reduction) process were expected to shut down, owing to energy cost increases and to comply with environmental regulations.

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MAGNESIUM METAL

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 its capacity by 20%. Another company was seeking financing for a proposed plant to produce magnesium from dolomite in Nevada and was awaiting permits to operate a bench-scale pilot plant that had been completed at the beginning of the year to test recovery of magnesium from its deposit. Two companies were testing processes to produce magnesium and magnesium compounds from asbestos tailings in Quebec, Canada. One of the companies proposed to build a 50,000-ton-per-year plant if its pilot-plant tests proved economically feasible. A company in Australia was conducting a feasibility study for a 5,000-ton-per-year plant to recover magnesium from coal fly ash.

The use of magnesium in automobile parts continues to increase as automobile manufacturers seek to decrease vehicle weight in order to comply with fuel-efficiency standards. However, some foundries switched to aluminum from magnesium because lower aluminum prices in 2016 provided a cost advantage. The substitution of aluminum for steel in automobile sheet was expected to increase consumption of magnesium in aluminum alloy sheet. Although some magnesium sheet applications have been developed for automobiles, these were generally limited to expensive sports cars and luxury vehicles, automobiles where the higher price of magnesium is not a deterrent to its use.

Consumption of magnesium in the production of titanium metal by the Kroll process increased during the early part of 2016 as a titanium sponge plant in Utah increased production. However, in August, the owner of the titanium sponge plant announced that it would shut down the plant by yearend, citing the availability of titanium sponge at lower prices from suppliers outside the United States. In October, the owner of the magnesium plant in Utah announced that it would delay the completion of its expansion project from 2017 until at least 2018 because of the shutdown of the adjacent titanium sponge plant.

World Primary Production and Reserves:

	Primary production		Reserves[3]
	2015	2016[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	15	15	
China	852	880	
Israel	19	25	
Kazakhstan	8	10	
Korea, Republic of	10	10	
Russia	60	60	
Turkey	(4)	6	
Ukraine	8	8	
World total[5] (rounded)	972	1,010	

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 in most applications; 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.

[e]Estimated. W Withheld to avoid disclosing company proprietary data.
[1]See also Magnesium Compounds.
[2]Defined as imports – exports.
[3]See Appendix C for resource and reserve definitions and information concerning data sources.
[4]Less than 500 metric tons.
[5]Excludes U.S. production.