



# 2009 Minerals Yearbook

## MAGNESIUM

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Primary magnesium was produced by one company in the United States, and much of the U.S. demand was met by imports. Israel was the principal source of imported magnesium metal and alloys. Aluminum alloying, diecasting, and iron and steel desulfurization, in descending order, were the principal end-use applications for magnesium in the United States in 2009. Consumption of magnesium in the United States in 2009 was significantly lower than that of 2008 mainly because of the global economic decline. Decreases in primary aluminum production and secondary aluminum recovery contributed to the overall decline in domestic consumption of magnesium. China continued to dominate world production of primary magnesium, accounting for 82% of the total (excluding the United States).

## Legislation and Government Programs

The U.S. Department of Commerce, International Trade Administration (ITA) (2009a), published the final results of its administrative review of antidumping duties on pure magnesium imported from Russia. Solikamsk Magnesium Works did not ship magnesium to the United States during the period of review (April 1, 2007, through March 31, 2008), so the ITA rescinded the antidumping duty order for Solikamsk. The other Russian magnesium producer, VSMPO-Avisma Corp. (Avisma), chose not to participate in the administrative review, and requested that the ITA remove all proprietary information on Avisma from the record. As a result of the decision not to participate, the ITA used what it termed “adverse facts available” to determine Avisma’s dumping margin, which was 43.58% ad valorem for pure magnesium. Antidumping duty rates for other Russian firms were set at 21.01% ad valorem.

In December, the ITA published its final antidumping duty administrative review for pure magnesium imported from the Chinese firm Tianjin Magnesium International Co. Ltd. (TMI). According to the ITA, TMI withheld information and provided information that could not be verified during the investigation. TMI’s suppliers reportedly lacked documentation of payment, had recordkeeping discrepancies, and had altered requested documents. As a result, the ITA set a punitive antidumping duty of 111.73% ad valorem (Jenneman, 2009d; U.S. Department of Commerce, International Trade Administration, 2009b). TMI planned to appeal the decision before the U.S. Court of International Trade.

The United States was seeking the formation of a formal World Trade Organization (WTO) panel on a complaint filed on June 23 alleging that China improperly restricted exports of materials to help its own manufacturers. The United States and the 27-nation European Union filed the initial complaint at the WTO on June 23, and Mexico joined the complaint on August 21. According to the complaint, China imposed quotas on exports of some materials and imposed export duties on

several raw materials. The materials included in the complaint were bauxite, coke, fluorspar, magnesium, manganese, silicon metal, silicon carbide, yellow phosphorus, and zinc (Agence France-Presse, 2009). In December, the WTO Dispute Settlement Body set up a panel in response to this complaint. The panel was scheduled to complete its report of findings and recommendations within 9 months after it was established (Office of the United States Trade Representative, 2009). Several other nations, including Canada, planned to participate in the panel.

## Production

U.S. Magnesium LLC was the sole producer of primary magnesium in the United States. The company recovered magnesium electrolytically from brines from the Great Salt Lake at its 52,000-metric-ton-per-year (t/yr) plant in Rowley, UT. U.S. Magnesium announced that it would reduce production and delay expansion at its plant, citing weak demand as the reason for the announced actions. U.S. Magnesium had planned on increasing production capacity to 70,000 t/yr by 2010, but this would be delayed until demand improves (McBeth and de Klerk, 2009).

## Environmental Issues

The cover gas sulfur hexafluoride ( $\text{SF}_6$ ) that is used to protect molten magnesium from oxidation has been identified as a potential factor in global warming. Although studies on the gas’s effect continued, its long atmospheric life (about 3,000 years) and high potential as a greenhouse gas (23,900 times the global warming potential of carbon dioxide) resulted in a call for voluntary reductions in emissions. In 1999, the U.S. magnesium industry, the International Magnesium Association, and the U.S. Environmental Protection Agency (EPA) began a voluntary partnership to reduce emissions of  $\text{SF}_6$ . The major processes that require  $\text{SF}_6$  melt protection are primary production; secondary production; die, permanent mold, and sand casting; wrought products production; and anode production. According to the EPA, the magnesium industry emitted 2.0 teragrams  $\text{CO}_2$  equivalent of  $\text{SF}_6$  in 2008, representing a decrease of approximately 23% from 2007 emissions. The decrease may be attributed to die casting facilities closing in the United States during 2008 because of reduced demand from the American automobile industry and other industrial sectors. An issue that was expected to be addressed in future inventories is the likely adoption of alternate cover gases by U.S. magnesium producers and processors. These cover gases, which include AM-cover™ (containing hydrofluorocarbon-134a) and Novec™ 612 (dodecafluoro-2-methylpentan-3-one), have lower global warming potential than  $\text{SF}_6$  and tend to quickly decompose during their exposure to the molten metal. Magnesium producers and processors voluntarily have begun using these

cover gases in a limited fashion (U.S. Environmental Protection Agency, 2010).

After an investigation begun in late 2008, the EPA added U.S. Magnesium's Tooele County, UT, operations to the national priorities list of Superfund sites. Superfund is the name of the fund established by the Comprehensive Environmental Response, Compensation and Liability Act of 1980. Designation as a Superfund site allows the EPA to clean up such sites and to compel responsible parties to perform cleanups or reimburse the Government for EPA-led cleanups. The designated site encompasses 1,830 hectares (4,530 acres) on the southwestern edge of the Great Salt Lake, 64 kilometers (40 miles) from Salt Lake City, UT. Contaminants at the site include acidic wastewater, dioxins, furans, heavy metals, hexachlorobenzene, polychlorinated biphenyls, and polycyclic aromatic hydrocarbons. U.S. Magnesium planned to challenge the designation (Jennemann, 2009c; U.S. Environmental Protection Agency, 2009).

In a separate but related lawsuit, U.S. Magnesium and the EPA were in the U.S. Court of Appeals on November 18 as a result of a suit brought by the EPA in 2001 that alleged U.S. Magnesium violated the Resource Conservation and Recovery Act. The EPA alleged that dioxins and other cancer-causing agents that are byproducts of the magnesium extraction process are a threat to workers, wildlife, and public health. U.S. Magnesium claimed that Congress excluded the company from the law and that the EPA was retroactively applying new guidelines. In a 2007 ruling, a U.S. District Court judge ruled in favor of U.S. Magnesium, and the EPA appealed the decision (Coffman, 2009).

## Consumption

Data for magnesium metal are collected from two voluntary surveys of U.S. operations by the U.S. Geological Survey. Of the 64 companies canvassed for magnesium consumption data, 53% responded, representing 59% of the magnesium-base scrap consumption listed in table 2 and the primary magnesium consumption listed in table 3. Data for the 30 nonrespondents were estimated on the basis of prior-year consumption levels and other factors.

Reported primary magnesium consumption in 2009 was about 21% lower than that in 2008 (table 3), reflecting the effects of the global economic downturn. Aluminum alloying was the principal use for primary magnesium, accounting for 45% of the total, followed by diecasting with 37% and iron and steel desulfurization with 8%. Primary magnesium use in aluminum alloying decreased by 34%, which mirrored the decline in U.S. primary aluminum production. The 36% decline in U.S. steel production from 2008 to 2009 resulted in a significant drop in the use of magnesium in iron and steel desulfurization of 44%.

In contrast, primary magnesium consumption for diecasting applications was 18% higher than that in 2008, but still at a level significantly lower than before the economic crisis that began in 2008. This increase may have been partially attributed to the Car Allowance Rebate System (CARS), more commonly known as "Cash for Clunkers," which was a Federal Government \$3 billion automobile scrapping program intended to provide economic incentives to U.S. residents to

purchase new, more fuel-efficient vehicles when trading in less fuel-efficient vehicles. The program officially started on July 1, 2009, the processing of claims did not begin until July 24, and the program ended on August 24, as the appropriated resources were exhausted with sales of about 700,000 new vehicles (U.S. Department of Transportation, 2009). Despite increased sales of automobiles during July and August, the International Organization of Motor Vehicle Manufacturers (2010) reported that U.S. vehicle production in 2009 decreased by 34.3% from that in 2008, and production in Canada also was 28.5% lower.

Magnesium recovery from scrap also was 20% lower than that in 2008 mainly as a result of smaller quantities of aluminum scrap being processed.

In December, Allegheny Technologies Inc. (ATI) began initial production at its titanium sponge facility in Rowley. The company planned to systematically increase production during 2010 until the plant reaches its full capacity. When this Utah sponge facility is fully operational, ATI's total sponge production capacity (including the Albany, OR, facility) was projected to be about 20,900 t/yr. The company also temporarily idled its Albany sponge production facility in July because of a decline in the commercial aerospace market (Allegheny Technologies Inc., 2010, p. 19, 22). Magnesium consumption would be expected to increase with increased titanium production because magnesium is used in the Kroll process to reduce titanium tetrachloride to titanium sponge.

On January 30, Contech, LLC (Portage, MI) filed a petition under chapter 11 of the U.S. Bankruptcy Code to restructure its business, citing unprecedented low volumes of diecastings used by the automobile industry as the reason. The company produced aluminum and magnesium diecastings for the automobile industry and has plants in Michigan, Indiana, Tennessee, and the United Kingdom, but only the U.S. operations were affected by the chapter 11 filing (Contech, LLC, 2009). In June, the U.S. Bankruptcy Court in Michigan approved the sale of Contech's aluminum and magnesium diecasting assets to Revstone Industries LLC.

In addition, one of the leading aluminum sheet producers, Aleris International Inc. filed for chapter 11 bankruptcy protection in mid-February citing a decrease in demand from the automobile industry as the principal reason for the filing. Only the company's U.S. operations were affected by the filing. Aleris was a leading consumer of magnesium at its rolling and recycling operations, and companies such as U.S. Magnesium, Dead Sea Magnesium Ltd., and Advanced Magnesium Alloys Corp. were among the company's creditors (McBeth, 2009a).

Aluminum and magnesium diecaster Spartan Light Metal Products Inc. announced that it would cut production and lay off employees in response to a 30% decrease in diecasting orders for the first quarter of 2009. Other magnesium diecasters reported that they would extend plant shutdowns into January, and many had enough magnesium alloy inventory to supply plant requirements for 8 weeks to 6 months (McBeth, 2009c).

Aluminum and magnesium diecaster Internet Corp. began selling its assets as a result of its chapter 11 bankruptcy filing in August 2008. The company had closed some of its plants in 2008, including its Pulaski, TN, plant, where it manufactured aluminum and magnesium automotive diecastings. Continental Casting LLC

(Perry, MO) purchased two plants from Intermet—one in Monroe City, MO, that produced aluminum and zinc castings and one in Palmyra, MO, that produced aluminum and magnesium castings. Continental Casting planned to continue to operate the facilities and retain the plant employees (McBeth and Gilcrest, 2009).

Quad City Die Casting Co. closed its Moline, IL, diecasting facility in September because of the slowdown in demand from its principal customer, American Kawasaki Motorcycle Corp. Quad City produced aluminum, magnesium, and zinc diecastings. Approximately 100 workers were laid off (Murphy, 2009).

## Stocks

Producers' yearend 2009 stocks of primary magnesium were about the same as those at yearend 2008; producer stock data were withheld to avoid disclosing company proprietary data. Consumer stocks of primary and alloy magnesium were 4,850 metric tons (t) at yearend 2009, 38% lower than the yearend 2008 level of 7,810 t (revised).

## Prices

In 2009, prices continued the decline begun in the fourth quarter of 2008. Most of the decline in prices in the United States early in the year resulted from renegotiations of contracts, not spot sales. In addition, consumers were delaying deliveries because of the slowdown in the magnesium end-use markets and in consumption in secondary aluminum products (Jennemann, 2009a). By midyear, consumers had significant quantities of magnesium left in their 2009 contracts and were not negotiating contracts for 2010 yet, and spot magnesium sales were almost nonexistent (Jennemann, 2009b). By yearend, prices were significantly lower than those at yearend 2008 in response to the weak global economy and weak magnesium demand.

In November, contract negotiations for 2010 began in Europe and the United States as large aluminum companies solicited offers. Several significant aluminum buyers in Europe settled first quarter 2010 contracts for Chinese-origin magnesium at \$2,600 to \$2,650 per metric ton. U.S. contracts with the leading aluminum producers, however, were not completed by yearend, although offers at \$2.20 per pound were reported (McBeth, 2009b).

## Foreign Trade

Total magnesium exports for 2009 were about 36% higher than those in 2008 (table 5). Canada (52%), Singapore (14%), and Mexico (13%) were the principal destinations.

Magnesium imports for consumption in 2009 were about 43% less than those in 2008 (table 6). Magnesium metal (containing at least 99.8% by weight of magnesium) imports were 52% lower compared with those in 2008, and alloy imports were 63% lower. Reduced consumption by the automotive diecasting industry after the closure of several U.S. diecasting plants was the main reason for the decline in alloy imports. Israel (71%) was the principal source of imported magnesium metal and of imported alloys (22%).

## World Review

**Canada.**—Timminco Ltd. completed the divestiture of its magnesium business in July. The company merged its

remaining extrusion businesses with the magnesium operations of China-based Winca Tech Ltd. to form Applied Magnesium International Ltd. Timminco's facility in Nuevo Laredo, Mexico, and Winca's facilities in Hebi, Henan Province, and Linyi, Shandong Province, China, were included in the new company. Former managers and employees of Timminco's magnesium business were expected to form the core management team of its North American operations, based in Denver, CO, where Timminco's magnesium extrusion facility was located. In connection with the sale, Timminco received a 19.5% equity interest in Applied Magnesium; Winca held the remaining equity (Timminco Ltd., 2009).

In November, Swiss firm Xstrata plc began demolishing the 63,000-t/yr Magnola magnesium plant in Asbestos, Quebec. The plant had been constructed in 2000 by the former Noranda Inc. to recover magnesium from asbestos tailings but was closed in 2003 because magnesium produced at Magnola could not compete with lower priced magnesium from China in the world market. Norsk Hydro ASA's 48,000-t/yr magnesium plant in Becancour, Quebec, had been demolished earlier in 2009 (McDougall, 2009).

Trimag L.P. announced that it was closing its Boisbriand, Quebec, diecasting plant in June following the loss of its major customer, General Motors Corp. (GM), to which Trimag had supplied nearly all of its high-pressure diecastings. GM canceled its business with Trimag because of low automotive demand. The plant had been idle since late 2008, and 160 workers were permanently laid off. Trimag also had shut down an Ontario magnesium diecasting plant in 2007 (CNW Group, 2009).

**China.**—According to the China Nonferrous Metals Industry Association, China produced 500,000 t of magnesium in 2009, 5% lower than production in 2008 (China Magnesium Industry & Market Bulletin, 2010).

In January, Taiyuan Tongxiang Magnesium Co. Ltd. (Shanxi Province) reportedly cut its production to 3,000 metric tons per month (t/mo) from the 10,000-t/mo rate at which it had been producing in 2008. Only 5 of the company's 25 magnesium plants were in operation. Persistent weakness in demand in China's automotive sector and a forecast for this weakness to continue were the principal reasons for the shutdown. Taiyuan Tongxiang's total magnesium production capacity was 100,000 t/yr (Metal-Pages, 2009a). Other magnesium producers in China also reported that they would cut production and delay expansions until the market improves.

Although magnesium production has declined in China, companies still were announcing capacity increases. Ningxia Huaying Mining Group Co. (Ningxia Autonomous Region) commissioned the first phase of its magnesium alloy facility at the end of October. The first phase of the facility was designed to produce 50,000 t/yr of magnesium alloys. Total investment in the project, which would have an alloy production capacity of 150,000 t/yr when completed in 2012, was expected to be \$587 million (Metal-Pages, 2009c). Qinghai Salt Lake Industry Group Co. Ltd. (Qinghai Province) reportedly was buying equipment from North America to construct a 50,000-t/yr magnesium metal plant. The equipment was scheduled to be delivered by October, and construction was expected to be completed by 2011. Qinghai also planned to expand capacity to 100,000 t/yr in the future.

The proposed plant would recover magnesium from magnesium chloride extracted from salt lakes in the Qinghai-Tibet plateau from which the company produced salt (Metal-Pages, 2009b). Fugu Coal & Chemical Group Co. Ltd. (Shaanxi Province) planned to complete a magnesium production facility with a total production capacity of 180,000 t/yr by yearend. Production capacity at the facility was 40,000 to 50,000 t/yr (Platts Metals Week, 2009a).

Ningxia Huiye Magnesium Co. Ltd. (Ningxia Autonomous Region) completed its magnesium ingot expansion project in June, increasing production capacity to 66,000 t/yr from 40,000 t/yr. The company, which has five plants in Ningxia Hui Autonomous Region and Shanxi Province, had originally planned to finish the expansion project before yearend 2008, but delayed the expansion because of rapidly falling magnesium prices and the global economic crisis (Metal-Pages, 2009d).

China Direct Industries, Inc. (Deerfield Beach, FL) signed a letter of intent with Taiyuan Yiwei Magnesium Group Ltd. (Shanxi Province) to acquire the minority interest in Taiyuan Changxin Magnesium Co. Ltd. (Shanxi Province), Shanxi Gu County Golden Magnesium Co. Ltd. (Shanxi Province), and Baotou Xinjin Magnesium Industry Co. Ltd. (Inner Mongolia Autonomous Region) (subsidiaries of Yiwei Magnesium). In addition, China Direct was seeking to acquire up to five additional magnesium facilities from Yiwei Magnesium. These five facilities have a combined production capacity of 40,000 t/yr of pure magnesium ingot, 10,000 t/yr of magnesium powder, and 10,000 t/yr of magnesium alloy. China Direct also planned to sell its interest in Pan Asia Magnesium Co. Ltd. (China Direct Industries, Inc., 2009).

The municipal government of Anshan, Liaoning Province, secured investment through Magnesium Resources Corp. of China Ltd. to build a magnesium plant in the city's Haicheng district. Magnesium Resources was expected to invest up to \$1.5 billion in the construction of the facility, which would have a capacity of 200,000 t/yr of magnesium metal and 50,000 t/yr of magnesium alloys. The first phase of the project was expected to be completed in mid-2010 (Metal-Pages, 2010a).

**Israel.**—In July, Israel Chemicals Ltd. (ICL) and Volkswagen AG reached a compromise regarding Volkswagen's demand to pull out of its partnership in Dead Sea Magnesium Ltd. Under the accord, Volkswagen would provide \$30 million to Dead Sea Magnesium's 35,000-t/yr primary magnesium plant and transfer its 35% share in the company to ICL, which owns the other 65%. At the same time, ICL would provide \$55.7 million in funds to Dead Sea Magnesium (Reuters, 2009). The companies had been negotiating Volkswagen's withdrawal from the venture since December 2008.

**Malaysia.**—CVM Minerals Ltd. announced that it was delaying completion of its primary magnesium plant under construction in Perak, which was originally scheduled to be completed in March. CVM has the rights to mine dolomite from the nearby Dolomite Hills and was constructing the first of two production lines for magnesium with a 15,000-t/yr capacity. When the second line is completed, the plant's total capacity was projected to be 30,000 t/yr. At yearend, construction of the Perak magnesium plant was in progress. The reduction furnaces were being tested, and some modifications were required. The company estimated that the tests would be completed in March

2010, and commercial production was scheduled for April (Platts Metals Week, 2009b; CVM Minerals Ltd., 2010, p. 1).

**Norway.**—SilMag D.A. (a 50-50 joint venture between Norsk Hydro ASA and AMG Advanced Metallurgical Group N.V. of the Netherlands) planned to postpone secondary magnesium alloy production, which was originally scheduled to start in 2009, in Porsgrunn. The company cited the decline in magnesium consumption and price since autumn 2008 and difficulty in magnesium scrap collection (Metals Place, 2009a). In October, SilMag began testing at a pilot plant to recover magnesium chloride from olivine. Testing was expected to continue through May 2010, but the company would not commercialize the process until a user is found for the silica that is generated in the process (Metals Place, 2009b). The joint-venture project planned to recover magnesium at Norsk Hydro's former primary magnesium plant that closed in 2002.

**Russia.**—Magnesium shipments at Solikamsk in 2009 totaled 12,120 t of metal and alloy, nearly 27% less than those in 2008. Solikamsk cited the global economic downturn and a significant stockpile of product at producers' and customers' warehouses as factors contributing to the decrease in shipments. Because of the slump in demand, the company shut down 65% of its electrolytic magnesium production capacity and reduced the workweek of its employees (Metal-Pages, 2010c).

## Outlook

U.S. magnesium consumption was expected to continue to be directly correlated to the global economy. If the economy recovers, magnesium consumption in the United States should return to its earlier levels. A significant portion of U.S. demand for magnesium will depend on its use in aluminum alloys. Aluminum production in the United States was not projected to increase significantly until producers were certain of a sustained economic recovery; in mid-2010, only about 50% of the U.S. primary aluminum production capacity was in use.

Most of the growth in magnesium use in the past decade resulted from its increased use in automotive applications, and any increase in automobile manufacturing would be expected to result in an increase in the use of magnesium because of its light weight. However, automotive manufacturers may be less likely to choose magnesium than other lightweight materials, such as plastic, because of the limited availability from multiple producers. Because of antidumping duties assessed on magnesium imported from China and Russia, automobile manufacturers are limited to sourcing primary magnesium from one company in Brazil, one in Israel, and one in the United States; the limited number of suppliers was one of the reasons that the U.S. automotive industry was reluctant to use magnesium for many years. In May 2010, the North American Die Casting Association (NADCA) submitted comments to the ITC in a 5-year review of duties for magnesium that indicated that the lack of effective competition in the U.S. market has harmed die casters since the imposition of the antidumping duty orders in 2005. The NADCA estimated that as many as 1,675 direct jobs and 8,000 supporting jobs have been lost in the diecasting industry as a result of the imposition of these orders (North American Die Casting Association, 2010). Ultimately,

the sustained use of magnesium in automotive applications may depend on its availability from multiple sources.

Analysts at Clark & Marron Pty. Ltd. projected that, after decreasing by 20% to 480,000 t in 2009 from that in 2008, global magnesium demand was expected to grow by an average of 7.9% per year through 2019. The growth in demand was expected to be driven by the increased use of magnesium in diecasting and aluminum alloys (Metal-Pages, 2010b).

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## GENERAL SOURCES OF INFORMATION

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TABLE 1  
 SALIENT MAGNESIUM STATISTICS<sup>1</sup>

(Metric tons unless otherwise specified)

	2005	2006	2007	2008	2009
United States:					
Production:					
Primary magnesium	W	W	W	W	W
Secondary magnesium	73,300	81,900 <sup>r</sup>	84,100 <sup>r</sup>	83,700 <sup>r</sup>	66,600
Exports	9,650	12,300	14,800	14,400	19,600
Imports for consumption	84,700	75,300	71,800	83,300	47,300
Consumption, primary	82,100	77,600	72,200	64,500 <sup>r</sup>	50,900
Yearend stocks, producer	W	W	W	W	W
Price <sup>2</sup> dollars per pound	1.15–1.30	1.35–1.45	2.00–2.50	3.05–3.25	2.20–2.40
World, primary production <sup>c</sup>	622,000	675,000	751,000	670,000 <sup>r</sup>	608,000

<sup>c</sup>Estimated. <sup>r</sup>Revised. W Withheld to avoid disclosing company proprietary data.

<sup>1</sup>Data are rounded to no more than three significant digits.

<sup>2</sup>Source: Platts Metals Week.

TABLE 2  
MAGNESIUM RECOVERED FROM SCRAP PROCESSED IN THE  
UNITED STATES, BY KIND OF SCRAP AND FORM OF RECOVERY<sup>1</sup>

(Metric tons)

KIND OF SCRAP	2008	2009
New scrap:		
Magnesium-base	22,400 <sup>r</sup>	17,200
Aluminum-base	38,700 <sup>r</sup>	29,900
Total	61,100 <sup>r</sup>	47,100
Old scrap:		
Magnesium-base	1,210	1,210
Aluminum-base	21,300 <sup>r</sup>	18,300
Total	22,600 <sup>r</sup>	19,500
Grand total	83,700 <sup>r</sup>	66,600
FORM OF RECOVERY		
Magnesium alloy ingot <sup>2</sup>	W	W
Magnesium alloy castings	7,880 <sup>r</sup>	7,970
Magnesium alloy shapes	-- <sup>r</sup>	--
Aluminum alloys	62,000 <sup>r</sup>	49,700
Other <sup>3</sup>	13,800 <sup>r</sup>	8,900
Total	83,700 <sup>r</sup>	66,600

<sup>r</sup>Revised. W Withheld to avoid disclosing company proprietary data; included in "Other."

-- Zero.

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

<sup>2</sup>Includes secondary magnesium content of both secondary and primary alloy ingot.

<sup>3</sup>Includes chemical and other dissipative uses, cathodic protection, and data indicated by symbol W.

TABLE 3  
U.S. CONSUMPTION OF PRIMARY MAGNESIUM, BY USE<sup>1</sup>

(Metric tons)

Use	2008	2009
For structural products:		
Castings:		
Die	16,200 <sup>r</sup>	19,100
Permanent mold	19	44
Sand	428	410
Wrought products <sup>2</sup>	2,480	1,160
Total	19,100 <sup>r</sup>	20,700
For distributive or sacrificial purposes:		
Aluminum alloys	35,000	23,000
Cathodic protection (anodes)	824	686
Iron and steel desulfurization	7,070	3,970
Nodular iron	61	72
Reducing agent for titanium, zirconium, hafnium, uranium, beryllium	1,320	1,120
Other <sup>3</sup>	1,080	1,350
Total	45,300	30,200
Grand total	64,500 <sup>r</sup>	50,900

<sup>r</sup>Revised.

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

<sup>2</sup>Includes sheet and plate and forgings.

<sup>3</sup>Includes chemicals and scavenger, deoxidizer, and powder.

TABLE 4  
YEAREND MAGNESIUM PRICES

Source		2008	2009
Platts Metals Week:			
U.S. spot dealer import	dollars per pound	3.00–3.25	2.25–2.40
U.S. spot Western	do.	3.05–3.25	2.20–2.40
China	dollars per metric ton	2,900–3,000	2,630–2,700
European free market	do.	2,900–3,000	2,700–2,800
Metal Bulletin:			
China free market	do.	2,800	2,700–2,780
European free market	do.	2,800–2,900	2,700–2,750

do. Ditto.

TABLE 5  
U.S. EXPORTS OF MAGNESIUM, BY COUNTRY<sup>1</sup>

Country	Waste and scrap		Metal		Alloys		Powder, sheets, tubing, ribbons, wire, other forms	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
2008:								
Brazil	--	--	--	--	699	\$3,750	14	\$517
Canada	1,290	\$3,240	666	\$2,300	4,540	18,500	287	4,000
Mexico	1,070	1,660	565	1,470	524	3,470	688	3,780
Singapore	--	--	1,770	5,780	10	32	13	286
United Kingdom	58	151	12	24	14	52	432	11,300
Other	176	366	89	188	976	4,130	517	10,400
Total	2,600	5,420	3,100	9,770	6,760	29,900	1,950	30,200
2009:								
Brazil	--	--	220	648	2,090	10,100	21	761
Canada	2,050	4,630	2,610	8,470	5,290	22,100	217	3,330
Mexico	165	453	520	1,800	1,050	4,760	881	5,480
Singapore	--	--	2,550	9,150	262	944	9	191
United Kingdom	--	--	--	--	10	51	340	10,300
Other	67	119	221	461	488	2,470	581	10,500
Total	2,280	5,200	6,120	20,500	9,190	40,400	2,050	30,500

-- Zero.

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

Source: U.S. Census Bureau.

TABLE 6  
U.S. IMPORTS FOR CONSUMPTION OF MAGNESIUM, BY COUNTRY<sup>1</sup>

Country	Waste and scrap		Metal		Alloys, magnesium content		Powder, sheets, tubing, ribbons, wire, other forms, magnesium content	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	(metric tons)	(thousands)	(metric tons)	(thousands)	(metric tons)	(thousands)	(metric tons)	(thousands)
2008:								
Canada	15,400	\$28,500	6	\$21	3,040	\$17,100	1,350	\$7,500
China	106	295	19,100	95,000	196	1,570	511	4,140
Israel	--	--	21,800	81,100	3,940	17,400	--	--
Kazakhstan	--	--	256	678	--	--	--	--
Mexico	1,520	1,930	--	--	1,060	4,770	(2)	2
Russia	--	--	2,210	7,530	--	--	15	355
Other	7,090	28,000	878	5,560	4,730	33,200	96	2,690
Total	24,100	58,800	44,300	190,000	13,000	74,100	1,970	14,700
2009:								
Canada	14,800	24,300	22	112	687	3,360	2	85
China	50	49	4,970	22,600	133	649	122	1,530
Israel	--	--	15,300	58,500	1,040	4,890	--	--
Kazakhstan	--	--	333	918	--	--	--	--
Mexico	805	1,290	25	210	683	2,660	6	323
Russia	--	--	307	1,200	8	75	2	102
Other	5,250	14,700	438	3,190	2,240	18,200	73	2,130
Total	20,900	40,300	21,400	86,800	4,790	29,800	205	4,170

-- Zero.

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

<sup>2</sup>Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 7  
WORLD ANNUAL PRIMARY MAGNESIUM  
PRODUCTION CAPACITY, DECEMBER 31, 2009<sup>1</sup>

(Metric tons)

Country	Capacity
Brazil	18,000
China	1,030,000
India	900
Israel	27,500
Kazakhstan	10,000
Russia	80,000
Serbia and Montenegro	5,000
Ukraine	15,000 <sup>2</sup>
United States	52,000
Total	1,240,000

<sup>1</sup>Includes capacity at operating plants as well as at plants on standby basis.

<sup>2</sup>Idle.

TABLE 8  
MAGNESIUM: ESTIMATED PRIMARY WORLD PRODUCTION, BY COUNTRY<sup>1,2</sup>

(Metric tons)

Country	2005	2006	2007	2008	2009
Brazil	6,000	6,000	18,000	15,000	16,000
Canada <sup>3</sup>	50,000	65,000	16,300	2,000 <sup>r</sup>	--
China	470,000	520,000	625,000	559,000	501,000
Israel <sup>4</sup>	27,853	24,581	29,618	32,051 <sup>r</sup>	29,000
Kazakhstan	20,000	21,000	21,000	21,000	21,000
Russia <sup>3</sup>	45,000	35,000	37,000	37,000	37,000
Serbia	1,500 <sup>5</sup>	1,500	2,000 <sup>r</sup>	1,500	1,500
Ukraine	2,000	2,200	2,500	2,000 <sup>r</sup>	2,000
United States	W	W	W	W	W
Total	622,000	675,000	751,000	670,000 <sup>r</sup>	608,000

<sup>r</sup>Revised. W Withheld to avoid disclosing company proprietary data; not included in "Total." -- Zero.

<sup>1</sup>World totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Table includes data available through July 13, 2010.

<sup>3</sup>Includes secondary.

<sup>4</sup>Reported figure.

<sup>5</sup>Montenegro and Serbia formally declared independence in June 2006 from each other and dissolved their union.