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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. Canada, China, and Israel were the principal sources of imported magnesium. Aluminum alloying, diecasting, and iron and steel desulfurization, in descending order, were the principal end-use applications for magnesium in the United States in 2008. Consumption of magnesium in the United States in 2008 was significantly lower than that of 2007 because of the global economic decline and, in particular, the decline in production of automobiles. Because of reduced vehicle production, several large U.S. magnesium diecasters shut their operations in 2008. China continued to dominate world production of primary magnesium, accounting for 83% of the total (excluding the United States).

Legislation and Government Programs

The U.S. Court of International Trade rejected an appeal by Tianjin Magnesium International Co., Ltd. (TMI) that would have prevented the U.S. Department of Commerce, International Trade Administration (ITA) from conducting an antidumping review of TMI's magnesium shipments to the United States for 2006–07. As a result of this decision, the ITA was authorized to conduct the antidumping review and establish a new dumping margin for TMI. TMI was the only China-based company with a 0% antidumping rate for magnesium. Because of the inclusion of TMI in the antidumping review, which had been scheduled for completion by January 31, 2008, the ITA extended the review period to May 30 (U.S. Court of International Trade, 2008, p. 1–3; U.S. Department of Commerce, International Trade Administration, 2008b). In December, the ITA published the final results of its administrative review of antidumping duties for pure magnesium imported into the United States from China. Final dumping margins for the May 1, 2006, through April 30, 2007, period of review and still in effect at yearend were 0.63% ad valorem for TMI, 111.73% ad valorem for Shanxi Datuhe Coke & Chemicals Co., Ltd., and 108.26% ad valorem for the China-wide rate (U.S. Department of Commerce, International Trade Administration, 2008c). The China-wide rate has been in effect since 1995. The ITA published its final antidumping duties on magnesium alloy imported from TMI. The ITA determined that the weighted average dumping margin for the company for April 1, 2006, to March 31, 2007, was 0% (U.S. Department of Commerce, International Trade Administration, 2008a).

Other antidumping duty orders in effect at yearend for magnesium imported into the United States from China were as follows: for granular magnesium, the duty was set at 305.56% ad valorem as the China-wide rate and 24.67% ad valorem for Minmetals Precious & Rare Minerals Import and Export/China National Nonferrous Metals Industry Trading Group Corp. (in effect since November 2001), and for magnesium alloy, the duty was set at 141.49% ad valorem as the China-wide rate, 49.66% ad valorem for Beijing Guangling Jinghua Science & Technology Co. Ltd., and 0% ad valorem for TMI (the China-wide and Guangling rates have been in effect since April 2005) (U.S. International Trade Commission, 2007, p. I–6).

In a final determination by the ITA, U.S. antidumping duty rates for imports of magnesium from Russia will rise to 15.77% for VSMPO-AVISMA Corp. and to 21.71% for JSC Solikamsk Magnesium Plant. The administrative review of the antidumping duty order covered pure and alloy magnesium imports for the period April 1, 2006, through March 31, 2007 (McBeth, 2008d).

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. This capacity included a 9,000-t/yr capacity expansion that was onstream by summer 2008. U.S. Magnesium also announced that it had completed an engineering and cost analysis for an additional expansion of 18,000 t/yr that could be completed by 2010 (McBeth, 2008e).

In March, Alcoa Inc. (Pittsburgh, PA) began an internal review to determine if a restart of its Addy, WA, magnesium plant was warranted. The 43,000-t/yr silicothermic plant was closed in 2001 mainly because of competition from cheaper magnesium from China and the high cost of power and ferrosilicon. The U.S. spot Western magnesium price at the time Alcoa had closed the plant was about $1.25 per pound compared with about $3.20 per pound at the time that the study was conducted. Alcoa had produced magnesium primarily to satisfy its internal consumption requirements for aluminum alloying. Some equipment at the plant would need to be replaced, and Alcoa would consider the costs to purchase power on the open market and rehire employees before determining if a restart would be economically possible. When it had been operational, the plant's power requirements had been met by the Bonneville Power Administration, but this allocation has been shifted to Alcoa's Intalco aluminum smelter in Ferndale, WA. Power purchase on the open market could be more expensive (McBeth, 2008a).

Environmental Issues

The cover gas sulfur hexafluoride (SF_6) that is used to protect molten magnesium from oxidation has been implicated as a potential factor in global warming. Although studies on the gas's effect continue, 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) has 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 SF_6. The major processes that require 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, SF_6 emissions from primary magnesium production and magnesium casting in 2007 were 4% greater than those in 2006 because of an increase in sand casting. An issue that will 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 hydroflurocarbon-134a) and Novec™ 612 (dodecafluoro-2-methylpentan-3-one), have lower global warming potential than 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, 2009, p. 4–49—4–52).

On September 3, the EPA announced that it planned to include U.S. Magnesium's Rowley magnesium plant on its Superfund list of hazardous waste sites. According to the EPA, hazards at the site included heavy metals, acidic wastewater, polychlorinated biphenyls, dioxins and furans, hexachlorobenzene, and polycyclic aromatic hydrocarbons. These contaminants have cancerous and noncancerous health risks to humans and wildlife; have been released into the air, soil, surface water, and ground water; and were largely uncontrolled. The public had until November 3 to provide comments on the inclusion of the site on the Superfund list (U.S. Environmental Protection Agency, 2008).

Consumption

Data for magnesium metal are collected from two voluntary surveys of U.S. operations by the U.S. Geological Survey. Of the 68 companies canvassed for magnesium consumption data, 54% responded, representing 44% of the magnesium-base scrap consumption listed in table 2 and the primary magnesium consumption listed in table 3. Data for the 31 nonrespondents were estimated on the basis of prior-year consumption levels and other factors.

Reported primary magnesium consumption in 2008 was about 19% lower than that in 2007 (table 3), most of which was attributed to reduced consumption for diecastings. Consumption of primary magnesium for diecasting applications was more than 50% lower than that in 2007, reflecting the closure of diecasting operations in the United States as vehicle production declined. According to the International Organization of Motor Vehicle Manufacturers (2009), U.S. vehicle production in 2008 decreased by 19.3% from that in 2007, and production in Canada also was 19.4% lower. Aluminum alloying was the principal use for primary magnesium, accounting for 60% of the total, followed by diecasting with 17% and iron and steel desulfurization with 12%.

On January 11, magnesium diecaster Lunt Manufacturing Inc. closed its plants in Hampshire and Schaumberg, IL, after 34 years in business citing foreign competition as the reason for the closures. The company had begun laying off workers in December 2007. Lunt Manufacturing produced more than 200 different components, primarily for the automotive industry (McCoppin, 2008).

Softness in the North American auto industry coupled with high magnesium prices affected several magnesium diecasting companies. Magnesium Aluminum Corp. (Cleveland, OH) closed its magnesium diecasting operation in midyear because the company's leading customer planned to move a significant amount of business offshore. The company, which had been in business since 1973, made lightweight auto steering components, such as steering columns and the armatures for steering wheels (Metal-Pages Ltd., 2008b). Intermet Corp. (Fort Worth, TX) filed for Chapter 11 bankruptcy protection in August, citing low auto sales and high commodity prices as the reason for the filing. The company operated a magnesium diecasting facility in Palmyra, MO, in addition to aluminum and zinc diecasting facilities in the midwestern United States. Intermet previously had filed for Chapter 11 bankruptcy protection in 2004 and emerged as a private company in 2005 (Cowden, 2008b). Spartan Light Metal Products Inc. (St. Louis, MO) began laying off employees at its Mexico, MO, magnesium diecasting facility because of dramatically reduced orders for Ford Motor Co.'s F-150 pickup trucks (Cowden, 2008a). In December 2007, Gibbs Die Casting Corp. announced that it was closing its magnesium diecasting plant in Harlingen, TX, because of the declining market share of the traditional U.S. auto manufacturers and the downturn of North American auto sales. Gibbs planned to move some of the operations to its Henderson, KY, diecasting plant (Stinnett, 2007).

Because of the escalation in magnesium prices, General Motors Corp. (GM) switched from annual-fixed-price to market-based pricing effective May 1, 2008. GM has purchased magnesium under contract, primarily from two sources—U.S. Magnesium and China's Nanjing Welbow Metals Co., Ltd.—that it would resell to diecasters that produced parts for GM. Contract prices negotiated for 2008 were reported to be $1.35 to $1.45 per pound; magnesium purchased at these prices was sold to GM's contract diecasters at about $1.70 per pound. Under the new pricing strategy, GM planned to adjust its prices monthly using the Platts Metals Week U.S. spot Western price as a basis for the adjustments (McBeth and Shair, 2008).

Stocks

Producers' yearend 2008 stocks of primary magnesium increased from those at yearend 2007; producer stock data were withheld to avoid disclosing company proprietary data. Consumer stocks of primary and alloy magnesium were 6,920 t at yearend 2008, 24% higher than the yearend 2007 level of 5,580 t (revised).

Prices

Domestic magnesium prices continued to increase rapidly and reached $2.80 to $3.15 per pound by the end of January 2008. This was the highest price since 1995, when the magnesium price range peaked at $2.19 to $2.35 per pound. Beginning in 2008, Platts Metals Week introduced a new price series—

99.8%-pure magnesium, f.o.b. Tianjin, China (table 4). The new price listing will provide a gauge of prices from the leading producing country.

From the end of 2007 to the end of the first quarter of 2008, the average U.S. spot Western price increased by nearly $1.00 per pound. Prices in China and Europe also increased significantly. Several factors contributed to these price escalations. In the United States, a decline in imports from Russia and Canada, two of the leading import sources, caused a supply shortage on the spot market. In China, increased prices for ferrosilicon, power, and transportation were cited as causes for the rapid price increase. In addition, environmental crackdowns by the Government of China may have led to shutdowns at some smaller plants, but the larger plants in Shanxi Province were still operating. Concerns about potential plant closures prior to the Olympics to reduce air pollution also may have pushed prices higher in China (Shair, 2008).

In the United States, the Platts Metals Week U.S. spot Western price range reached a peak of $3.50 to $3.70 per pound at the beginning of July. In China, the magnesium price range reached a high of $5,950 to $6,250 per metric ton at the end of May, but began falling rapidly after that. After consumption in China and in Europe had fallen, consumers were working off some of their stocks rather than purchasing magnesium on the spot market at the high prices. Essentially two markets developed in 2008 after prices peaked—the U.S. market and the market in the rest of the world. Although they fell from the alltime high in July, U.S. spot prices remained high because of antidumping duties assessed on two of the leading magnesium supplying countries—China and Russia. Although some magnesium from both these countries has been imported into the United States, supplies from these countries were not as substantial as in the past. Because of weak demand in the auto industry and the global financial situation, many domestic magnesium consumers did not purchase magnesium on the open market and were reluctant to negotiate 2009 contracts (Jennemann, 2008). In China, however, prices dropped nearly as quickly as they had increased. By yearend, the average Platts Metals Week China magnesium price was $2,950 per ton, less than one-half of the high for the year. In contrast, the average U.S. spot Western price at yearend was only 12% lower than the high in 2008.

Later in the year, consumers were beginning to negotiate prices for 2009 purchases but reportedly were not able to lock in contract pricing. Press reports indicated that initial 2009 offer levels were $3.50 to $4.00 per pound (McBeth, 2008c).

Foreign Trade

Total magnesium exports for 2008 were about 3% less than those in 2007 (table 5). Canada (47%), Mexico (20%), and Singapore (12%) were the principal destinations. Exports of metal to Canada fell significantly mainly because of the idling of automotive diecasting capacity there.

Magnesium imports for consumption in 2008 were about 16% higher than those in 2007 (table 6). Magnesium metal (containing at least 99.8% by weight of magnesium) imports increased by 63% compared with those in 2007, and alloy imports were 41% lower. The increase in metal imports was mainly a result of increased imports from China; this presumably was imports from TMI, the only firm that had no antidumping duty imposed on imports. A significant quantity of magnesium was imported from China into the United States right before the U.S. Government's decision on antidumping duties was scheduled to be announced. Magnesium alloy imports fell in 2008 because of a decline in imports from Canada. With the closure of magnesium production capacity in Canada and reduced demand by the automotive industry for magnesium diecastings, alloy demand fell as well. Israel (49%) and China (43%) were the principal sources of imported magnesium metal. Israel (30%) and Canada (23%) were the principal sources of imported alloys.

World Review

Bahrain.—Capivest B.S.C. (formerly Khaleej Finance & Investment B.S.C., Manama) announced that it would establish a $1 billion company to construct magnesium smelters in the Middle East and North Africa. Capivest signed an agreement with TRU Group Inc. to oversee the technical and engineering aspects of the company. Bankable feasibility studies have already been completed to construct and operate a magnesium plant in the region with an initial production capacity of 30,000 to 60,000 t/yr. The company eventually planned to build multiple magnesium smelters in different locations in the region (Metal-Pages Ltd., 2008a).

Canada.—In June, Timminco Ltd. (Toronto, Ontario) announced that it would close its manufacturing facility in Haley, Ontario, which supplied the cast magnesium billet used in Timminco's magnesium extrusion operations in Aurora, CO. All these supplies will be provided by outsource partners. The Haley plant also produced specialty magnesium granules and turnings, which will be produced at Timminco's Nuevo Laredo, Mexico, facility (Timminco Ltd., 2008).

In August, Dynacast International Ltd. (London, United Kingdom) acquired Canadian magnesium and zinc diecaster FisherCast Global Corp. (Peterborough, Ontario), which had filed for protection under the under the Companies' Creditors Arrangement Act (CCAA) in June. Also in June, Meridian Technologies Inc. (Strathroy, Ontario) announced that it had reached a restructuring agreement with its lenders. Under the terms of the agreement, a newly reorganized company, Meridian Lightweight Technologies Inc., would be created. Meridian Technologies initiated a proceeding under the CCAA in Ontario. The application includes only Meridian's British and Canadian operations. As part of the agreement, the company received new financing of up to $55 million consisting of a $30 million revolving credit facility and a $25 million term loan. In addition to the new financing, the company's secured lenders exchanged a significant portion of the existing debt for all of the equity in Meridian Lightweight Technologies. Meridian Lightweight Technologies had magnesium diecasting operations in Canada, China, the United Kingdom, and the United States (McBeth, 2008b).

Gossan Resources Ltd. (Winnipeg, Manitoba) announced that the CANMET Materials Technology Laboratory (Ottawa, Ontario) would conduct bench scale testing of the Zuliani process to extract magnesium metal from dolomite. CANMET planned to undertake several bench-scale tests to confirm

process thermodynamics and kinetics for the Zuliani technology. Gossan holds a large high-purity magnesium dolomite property at Inwood, Manitoba, and the worldwide rights for the Zuliani process, a new magnesium production process projected by the company to significantly reduce the direct operating cost of production (Gossan Resources Ltd., 2008). Gossan has been attempting to develop the Inwood property since 2003.

China.—According to the China Nonferrous Metals Industry Association, China produced 631,000 metric tons (t) of magnesium in 2008, slightly more than that in 2007. The distribution of production among the provinces and regions was as follows: Shanxi Province, 326,000 t; Shaanxi Province, 86,200 t; Ningxia Autonomous Region, 68,200 t; Inner Mongolia Autonomous Region, 8,700 t; and Jilin Province, 1,900 t (China Magnesium Industry & Market Bulletin, 2009c). The China Magnesium Association, however, reported that primary magnesium production was 558,000 t, 15% lower than production in 2007, and China's consumption was 158,000 t, 40% lower than consumption in 2007 (China Magnesium Industry & Market Bulletin, 2009a). The discrepancy may be the result of double counting magnesium granule production. Also, according to the China Magnesium Association, 18 magnesium plants that use direct coal combustion as a fuel source were forced to close in 2008 because their energy consumption and pollution were extremely high. There were 66 magnesium smelters within China, with a total production capacity of 1.16 million metric tons per year, which was 19% higher than 2007 capacity (China Magnesium Industry & Market Bulletin, 2009b).

In China, companies continued to implement expansion plans for magnesium metal and alloy production. China Magnesium Industry & Market Bulletin (2008) reported more than 50 projects that were announced to add magnesium metal, alloy, and/or diecasting capacities in China. Some were upgrades of existing capacity that had been shut down, but most were new projects that could increase production capacity significantly. Additional proposed primary production capacity totaled more than 3 million metric tons, although many of these plants most likely will not be constructed because the market would not support that much additional capacity.

Prices in China fell rapidly during the third quarter and reportedly have dropped below the cost of production. As a result, several plants temporarily closed or reduced production levels. Taiyuan Yiwei Magnesium Industry Co. Ltd. (Taiyuan City, Shanxi Province), one of the country's leading magnesium producers with a capacity of 80,000 t/yr, reduced production to about 12,000 t/yr (Shair and McBeth, 2008a). Shanxi Guangling Jinhua Magnesium Industry Science and Technology Co. (Beijing) reportedly closed its 12,500-t/yr plant in October citing low prices. Shanxi United Magnesium Industry Co. Ltd. (Taiyuan City) reported that it had reduced its magnesium output by more than one-half to 1,200 to 2,400 t/yr because of weak demand (Shair and McBeth, 2008b).

In January, China Direct Inc. (Boca Raton, FL) announced that its subsidiaries, Jinwei Magnesium Co., Ltd. and Pan Asia Magnesium Co., Ltd., started production at two newly constructed 6,000-t/yr primary magnesium plants. The startups mark the completion of the second stage of construction at Jinwei and Pan Asia, which each have the capacity to produce 12,000 t/yr of magnesium (China Direct, Inc., 2008b). By May, the company began production at its third 6,000-t/yr facility at Pan Asia (Shanxi Province), and Baotou Changxin Magnesium Co., Ltd. (Inner Mongolia Autonomous Region) began production at its first 8,000-t/yr facility. Beginning in June, Baotou Changxin brought an additional 4,000 t/yr of capacity onstream, bringing the total annual production capacity at Baotou Changxin to 12,000 t/yr (China Direct, Inc., 2008a).

Congo (Brazzaville).—In June, MagMetals Inc. [a subsidiary of MagIndustries Corp. (Toronto)] signed a technology license agreement with Norsk Hydro ASA that granted MagMetals a nonexclusive license to use Norsk Hydro's technology to construct and operate a magnesium plant in Africa. In addition to this license agreement, MagMetals also purchased equipment from Hydro's recently closed magnesium plant in Becancour, Quebec, Canada; the equipment was auctioned off in early June. This equipment, together with plant engineering documents, operational data, and an extensive photo library, was expected to form the core of MagMetals newly established technology center in Quebec. The technology center was designed to support upcoming technical and economic studies for a final feasibility study of a proposed 60,000-t/yr magnesium metal plant near Kouilou (MagIndustries Corp., 2008). MagMetals has been attempting to develop magnesium metal production capacity in Congo (Brazzaville) since 1997.

Israel.—In December, Volkswagen AG (Wolfsburg, Germany) (VW) announced that it would return its 35% ownership in the Dead Sea Magnesium plant to its majority owner, Israel Chemicals Ltd. (Tel Aviv) (ICL). The Dead Sea Magnesium joint venture, established in 1995, operated a 35,000-t/yr plant where magnesium is recovered from brines from the Dead Sea. Although the joint venture has had financial difficulties since it began operation and was reported to have a debt of more that $100 million, VW reportedly viewed itself as no longer responsible for this debt. As a result, ICL planned to take legal action against VW (Sandler, 2008).

Malaysia.—Commerce Venture Magnesium Sdn Bhd [a unit of Ho Wah Genting Bhd (Kuala Lumpur)] (CVM) announced that it was constructing a 15,000-t/yr magnesium plant in Taiping, Perak State, at a cost of about $54.4 million. A groundbreaking ceremony was held on February 26, and the plant was expected to be completed by the first half of 2009. CVM reportedly had exclusive mining rights to extract dolomite from two limestone-dolomite deposits in Kuala Kangsar under a 20-year agreement with Harta Perak Corp Sdn Bhd. CVM also planned to raise at least RM 60 million (about $19 million) by a planned listing on the Hong Kong, China, stock exchange to finance a 15,000-t/yr expansion by 2010 (Kaur, 2008).

Mexico.—In March, Meridian Technologies opened a new manufacturing facility in Ramos Arizpe to produce magnesium diecastings for the automotive industry. The initial manufacturing facility would have 3 diecasting machines, each with a capacity of 1,600 short tons, and 7 machining centers and would employ 84 workers (Meridian Technologies Inc., 2008).

Norway.—SilMag D.A., a new company formed by a 50:50 joint venture between Norsk Hydro and AMG Advanced Metallurgical Group N.V. (Amsterdam, Netherlands),

announced that it would establish a pilot plant at Norsk Hydro's shuttered magnesium plant in Porsgrunn in early 2009. Upon completion of the pilot program, AMG and Hydro would jointly evaluate the decision to invest in a commercial scale production facility. SilMag planned to produce primary and recycled magnesium using locally produced olivine as a raw material. (Norway was the world's leading olivine producer.) Coproduct silica also would be produced at the plant. SilMag was negotiating with Norsk Hydro to use the idle equipment at Porsgrunn, where the primary production plant has been closed since 2005, and the casthouse has been closed since 2006. SilMag planned to refurbish the recycling facilities by late 2008 or early 2009 with a capacity of 15,000 t/yr. The primary magnesium plant was expected to take about 2 years to complete and was projected to be completed by 2011 with a capacity of 35,000 t/yr, slightly less than the capacity at the plant when it closed (Blamey, 2008).

Outlook

The downturn in the global economy was expected to be the most significant influence on U.S. magnesium production and consumption. Although magnesium supplies in the United States were expected to be lower than in the past because of closures of primary magnesium facilities in Canada and limited availability of magnesium from Russia, lower consumption levels were expected offset the drop in supplies. Yet, because supplies of magnesium from China (the leading producer) were limited because of antidumping duty regulations, prices were expected to remain relatively high compared with prices prior to 2007. Newly installed capacity at U.S. Magnesium's plant in Rowley was expected to be used by Allegheny Technologies Inc. to recycle magnesium chloride generated at Alleghheny Technologies' titanium sponge plant under construction nearby. The new plant was scheduled to be operational by yearend 2009 and would produce nearly 11,000 t/yr of titanium sponge; however, projected delays in aircraft production may limit titanium production, so U.S. Magnesium's capacity may be available to produce magnesium for other uses (Metal-Pages Ltd., 2009).

U.S. magnesium consumption was expected to remain depressed in light of the global economic woes. GM's bankruptcy filing in June 2009 coupled with North American vehicle production in the first half of 2009 that was 50% lower than that in 2008 (WardsAuto.com, 2009) most likely will be reflected in lower production of magnesium diecastings. However, new corporate average fuel economy (CAFE) rates that were legislated in 2007 in the Energy Independence and Security Act of 2007 (Public Law 110–140) could provide an impetus to continue to increase the quantity of magnesium diecastings used in domestically produced automobiles. The section relating to CAFE requires the average fuel economy of the Nation's new car and light truck fleet to begin increasing from present levels with the 2011 model year and to reach 35 miles per gallon by the 2020 model year (U.S. Congress, 2007, p. 8–18).

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TABLE 1
SALIENT MAGNESIUM STATISTICS[1]

(Metric tons unless otherwise specified)

	2004	2005	2006	2007	2008
United States:					
Production:					
Primary magnesium	W	W	W	W	W
Secondary magnesium	72,100 r	73,300	81,700 r	83,300 r	75,700
Exports	11,800	9,650	12,300	14,800	14,400
Imports for consumption	98,600	84,700	75,300	71,800	83,300
Consumption, primary	101,000	82,100	77,600	72,200 r	58,400
Yearend stocks, producer	W	W	W	W	W
Price[2] dollars per pound	1.55–1.60	1.15–1.30	1.35–1.45	2.00–2.50	3.05–3.25
World, primary production e	595,000	622,000	675,000	751,000 r	671,000

eEstimated. rRevised. W Withheld to avoid disclosing company proprietary data.
[1]Data are rounded to no more than three significant digits.
[2]Source: Platts Metals Week.

TABLE 2
MAGNESIUM RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES, BY KIND OF SCRAP AND FORM OF RECOVERY[1]

(Metric tons)

	2007	2008
KIND OF SCRAP		
New scrap:		
Magnesium-base	16,600	14,400
Aluminum-base	43,200 r	39,000
Total	59,900 r	53,400
Old scrap:		
Magnesium-base	807	1,210
Aluminum-base	22,700 r	21,100
Total	23,500 r	22,300
Grand total	83,300 r	75,700
FORM OF RECOVERY		
Magnesium alloy ingot[2]	W	W
Magnesium alloy castings	484	385
Magnesium alloy shapes	262	175
Aluminum alloys	66,300 r	60,500
Other[3]	16,300	14,600
Total	83,300 r	75,700

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Other."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes secondary magnesium content of both secondary and primary alloy ingot.
[3]Includes chemical and other dissipative uses, cathodic protection, and data indicated by symbol W.

TABLE 3
U.S. CONSUMPTION OF PRIMARY MAGNESIUM, BY USE[1]

(Metric tons)

Use	2007	2008
For structural products:		
Castings:		
Die	23,100	10,200
Permanent mold	29	19
Sand	598 r	428
Wrought products[2]	2,820 r	2,480
Total	26,600 r	13,100
For distributive or sacrificial purposes:		
Aluminum alloys	32,000 r	35,000
Cathodic protection (anodes)	916	824
Iron and steel desulfurization	9,290	7,070
Nodular iron	142 r	61
Reducing agent for titanium, zirconium, hafnium, uranium, beryllium	1,280	1,320
Other[3]	2,010	1,080
Total	45,600 r	45,300
Grand total	72,200 r	58,400

rRevised.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes sheet and plate and forgings.
[3]Includes chemicals and scavenger, deoxidizer, and powder.

TABLE 4
YEAREND MAGNESIUM PRICES

Source		2007	2008
Platts Metals Week:			
U.S. spot dealer import	dollars per pound	1.80–2.30	3.00–3.25
U.S. spot Western	do.	2.00–2.50	3.05–3.25
China	dollars per metric ton	NA	2,900–3,000
European free market	do.	3,900–4,200	2,900–3,000
Metal Bulletin:			
China free market	do.	4,200–4,900	2,800
European free market	do.	4,100–4,500	2,800–2,900

do. Ditto. NA Not available.

TABLE 5
U.S. EXPORTS OF MAGNESIUM, BY COUNTRY[1]

	Waste and scrap		Metal		Alloys		Powder, sheets, tubing, ribbons, wire, other forms	
Country	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
2007:								
Brazil	19	$59	--	--	1,210	$3,760	5	$180
Canada	1,210	2,930	3,420	$8,580	4,660	13,000	359	5,270
Mexico	423	722	825	1,630	1,160	3,770	140	1,350
Singapore	--	--	1	4	1	4	3	88
United Kingdom	--	--	--	--	36	139	272	7,290
Other	143	290	37 r	78 r	511 r	2,920	391 r	8,610 r
Total	1,800	4,000	4,290	10,300	7,570	23,600	1,170	22,800
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

rRevised. -- Zero.
[1]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[1]

	Waste and scrap		Metal		Alloys, magnesium content		Powder, sheets, tubing, ribbons, wire, other forms, magnesium content	
Country	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
2007:								
Canada	11,100	$17,100	1,070	$3,950	13,100	$48,600	805	$3,090
China	334	628	3,450	9,940	64	187	625	4,560
Israel	--	--	14,500	41,500	2,420	7,560	--	6
Kazakhstan	--	--	974	2,570	--	--	--	--
Mexico	2,750	2,360	--	--	1,990	4,820	--	--
Russia	--	--	6,110	12,200	--	--	20	488
Other	7,050	14,400	1,010	3,380	4,360	18,400	37	1,510
Total	21,200	34,500	27,200	73,500	21,900	79,600	1,490	9,650
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

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 7
WORLD ANNUAL PRIMARY MAGNESIUM
PRODUCTION CAPACITY, DECEMBER 31, 2008[1]

(Metric tons)

Country	Capacity
Brazil	18,000
Canada	9,000 [2]
China	953,000
India	900
Israel	27,500
Kazakhstan	10,000
Russia	80,000
Serbia	5,000
Ukraine	15,000 [2]
United States	52,000
Total	1,170,000

[1]Includes capacity at operating plants as well as at plants on standby basis.

[2]Idle.

TABLE 8
MAGNESIUM: ESTIMATED PRIMARY WORLD PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country	2004	2005	2006	2007	2008
Brazil	6,000	6,000	6,000	18,000	15,000
Canada[3]	54,000	50,000	65,000	16,300	--
China	442,000	470,000	520,000	625,000 [r]	559,000
Israel	28,000	27,853 [4]	24,581 [4]	29,618 [r, 4]	35,000
Kazakhstan	18,000	20,000	21,000	21,000	21,000
Russia[3]	45,000	45,000	35,000	37,000	37,000
Serbia	1,600 [5]	1,500 [5]	1,500	1,500	1,500
Ukraine	3	2,000	2,200	2,500	2,500
United States	W	W	W	W	W
Total	595,000	622,000	675,000	751,000 [r]	671,000

[r]Revised. W Withheld to avoid disclosing company proprietary data; not included in "Total." -- Zero.
[1]World totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.
[2]Table includes data available through July 14, 2009.
[3]Includes secondary.
[4]Reported figure.
[5]Montenegro and Serbia formally declared independence in June 2006 from each other and dissolved their union.