MAGNESIUM

By Deborah A. Kramer

World oversupply of magnesium in 1996 led to a sharp decline in prices throughout the year. As a result of this oversupply, production in the United States declined in 1996. Despite the antidumping duties assessed on Russia, it continued to be the largest import source of primary magnesium. Canada, which was assessed antidumping and countervailing duties, was the largest import source of alloy magnesium. For the first time in 20 years, the United States imported more magnesium than it exported.

Automotive applications continued to dominate new applications for magnesium. Automotive manufacturers introduced several new magnesium components in their 1996 and 1997 models and planned additional components in the coming model years. Because of the wide price swings of magnesium, however, some automakers reversed plans to use magnesium in some applications.

A new primary magnesium plant in Israel produced its first magnesium ingot near the end of 1996. After completing routine shakedown procedures, the plant should be operating at its 27,500-metric-ton-per-year capacity in 1997. Plans continue to construct new primary magnesium plants in Australia, Canada, and Iceland. The Icelandic facility is expected to be completed by 1999; the Canadian facility, by 2000; and the Australian plant, by 2002. When the three plants are operational, they are expected to add 168,000 tons to world annual production capacity.

Legislation and Government Programs

Several changes to the antidumping and countervailing duties assessed on magnesium and magnesium alloy imports from Norsk Hydro Canada Inc. were announced during 1996. Two preliminary countervailing duty determinations were announced by the International Trade Administration (ITA) as a result of administrative reviews. For the period December 6, 1991, to December 31, 1992, countervailing duties for pure and alloy magnesium from Norsk Hydro Canada would be increased to 9.87% ad valorem from the current level of 7.61% ad valorem (U.S. Department of Commerce, 1996c). A preliminary review of countervailing duties on pure and alloy magnesium imports from Canada resulted in the determination of a rate of 4.01% ad valorem for the 1994 calendar year (U.S. Department of Commerce, 1996d). Final results of these reviews were not completed by yearend.

The ITA also issued final determinations on its antidumping order on imports of pure magnesium from Canada as a result of administrative reviews. For the period August 1, 1994, to July 31, 1995, the ITA determined that the weighted average dumping margin for magnesium imports from Norsk Hydro Canada was 0%. This deposit rate will be effective for all pure magnesium imported into the United States from Norsk Hydro Canada after August 12, 1996, the publication date of the final results (U.S. Department of Commerce, 1996e). Because there were no sales of magnesium for the period February 20, 1992, to July 31, 1993, the ITA could not assess separate dumping rates for this period, and the dumping margin of 0% that was established in August was applied to this period (U.S. Department of Commerce, 1996f).

The ITA received requests to conduct administrative reviews of the antidumping and countervailing duties on pure magnesium from Canada covering the period August 1, 1995, to July 31, 1996. The investigation was initiated in September, and final results of this review were scheduled for no later than August 31, 1997 (U.S. Department of Commerce, 1996b).

The ITA offered an opportunity for interested parties to request an administrative review of magnesium imported from China, Russia, and Ukraine. The period covered under the request was November 7, 1994, to April 30, 1996 (U.S. Department of Commerce, 1996a).

Taiyuan Heavy Machinery Import and Export Corp. of China requested a new shipper administrative review of the antidumping duty order on pure magnesium from China. Taiyuan maintains that it did not export magnesium to the United States during the period of investigation, and that it is not affiliated with any producer that did export magnesium during the period of investigation. Commerce is initiating the requested review and will issue final results no later than the end of September 1997 (U.S. Department of Commerce, 1996g).

Production

U.S. primary magnesium production declined by about 6% from 1995 production. World magnesium oversupply and high prices were primarily responsible for the production decrease. Capacity utilization was about 91%. *(See tables 1 and 2.)*

Consumption

Reported consumption of primary magnesium decreased in 1996, mainly because of a drop in demand for magnesium used in aluminum alloying. Aluminum alloying remained the largest end-use application for magnesium, however, representing 51% of total reported primary consumption; this percentage has been decreasing over the last few years as structural applications continue to grow. Structural uses, mostly diecasting, accounted for 24% of total reported consumption. *(See tables 3 and 4.)*

Use of magnesium alloys in automotive applications continued to grow in 1996. The 1997 model year cars were estimated to contain an average of 2.9 kilograms per vehicle, an increase of 16% from the 1996 level of 2.5 kilograms. New applications in the 1997 model year included instrument panel support beams in some General Motors Corp. (GM) luxury sedans, seat back frames in some GM minivans, and steering column support brackets in some GM and Chrysler Corp. sedans.

In October, Diemakers Inc. reportedly installed the first of two 1,200-ton, cold-chamber diecasting machines at its new facility in Hannibal, MO. Production at the plant was expected to begin in the first quarter of 1997, about 3 months earlier than originally scheduled, because of several new automotive diecasting jobs (Platt's Metals Week, 1996c).

Ganton Technologies reportedly began construction of a new magnesium diecasting facility in Pulaski, TN. The first phase of construction, begun near yearend, was expected to be completed in April 1997, with commercial production beginning in October. Growth in automotive diecasting was cited as the reason for constructing the new plant (Metal Bulletin, 1996b).

Spectrulite Consortium, through a joint venture with Resource Recycling Inc., planned to build a 17,000-ton-per-year nonferrous metals recycling facility in Foley, AL. The joint venture, called Cherokee Metal Recycling, planned to process mixed magnesium alloys, oily scrap, and machine chips, as well as magnesium and aluminum drosses. In addition, the company has purchased a casting line from the defunct Magnesium Co. of Canada plant, which will give Cherokee the capability to produce 4,500 tons of magnesium alloy anodes annually. Construction of the plant began in April (Platt's Metals Week, 1996l).

In July, Garfield Alloys Inc. announced that it would build a new magnesium recycling facility in Bellvue, OH, with a total annual capacity of 13,600 tons. The company already operates a 9,100-ton-per-year recycling plant near Cleveland, which it is in the process of expanding to 13,500 tons per year. The new plant, which was scheduled to be in operation by the second quarter of 1997, will operate under the name MagReTech Inc. and will process clean Type I magnesium scrap only. The facility should have the potential to double its capacity if conditions warrant (Platt's Metals Week, 1996m). Spectrulite also was continuing its efforts to increase recycling capacity at its Madison, IL, plant. The company has added 8,000 tons of annual capacity by installing new equipment and planned to increase annual output by 18,000 tons by the end of 1998 (Metal Bulletin, 1996c). Garfield Alloys and Spectrulite are installing new capacity in response to increased scrap generation by the diecasting industry. Spectrulite estimated that the scrap generation rate for diecasting operations was 40% to 50%.

In June, GM announced that it had signed a long-term contract with Norsk Hydro S.A. to supply GM with its magnesium alloy needs. Although contract terms were not disclosed, the quantity of magnesium alloys was significant, and the contract will extend well into the next decade. Norsk Hydro will supply the magnesium alloys, principally AM60, but also AZ91, to diecasters that are producing parts for GM at a price that is fixed for a 1-year period. Each year, the pricing will be renegotiated. This is the second long-term contract between an automotive manufacturer and a magnesium production firm (the other was Volkswagen and Dead Sea Magnesium in 1995) indicating that automotive manufacturers are committed to maintaining or increasing the quantity of magnesium in these applications (Platt's Metals Week, 1996f).

In February, Ford Motor Co. announced that it would use a urethane-covered magnesium armature for the steering wheels of its redesigned F-series pickup trucks, standard-size sports-utility vehicles, and Econoline vans. The magnesium alloy steering wheels, developed by United Technologies Automotive, will be about one-half of the weight of the steel components that they replace (American Metal Market, 1996).

GM chose magnesium alloy components for two new applications—seats in some 1997 model minivans and battery cases for the company's new electric vehicles. Die-cast magnesium alloy AM60 was chosen as the material for GM's minivan seat back frames and seat bottoms, which will require about 1,400 tons of magnesium annually. Each seat component was expected to weigh between 4.1 and 6.8 kilograms, depending on the minivan model. Meridian Technologies Inc., Toronto, Canada, will be the supplier of the AM60 casting for this application, and Norsk Hydro Canada will be the magnesium source (Wrigley, 1996c). For the battery-case applications, the alloy AZ91D will be molded by a process called Thixomolding, which combines the features of diecasting and injection molding. Although only 2,000 to 3,000 of the electric vehicles will be made annually, magnesium will be used in a number of other components, such as seat frames (Wrigley, 1996b).

Rapidly changing magnesium costs were cited as the reason for two U.S. auto manufacturers to cancel some programs to incorporate more magnesium diecastings into domestic passenger vehicles. Ford decided against switching from steel to magnesium in seat frames for its front-wheel-drive Windstar minivans, which was scheduled to begin with the 1997 models. Conversion of the seat-back frames, and eventually, the seat-bottom frames, was expected to require over 3,600 tons of magnesium diecasting alloy annually. The company also canceled the use of magnesium seat frame bottoms in its low-volume Mustang Cobra model (Wrigley, 1996d). In addition, Ford announced that it would use steel instead of magnesium alloys for the instrument panel support beams in its new luxury sport sedans, scheduled for introduction in 1999 (Wrigley, 1996a). GM decided against switching from aluminum to magnesium in some of its transmission cases. GM said that it could achieve a weight reduction similar to that from magnesium substitution by designing aluminum cases with thinner wall sections than normal (Wrigley, 1997).

Data for magnesium metal are collected from two voluntary surveys of U.S. operations. Of the 94 companies canvassed for magnesium consumption data, 61% responded, representing 55% of the primary magnesium consumption shown in tables 1 and 3. Data for the 33 nonrespondents were estimated based on prior-year consumption levels and other factors.

Stocks

Producers' yearend 1996 stocks of primary magnesium increased to 17,400 tons from the yearend 1995 level of 12,100 tons. This represents about 1.5 months of production at 1996 rates. Consumer stocks of primary and alloy magnesium increased slightly to 8,720 tons at yearend 1996; the 1995 yearend stocks were 8,700 tons (revised). Yearend 1996 consumer stocks of secondary magnesium declined to 572 tons from the 1995 level of 613 tons.

Prices

Primary magnesium prices dropped throughout 1996 mainly because of an oversupply of material to the world market. The sharpest decline occurred during the first 4 months of the year when the free market price dropped by about $1,000 per ton. At the beginning of 1996, the Metal Bulletin free market price range was $4,075 to $4,200 per ton; by yearend this range had fallen to $2,400 to $2,650 per ton. Other quoted prices followed similar patterns. The Platt's Metals Week European free market price range declined from $4,150 to $4,250 per ton at the beginning of 1996 to $2,600 to $2,700 per ton by yearend. As quoted throughout the year by Platt's Metals Week, the U.S. spot Western price range declined from $1.93 to $2.25 per pound at the start of the year to $1.70 to $1.80 per pound by yearend, and the U.S. spot dealer import price range declined from $2.18 to $2.22 per pound to $1.43 to $1.48 per pound by yearend.

Despite the drop in transaction prices, the U.S. producers did not lower their list prices for primary magnesium until near yearend. In December, Magnesium Corp. of America (MagCorp) announced that it was lowering its list price from $1.93 per pound to $1.80 per pound, effective January 1, 1997. Later, Dow Magnesium matched MagCorp's price reduction, also effective January 1, 1997. Both U.S. producers maintained a price quotation of $1.70 per pound for diecasting alloy AZ91D throughout 1996, although they were offering an 8-cent-per-pound discount on the material (Ozols, 1996).

Foreign Trade

Magnesium exports in 1996 were slightly higher than those in 1995 with most of the increase in scrap exports to Canada. Some of this increase was offset by a drop in exports of primary metal. Imports of magnesium in 1996 increased by 34% from the 1995 level. Imports of primary magnesium were almost three times greater and alloy imports were about 1.5 times as large as imports in 1995. Canada (52%) and Russia (33%) were the principal import sources; imports from Canada were mostly in the form of alloy, and imports from Russia were mostly primary metal. *(See tables 5 and 6.)*

World Review

The United States continued to lead the world in production and production capacity of primary magnesium, with about 39% of the world production, and about 28% of total world capacity. *(See tables 7, 8, and 9.)* Several sources report conflicting figures for China's magnesium production in 1995, ranging from about 12,000 tons to more than 90,000 tons. The 12,000-ton figure most likely counts production from the country's three largest smelters only; many small magnesium production plants (less than 200-ton annual capacity) operate intermittently. Much of China's magnesium production is exported to Japan; this was estimated to be about 40,000 tons in 1995. Production was most likely in the 60,000-ton-per-year range, with the production not exported remaining in stockpiles. Information conflicts regarding China's magnesium production capacity as well. This also stems from the small magnesium plants. Because they operate intermittently and production is used locally, capacity of and production from these plants is not well documented. Sources have published figure as high as 200,000 tons per year as China's annual production capacity.

Oversupply of magnesium affected stock levels throughout the world. According to the International Magnesium Association, 1996 yearend stocks for world producers were 42,100 tons, nearly double the 1995 level of 22,800 tons. World primary magnesium shipments of 295,400 tons were 3% less than those in 1995, with increases in shipments for diecasting and desulfurization offset by declines in shipments for aluminum alloying (International Magnesium Association, 1997).

The European Commission (EC) extended a provisional antidumping decision through the end of June 1996 that imposed minimum prices on magnesium imported from Russia and Ukraine. Minimum import prices of $3,365 per ton for Russian magnesium and $3,315 per ton for Ukrainian magnesium were in effect since December 1995. A delegation from one of the Russian producers and some traders went to Brussels, Belgium, in March 1996 to request that the minimum prices be reduced and that they would be given a quota beneath the floor price so they could import some magnesium into the EC (Platt's Metals Week, 1996d).

Despite a lapse in the provisional decision, the EC retained its antidumping duties on Russian and Ukrainian magnesium imports. However, the duties on both countries' imports were lowered. The minimum import price for Russian magnesium was lowered from 2,735 European Currency Units (ECU) per ton to 2,602 ECU per ton, and the minimum import price on Ukrainian magnesium was lowered from 2,701 ECU per ton to 2,568 ECU per ton (Platt's Metals Week, 1996e). Under terms of an undertaking agreement, however, these duties will be suspended for some imports. Under a clause in the undertaking agreement between the EC, Russia, and Ukraine, specified small quantities of magnesium that are invoiced to a EC-approved importer will not be subject to the duties, even though they are brought in below the minimum value (Platt's Metals Week, 1996i).

Canada.—Norsk Hydro Canada completed a study focused on expanding capacity at its Becancour, Quebec, magnesium facility. The expansion is expected to increase primary

magnesium production capacity by 10,000 tons per year and alloy capacity by 15,000 tons per year, as market conditions warrant. Alloy expansion increases are expected to be completed by the third quarter of 1997, while no date has been set for primary capacity expansion (Metal Bulletin, 1996d).

Noranda Metallurgy was proceeding with plans to construct a commercial-scale plant to recover magnesium from asbestos tailings in Quebec. Results from 10 months of pilot-plant operation should provide fine tuning for the commercial plant. Noranda also set up a basic engineering study, to be completed by the summer of 1997. Construction of the 58,500-ton-per-year plant was expected to begin in April 1998, to be completed by April 2000 (Metal Bulletin, 1996g).

MSI Magnesium Services Inc. reportedly entered into a joint-venture research program with the Alberta Research Council to develop magnesium recycling technology for its planned 32,000-ton-per-year scrap recovery plant. The C$1.2 million project will cover 4 years and was expected to provide MSI with secondary magnesium production technologies and processes for high-yield recovery of magnesium from scrap (Platt's Metals Week, 1996j).

China.—The Japan-based diecasting company, Nippon Kinzoku, planned to form a joint venture with a Chinese magnesium producer in Sizuishan, Ningxia, to produce magnesium, mainly for export. The joint venture, called Silver River Corp., was scheduled to complete a 1,000-ton-per-year plant by April 1997. Dolomite feed material for the plant will be mined locally, and the plant will be capable of producing 99.8%-pure and 99.9%-pure magnesium. Each of the joint venture partners will be eligible to receive equal portions of the plant's production, even though Nippon Kinzoku will have a 60% holding in the joint venture (Metal Bulletin 1996f). China also was developing magnesium alloys production capacity. Trial quantities of alloys were shipped to Japan to verify standards and quality.

Germany.—The German Government announced the establishment of a $17 million, 3-year magnesium research program to be funded jointly with industry. The program goal is to develop and optimize magnesium alloy products and processes. A total of 57 German companies, including 5 auto manufacturers, are participating in the project (Light Metal Age, 1996).

Iceland.—After completing a feasibility study, officials for the Icelandic Magnesium Project (IMP) said that they would go forward with a planned primary magnesium plant. IMP planned to form a new company, the Icelandic Magnesium Corp., with its partners Salzgitter Anlagenbau GmbH of Germany and Consortium Magniy of the Former Soviet Union. A 50,000-ton-per-year plant, using new technology that does not produce commercial byproduct chlorine, was to be completed in Reykjanes by the second half of 1999. Amalgamet Canada was expected to market primary metal and diecasting alloys that will be produced at the plant (Metal Bulletin, 1996e).

Israel.—Dead Sea Magnesium (DSM) produced the first magnesium ingot on December 14, 1996, from its new plant in Sdom, Israel. After a shakedown procedure that is expected to last until March 1997, full-scale production would begin. The plant, with an annual capacity of 27,500 tons, was scheduled to produce 10,000 tons of magnesium in 1997 (Platt's Metals Week, 1996h). In June 1996, DSM completed a sole-agency deal with Japan's Nissho Iwai to supply the firm with 5,000 tons per year of magnesium beginning in 1997 after the Sdom plant is running at capacity (Metal Bulletin, 1996a).

DSM also was studying plans to construct a magnesium diecasting plant as part of its primary magnesium production facility. Israel's ministry of trade and industry was expected to support the new plant because of high unemployment in the area; estimated employment at the plant would be 100 (Platt's Metals Week, 1996b).

An Israeli diecasting firm, Ortal Diecasting Ltd., signed a memorandum of understanding with Germany's Druckgusswerk Mossner GmbH to construct a $40 million magnesium diecasting plant in Israel. The project, a 50-50 joint venture between the two firms, will produce 4,000 tons per year of magnesium diecastings at a plant at the Neve Ur kibbutz. Completion of the plant is scheduled for 1998 (Platt's Metals Week, 1996g). Ortal Diecasting also signed an agreement with Germany's Audi AG to produce magnesium parts for the auto manufacturer. Ortal's magnesium supplier was expected to be DSM, beginning in 1997. The contract, valued at an estimated $7 million, requires DSM to provide 1,600 tons of magnesium in 1997, increasing to 3,600 tons by 1999 (Platt's Metals Week, 1996k).

Japan.—Japan's magnesium demand reportedly reached 30,500 tons in 1995; the first time that demand exceeded 30,000 tons. The country was totally dependent on imports to supply its primary magnesium requirements, and China, with 17,700 tons, was its largest import source in 1995. Aluminum alloying continued to be the principal use for magnesium in Japan, accounting for about 70% of total demand (Roskill's Letter From Japan, 1996).

Jordan.—The Arab Potash Co. announced plans to construct a new plant to produce magnesium from Dead Sea brines. Arab Potash signed a memorandum of understanding with the Russian Government to construct a 50,000-ton-per-year plant on the Jordanian shore of the Dead Sea. No completion date for the project was scheduled (Platt's Metals Week, 1996a).

United Kingdom.—Alcan Aluminium Ltd. announced the sale of some of its downstream businesses in February. Among the operations that was sold was Magnesium Elektron Ltd., a producer of specialty magnesium alloys. Two plants, one in Swinton, United Kingdom, and the other in Lakehurst, NJ, operating as Reade Manufacturing Co., were included in the sale. The purchasers were a group of institutional investors who will manage the new company under the title British Aluminium Ltd. (Alcan Aluminium Ltd., 1996).

Outlook

Industry analysts expect global use of magnesium diecastings in automotive applications to continue to grow into the next century, with an average annual growth rate of 15% to 20%.

North America and Europe, not surprisingly, were expected to be the areas with the largest growth. The majority of the growth is expected to fall into six categories of parts—instrument panels and brackets, seat frames, steering column components, manual transmission cases, cylinder head covers, and engine intake manifolds. The principal reasons for the increase in magnesium usage are weight reduction, component consolidation (i.e. fewer individual pieces per component), and competitive cost with the material that magnesium is replacing (Magers, 1996).

With the new magnesium plants being constructed around the world, magnesium supply should keep pace with the growing demand. As is evident from the alliances being formed between auto manufacturers and magnesium producers, automakers are demonstrating a long-term commitment to magnesium.

References Cited

Alcan Aluminium Ltd., 1996, Alcan Aluminium Limited completes sale of British Alcan downstream businesses: Montreal, Alcan Aluminium Ltd. press release, February 12, 3 p.

American Metal Market, 1996, Ford vehicles to use magnesium: American Metal Market, v. 104, no. 35, February 19, p. 4.

International Magnesium Association, 1997, Magnesium: International Magnesium Association, March, 6 p.

Light Metal Age, 1996, Germany's magnesium research project: Light Metal Age, v. 54, nos. 11, 12, p. 60.

Magers, D.M., 1996, A global review of magnesium parts in automobiles: Light Metal Age, v. 54, nos., 9, 10, p. 60-62.

Metal Bulletin, 1996a, DSM completes Mg deal with Nissho Iwai: Metal Bulletin, no. 8088, June 17, p. 10.

———1996b, Ganton builds US diecasting plant: Metal Bulletin, no. 8126, November 4, p. 10.

———1996c, Garfield plans USA's third magnesium plant: Metal Bulletin, no. 8096, July 15, p. 12.

———1996d, Hydro Magnesium completes Becancour expansion study: Metal Bulletin, no. 8132, November 25, p. 7.

———1996e, Icelandic Mg project moves forward: Metal Bulletin, no. 8083, May 30, p. 11.

———1996f, Nippon Kinzoku forms Chinese Mg venture: Metal Bulletin, no. 8054, February 15, p. 16.

———1996g, Noranda moves forward with Magnola project: Metal Bulletin, no. 8139, December 19, p. 11.

Ozols, Victor, 1996, Magcorp cuts price on metal by 13¢/lb: American Metal Market, v. 104, no. 245, December 19, p. 1.

Platt's Metals Week, 1996a, Arab Potash plans Mg plant: Platt's Metals Week, v. 67, no. 15, April 8, p. 5.

———1996b, Dead Sea Works mulls magnesium plant expansion: Platt's Metals Week, v. 67, no. 45, November 11, p. 14.

———1996c, Diemakers starts Mg plant early: Platt's Metals Week, v. 67, no. 42, October 21, p. 9.

———1996d, EC extends provisional magnesium antidumping duties: Platt's Metals Week, v. 67, no. 18, April 29, p. 6.

———1996e, Europe to keep antidumping duties on Russian magnesium: Platt's Metals Week, v. 67, no. 29, July 15, p. 1, 10.

———1996f, General Motors, Hydro Magnesium sign long-term contract: Platt's Metals Week, v. 67, no. 24, June 10, p. 1,7.

———1996g, Israeli diecaster in jv: Platt's Metals Week, v. 67, no. 14, April 1, p. 5.

———1996h, Israel's Dead Sea Magnesium details production schedule: Platt's Metals Week, v. 67. no. 52, December 30, p. 5-6.

———1996i, Mg duties suspended under clause: Platt's Metals Week, v. 67, no. 30, July 22, p. 6.

———1996j, MSI-Magnesium in research jv for secondary magnesium: Platt's Metals Week, v. 67, no. 24, June 10, p. 7.

———1996k, Ortal ties up Mg deal: Platt's Metals Week, v. 67, no. 30, July 22, p. 6.

———1996l, Spectrulite, Resource Recycling build plant: Platt's Metals Week, v. 67, no. 17, April 22, p. 10.

———1996m, US magnesium recycler Garfield to build new facility: Platt's Metals Week, v. 67, no. 29, July 15, p. 10-11.

Roskill's Letter From Japan, 1996, Magnesium—Japanese demand reaches a record level: Roskill's Letter From Japan, no. 242, p. 16-17.

U.S. Department of Commerce, International Trade Administration, 1996a, Antidumping or countervailing duty order, finding, or suspended investigation; opportunity to request administrative review: Federal Register, v. 61, no. 90, May 8, p. 20791-20792.

———1996b, Initiation of antidumping and countervailing duty administrative reviews: Federal Register, v. 61, no. 181, September 17, p. 48882-48885.

———1996c, Preliminary results of first countervailing duty administrative reviews—Pure magnesium and alloy magnesium from Canada: Federal Register, v. 61, no. 54, March 19, p. 11186-11189.

———1996d, Pure magnesium and alloy magnesium from Canada; preliminary results of countervailing duty administrative reviews: Federal Register, v. 61, no. 195, October 7, p. 52435-52437.

———1996e, Pure magnesium from Canada; final results of antidumping duty administrative review: Federal Register, v. 61, no. 156, August 12, p. 41771-41773.

———1996f, Pure magnesium from Canada—Final results of antidumping duty administrative review: Federal Register, v. 61, no. 185, September 23, p. 49732-49733.

———1996g, Pure magnesium from the People's Republic of China (PRC)—Initiation of new shipper antidumping duty administrative review: Federal Register, v. 61, no. 252, December 31, p. 69067.

Wrigley, Al, 1996a, Ford jettisons magnesium: American Metal Market, v. 104, no. 157, August 14, p. 12.

———1996b, GM picks magnesium for EV1s: American Metal Market, v. 104, no. 75, April 17, p. 5.

———1996c, GM picks magnesium for new minivan seats: American Metal Market, v. 104, no. 84, April 30, p. 12.

———1996d, Magnesium switch withdrawn by Ford: American Metal Market, v. 104, no. 235, December 5, p. 1, 6.

———1997, GM's manufacturing effort slowing: American Metal Market, v. 105, no. 3, January 6, p. 4.

SOURCES OF INFORMATION

U.S. Geological Survey Publications

Magnesium. Ch. in Mineral Commodity Summaries, annual.[1]

Magnesium. Mineral Industry Surveys, quarterly.[1]

Magnesian Refractories. Ch. in United States mineral resources, U.S. Geological Survey Professional Paper 820.

Other

American Metal Market, daily.

International Magnesium Association. Magnesium, monthly.

Magnesium. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.

Metal Bulletin [London], biweekly.

Platt's Metals Week.

Roskill Information Services Ltd. Magnesium Metal 1991, 6th ed.

[1]Prior to January 1996, published by the U.S. Bureau of Mines.

TABLE 1
SALIENT MAGNESIUM STATISTICS 1/

(Metric tons unless otherwise specified)

	1992	1993	1994	1995	1996
United States:					
Production:					
Primary magnesium	137,000	132,000	128,000	142,000	133,000
Secondary magnesium	57,000	58,900	62,100	65,100	70,900
Exports	52,000	38,800	45,200	38,300	40,500
Imports for consumption	11,800	37,200	29,100	34,800	46,600
Consumption, primary	93,800	101,000	112,000	109,000	102,000
Yearend stocks, producer	5,860	17,800	11,600	12,100	17,400
Price per pound 2/	$1.46-$1.53 3/	$1.43-$1.46	$1.63	$1.93-$2.25	$1.70-$1.80
World: Primary production	295,000	269,000	282,000 r/	389,000 r/	341,000 e/

e/ Estimated. r/ Revised.
1/ Data are rounded to three significant digits, except prices.
2/ Source: Platt's Metals Week.
3/ Producer price.

TABLE 2
U.S. MAGNESIUM METAL PRODUCERS, BY LOCATION, RAW MATERIAL,
AND PRODUCTION CAPACITY IN 1996

Company	Plant location	Raw material	Annual capacity (metric tons)
The Dow Chemical Co.	Freeport, TX	Seawater	65,000
Magnesium Corp. of America	Rowley, UT	Lake brines	40,000
Northwest Alloys Inc.	Addy, WA	Dolomite	40,000
Total			145,000

TABLE 3
MAGNESIUM RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES,
BY KIND OF SCRAP AND FORM OF RECOVERY 1/

(Metric tons)

	1995	1996
KIND OF SCRAP		
New scrap:		
Magnesium-base	3,590	8,040
Aluminum-base	31,800	32,800
Total	35,400	40,800
Old scrap:		
Magnesium-base	4,330	4,520
Aluminum-base	25,400	25,600
Total	29,800	30,100
Grand total	65,100	70,900
FORM OF RECOVERY		
Magnesium alloy ingot 2/	W	W
Magnesium alloy castings	2,250	2,750
Magnesium alloy shapes	320	175
Aluminum alloys	58,000	58,800
Zinc and other alloys	10	10
Other 3/	4,570	9,180
Total	65,100	70,900

W Withheld to avoid disclosing company proprietary data; included with "Other."
1/ Data are rounded to 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 and cathodic protection, as well as data indicated by symbol "W."

TABLE 4
U.S. CONSUMPTION OF PRIMARY MAGNESIUM, BY USE 1/

(Metric tons)

Use	1995	1996
For structural products:		
Castings:		
Die	13,400	14,700
Permanent mold	1,230	1,180
Sand	601	520
Wrought products 2/	8,510	8,080
Total	23,800	24,500
For distributive or sacrificial purposes:		
Aluminum alloys	60,200	52,300
Cathodic protection (anodes)	5,970	5,450
Chemicals	470	331
Iron and steel desulfurization	13,500	13,700
Reducing agent for titanium, zirconium, hafnium, uranium, and beryllium	1,750	2,340
Other 3/	3,460	3,630
Total	85,300	77,800
Grand total	109,000	102,000

1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Includes extrusions, sheet and plate, and forgings.
3/ Includes nodular iron, scavenger, deoxidizer, and powder.

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

	Waste and scrap		Metal		Alloys (gross weight)		Powder, sheets, tubing, ribbons, wire, other forms (gross weight)	
Country	Quantity (metric tons)	Value (thou-sands)	Quantity (metric tons)	Value (thou-sands)	Quantity (metric tons)	Value (thou-sands)	Quantity (metric tons)	Value (thou-sands)
1995:								
Australia	--	--	3,000	$8,530	4	$19	19	$125
Belgium	--	--	7,950	17,400	1,540	3,580	2,500	5,820
Canada	3,480	$8,160	221	789	4,000	10,400	921	4,410
Japan	--	--	6,720	20,900	146	785	569	3,610
Korea, Republic of	--	--	111	389	54	556	1,080	1,380
Mexico	--	--	165	597	37	259	1,670	1,040
Netherlands	--	--	2,590	6,090	70	239	38	122
Other	51	194	707	4,540	223	2,490	406	4,000
Total	3,540	8,350	21,500	59,300	6,080	18,400	7,200	20,500
1996:								
Australia	--	--	3,120	9,730	10	45	19	67
Belgium	9	23	2,940	12,200	656	1,670	728	2,260
Canada	8,360	20,500	24	84	4,830	17,500	860	4,880
Japan	6	15	5,410	17,400	123	532	486	4,910
Korea, Republic of	25	64	67	198	18	378	1,140	1,580
Mexico	9	23	373	1,570	36	253	3,180	542
Netherlands	20	45	4,810	13,300	1,100	3,360	902	2,550
Other	67	201	289	2,860	200	2,140	661	3,930
Total	8,500	20,900	17,000	57,300	6,970	25,900	7,970	20,700

1/ Data are rounded to three significant digits; may not add to totals shown.

Source: Bureau of the Census.

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

Country	Waste and scrap		Metal		Alloys (magnesium content)		Powder, sheets, tubing, ribbons, wire, other forms (gross weight)	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
1995:								
Brazil	--	--	534	$2,390	--	--	--	--
Canada	8,570	$19,300	471	1,740	13,300	$44,700	858	$4,190
China	281	528	384	517	51	88	--	--
Mexico	690	1,190	609	1,470	173	369	3	36
Russia	292	787	4,250	16,100	1,300	3,710	--	--
United Kingdom	318	779	--	--	405	3,050	4	147
Other	1,390	3,420	235 r/	802 r/	661	3,140	1	28
Total	11,500	26,000	6,480	23,000	15,900	55,100	867	4,410
1996:								
Brazil	133	457	717	2,860	36	124	--	--
Canada	1,460	3,230	1,130	4,830	20,900	74,700	1,050	5,460
China	57	131	171	467	1,680	4,540	52	144
Mexico	364	642	521	1,880	193	694	158	602
Russia	--	--	14,400	47,100	1,170	4,470	14	58
United Kingdom	311	666	163	450	363	3,320	2	193
Other	1,020	2,540	219	856	277	1,860	(2/)	7
Total	3,340	7,660	17,300	58,500	24,600	89,700	1,280	6,470

r/ Revised.
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Less than 1/2 unit.

Source: Bureau of the Census.

TABLE 7
WORLD ANNUAL PRIMARY MAGNESIUM PRODUCTION CAPACITY, 1/ DECEMBER 31, 1996, BY CONTINENT AND COUNTRY 2/

(Metric tons)

Continent and country	Capacity
North America:	
Canada	49,000
United States	145,000
Total	194,000
South America: Brazil	10,600
Europe:	
France	17,000
Kazakstan 3/	65,000
Norway	35,000
Russia 3/	82,000
Serbia and Montenegro	5,000
Ukraine 3/	54,000
Total	258,000
Asia:	
China	32,400
India	900
Israel	27,500
Total	60,800
World total	523,000

1/ Includes capacity at operating plants as well as at plants on standby basis.
2/ Data are rounded to three significant digits; may not add to totals shown.
3/ Includes magnesium production capacity that is used exclusively for titanium production as follows: Kazakstan, 40,000 metric tons; Russia, 35,000 metric tons; and Ukraine, 15,000 metric tons.

TABLE 8
MAGNESIUM: WORLD PRIMARY PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1992	1993	1994	1995	1996 e/
Brazil e/	7,300	9,700	9,700	9,700	9,000
Canada e/	25,800	23,000	28,900	48,100	54,000
China e/	10,600	11,800	24,000	93,600 r/	50,000
France	13,660	10,982	12,280	14,450 r/	14,000
Italy	1,211	--	--	--	--
Japan	7,119	7,471	3,412	--	-- 3/
Kazakstan e/	3,000	2,000	--	-- 3/	-- 3/
Norway	30,404	27,300	27,635	28,000 r/	30,000
Russia e/ 4/	40,000	30,000	35,400	37,500	35,000
Serbia and Montenegro	4,055	-- e/	-- r/	2,560 r/	2,500
Ukraine e/	15,000	14,900	12,000	13,000	13,000
United States	137,000	132,000	128,000	142,000	133,000 3/
Total	295,000	269,000	282,000 r/	389,000 r/	341,000

e/ Estimated. r/ Revised.
1/ World totals, U.S. data, and estimated data are rounded to three significant digits; may not add to totals shown.
2/ Table includes data available through July 15, 1997.
3/ Reported figure.
4/ Includes secondary.

TABLE 9
MAGNESIUM: WORLD SECONDARY PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1992	1993	1994	1995	1996 e/
Brazil e/	1,600	1,600	1,600	1,600	1,600
Japan	12,978	13,215	19,009	11,767 r/	12,500
U.S.S.R. e/ 3/	6,500	6,000	5,000	6,000	6,000
United Kingdom e/ 4/	800	1,000	1,000	1,000	1,000
United States	57,000	58,900	62,100	65,000	70,900 5/
Total	78,900	80,700	88,700	85,500 r/	92,000

e/ Estimated. r/ Revised.
1/ World totals, U.S. data, and estimated data are rounded to three significant digits; may not add to totals shown.
2/ Table includes data available through July 15, 1997.
3/ Dissolved in Dec. 1991; however, information is inadequate to formulate reliable estimates for individual countries.
4/ Includes alloys.
5/ Reported figure.