

# Mineral Industry Surveys

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## MAGNESIUM IN THE THIRD QUARTER 2000

Domestic production of primary magnesium in the third quarter of 2000 declined by 8% from that in the second quarter, according to the U.S. Geological Survey. Producers' stocks decreased by about 6%, and shipments also were 6% less than those in the second quarter.

Exports of magnesium through August 2000 were 23% lower than those in the same period of 1999. Magnesium imports

through August 2000 were about 8% higher than those in the corresponding period of 1999. Russia (42%), Israel (31%), and Canada (15%) were the principal sources of imported metal. Canada (53%) and China (32%) were the principal sources of imported alloys.

Quoted prices of primary magnesium continued to decline. Prices are shown in the following table.

	Units	Beginning of quarter	End of quarter
Metals Week U.S. spot Western	Dollars per pound	\$1.32-\$1.44	\$1.32-\$1.44
Metals Week U.S. spot dealer import	do.	1.12-1.15	1.12-1.15
Metals Week European free market	Dollars per metric ton	2,000-2,200	2,000-2,200
Metal Bulletin free market	do.	2,040-2,100	1,950-2,000
Metal Bulletin China free market	do.	1,450-1,500	1,355-1,420

At the request of Magnesium Corp. of America, the International Trade Commission (ITC) instituted an investigation into antidumping and countervailing duties on primary magnesium imported from China, Israel, and Russia. The investigation covers material that is imported under the Harmonized Tariff headings 8104.11.00, 8104.19.00, and 8104.30.00. A hearing was held on November 7, and a preliminary determination is scheduled to be completed by December 1 (U.S. International Trade Commission, 2000b). If, as occurred during the original investigation of imports of magnesium from Russia and China, these countries stop shipping material to the United States during the investigation period, the United States likely will face a temporary supply shortage, and prices may increase significantly.

The International Trade Administration (ITA) completed its administrative reviews of countervailing duties for pure and alloy magnesium from Canada in September. For the 1998 calendar year, the countervailing duty was established at 1.38% ad valorem for magnesium imported into the United States from Norsk Hydro Canada Inc. (U.S. Department of Commerce, 2000). The ITA also has begun an investigation of countervailing duties for calendar

year 1999. Through the NAFTA Secretariat, the government of Quebec appealed the final sunset reviews for the antidumping duty on pure magnesium and the antidumping and countervailing duty orders on magnesium alloy. These reviews were complete in July, and the ITC determined that these duties should remain in place. A decision on the appeals is scheduled to be completed by June 15, 2001 (NAFTA Secretariat, [n.d.], [Untitled], accessed November 7, 2000, at URL <http://www.nafta-sec-alena.org/english/index.htm>).

In an expedited 5-year review of the antidumping duty established for pure magnesium from China, the ITC determined that revocation of the duty likely would lead to continuation or recurrence of material injury. Therefore, the antidumping duty of 108.26% ad valorem will remain in effect (U.S. International Trade Commission, 2000a).

In spite of a fire in one of the four electrolytic cells on August 12, Noranda Inc. plans to open its Magnola magnesium plant in Quebec by the first quarter of 2001. Noranda produced its first magnesium metal late in October, and 2 out of 24 electrolytic cells have been commissioned. When the 63,000-metric-ton-per-year

plant opens, it will be the first in the world to use asbestos tailings as a raw material for magnesium production (Platt's Metals Week, 2000b; Canada Newswire, October 25, 2000, Noranda produces first magnesium metal, accessed October 31, 2000, at URL <http://newswire.ca/releases/October2000/25/c6547.html>).

In China, the Ningxia Magnesium Metal Works was declared bankrupt in September. Production at the 1,400-ton-per-year plant had stopped in March 1999, and the State is planning to auction off the plant once the final auditing is complete (Platt's Metals Week, 2000a). Tongxiang Magnesium Industry Co. cut its magnesium output in half for the second half of 2000, according to company officials. The cutback, from 2,000 tons per month to 1,000 tons per month, was in response to declining prices. Tongxiang exports most of its product to Japan and the Republic of Korea (Platt's Metals Week, 2000c).

Because of pollution problems and weak prices, many small magnesium plants in Henan and Shanxi Provinces have closed. Some of the larger plants are expected to close for a short period to make upgrades to reduce pollution. The Chinese magnesium export market is reported to be slow, particularly to countries in Europe. The European Union is reviewing the current antidumping duty of 31.7% ad valorem on imports of Chinese magnesium, and the potential of higher duties is stifling exports from China (Metal Bulletin, 2000c).

Japan's Nippon Kinzoku Co. Ltd. completed a 2,400-ton-per-year magnesium recycling plant in Kitakami, Iwate Prefecture that is expected to begin commercial production in January 2001. The completion of this plant raises the company's total recycling capacity to 8,000 tons per year; Nippon Kinzoku operates three other magnesium recycling plants in Japan (Furukawa, 2000).

Magnesium Elektron, a unit of the Luxfer Group, selected a site northwest of Prague, Czech Republic, to build a 10,000-ton-per-year secondary magnesium plant. A unoccupied manufacturing plant is located at the site, and Magnesium Elektron plans to refurbish the building for use as a magnesium recycling plant. The new plant, which will use magnesium alloy scrap from Germany as its feedstock to produce casting alloys, is expected to begin commercial operation in mid-2001, at an initial operating capacity of 7,500 tons per year. Finished product will be exported to German customers, and the plant will gradually ramp up its capacity to 10,000 tons per year by 2002, with an option to increase to 20,000 tons per year, if the market warrants (Metal Bulletin, 2000d).

Mintek, the South African technology company, is planning to test a new magnesium production process at a pilot plant that is scheduled to start operation by yearend. The new process is a derivative of the Magnetherm process in which dolomite is reduced with ferrosilicon and alumina to produce magnesium vapor. In Mintek's process the process is carried out at atmospheric pressure at about 1,700° C compared with operating at a vacuum at 1,550 to 1,600° C for the Magnetherm process. By operating at atmospheric pressure, rather than in a vacuum, the reduction process can be carried continuously, rather than as a batch process, which may have economic advantages. Mintek plans to evaluate the process for 3 to 6 months before deciding if it is suitable for commercial-scale development and estimates that a 50,000-ton-per-year plant would require a capital investment of \$200 to \$250 million (Metal Bulletin, 2000e). Immediately after this announcement, Mintek signed an technology license

agreement with Australia's Mt. Grace Resources NL, whereby Mt. Grace Resources will fund the demonstration project, and if test work is successful, use the process to recover magnesium from its Batchelor magnesite deposit in the Northern Territory. Mt. Grace Resources will test the new process along with the Heggie aluminothermic process to determine which will be the most economically attractive (Mt. Grace Resources NL, October 6, 2000, Mintek magnesium production technology licence and project option agreement, accessed October 17, 2000, at URL [http://www.mtgrace.com/releases/oct\\_6\\_2000.html](http://www.mtgrace.com/releases/oct_6_2000.html)).

In October, Mt. Grace Resources began bulk magnesite mining operations at its Batchelor magnesium project. The company plans to mine and stockpile 2,000 tons of magnesite to provide sample material for test work. An ore parcel will be sent to Mintek in Johannesburg in January for testing (Mt. Grace Resources NL, October 30, 2000, Mt[.] Grace Resources mines ore at Batchelor, accessed November 8, 2000, at URL [http://www.mtgrace.com/releases/oct\\_30\\_2000.html](http://www.mtgrace.com/releases/oct_30_2000.html)).

Australian Magnesium Corp. (AMC) entered into an alliance with VAW Aluminium AG to develop a magnesium engine block in hopes of providing additional funding for AMC's proposed 96,000-ton-per-year magnesium plant in Stanwell, Queensland. If the magnesium engine block is commercialized, AMC would be VAW's exclusive supplier of magnesium alloy for the first 5 years of production. AMC already has a 45,000-ton-per-year offtake agreement with Ford Motor Co. that provided much of the financing for its pilot plant (Metal Bulletin, 2000a). The company also received all governmental and environmental approvals for the construction of a commercial plant; the company expects that the plant will come on-stream in 2003 (Metal Bulletin, 2000b).

Ford plans to convert the cam covers on some of its truck engines from plastic to magnesium. Beginning with the 2003 model year, Ford will convert the cam covers on its 5.4-liter Triton V-8 engine to AZ91D, and the next model year, the company plans to convert the covers on the 6.8-liter Triton V-10 engine. Estimated magnesium consumption of the cam covers on both engines is about 3,200 tons annually. Spartan Light Metal Products Inc. and Internet Corp. will be the diecasters for the cam covers. The covers were switched for plastic to magnesium because magnesium has greater creep resistance than the existing plastic covers, and Ford expects that this will lead to fewer service problems (Wrigley, 2000a). With additional parts planned for conversion to magnesium, such as instrument panel support beams and four-wheel-drive transfer case covers, Ford plans to increase its total magnesium consumption from about 21,000 tons in the 2001 model year to 78,000 tons by the 2004 model year. Most of the new applications for magnesium will be in the company's sport utility vehicles and light-duty trucks (Wrigley, 2000b).

Researchers at Bar-Ilan University in Israel announced the construction of the first rechargeable battery based on magnesium. According to the researchers, the new battery can be charged more than 2,000 times and produces up to 1.3 volts of power, which is similar to existing rechargeable batteries. Although magnesium batteries currently exist, they are used mostly in military applications and are not rechargeable. By using electrolyte solutions based on magnesium organohaloaluminate salts and  $Mg_xMo_3S_4$  (where x is between zero and one) cathodes, the researchers can produce a battery that is about the size of a computer monitor. The new batteries are expected to be

commercially available within a year and to be used as uninterrupted power suppliers to computer networks affected by power outages (Aurbach and others, 2000).

The French producer of magnesium casting systems, Brochot SA, developed a new casting wheel designed to minimize surface oxidation when casting magnesium and magnesium alloys. The company has applied for a patent of its design, which was adapted from the design of a casting wheel for aluminum systems. By redesigning the points at which the molten metal is delivered to the casting wheel, metal turbulence is reduced, thus minimizing the surface area available for oxidation. In addition, Brochot has replaced the sulfur hexafluoride protective cover gas with a patented mixture of carbon dioxide, argon and xenon (Brown, 2000).

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TABLE 1  
U.S. IMPORTS FOR CONSUMPTION AND EXPORTS OF MAGNESIUM 1/

(Metric tons)

	2000					
	1999	January- May	June	July	August	January- August
<b>Imports:</b>						
Metal	26,900	9,360	2,230	2,210	2,350	16,200
Waste and scrap	6,780	3,680	675	620	988	5,960
Alloys (magnesium content)	56,500	24,300	4,470	4,640	4,740	38,100
Sheet, tubing, ribbons, wire, powder, other (magnesium content)	593	246	74	95	77	492
Total	90,700	37,500	7,450	7,570	8,150	60,700
<b>Exports:</b>						
Metal	4,790	2,320	746	227	926	4,210
Waste and scrap	16,500	2,080	309	488	877	3,750
Alloys (gross weight)	2,760	2,780	714	301	386	4,180
Sheet, tubing, ribbons, wire, powder, other (gross weight)	4,990	2,060	133	284	230	2,700
Total	29,000	9,230	1,900	1,300	2,420	14,800

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

Source: U.S. Census Bureau.