

Magnesium

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2001 Primary metal production: \$255 million^e
World rank: Second
Exports: \$176 million

	1999	2000	2001
	(tonnes)		
Primary metal production			
capacity (1,e)	49 000	50 500	59 500
Exports (HS 8104)	49 747	47 181	43 292
Imports (HS 8104)	38 377	34 588	(r) 33 480

(e) Estimated; (r) Revised.

(1) Canadian magnesium production data are confidential due to the limited number of companies reporting. This number is based on published capacity for primary metal. Note that other published estimates of Canadian magnesium production include significant quantities of recycled material.

World production of primary and recycled magnesium decreased to an estimated 524 000 t in 2001, down 7% from an estimated figure of 564 000 t in 2000.¹ Prices for magnesium followed the trend from 2000 and generally weakened during the year, due mainly to the continued high levels of shipments from China.

¹ Magnesium statistics vary between sources. Readers are cautioned to ensure data are appropriate for their needs. Including production figures published by the Chinese Magnesium Association, the totals would be 30 000 to 50 000 t higher. Note that statistics on magnesium use may include scrap components and may be/may have been over-stated. Work is under way to resolve these potential problems.

The International Magnesium Association (IMA) reported that Western primary magnesium production (which excludes China, the former Soviet Union and Israel) decreased by 14% (29 514 t) to 180 750 t in 2001 from 210 300 t in 2000. That decrease was due to the closure of Northwest Alloys' plant in Washington and decreased production at Magnesium Corporation of America's plant in Utah. The IMA estimated world shipments of magnesium at 330 180 t in 2001, a decline of 10% compared to the estimated 366 900 t shipped in 2000. (Further information from the Association can be obtained on the Internet at www.intlmag.org.)

CANADIAN DEVELOPMENTS

Producers

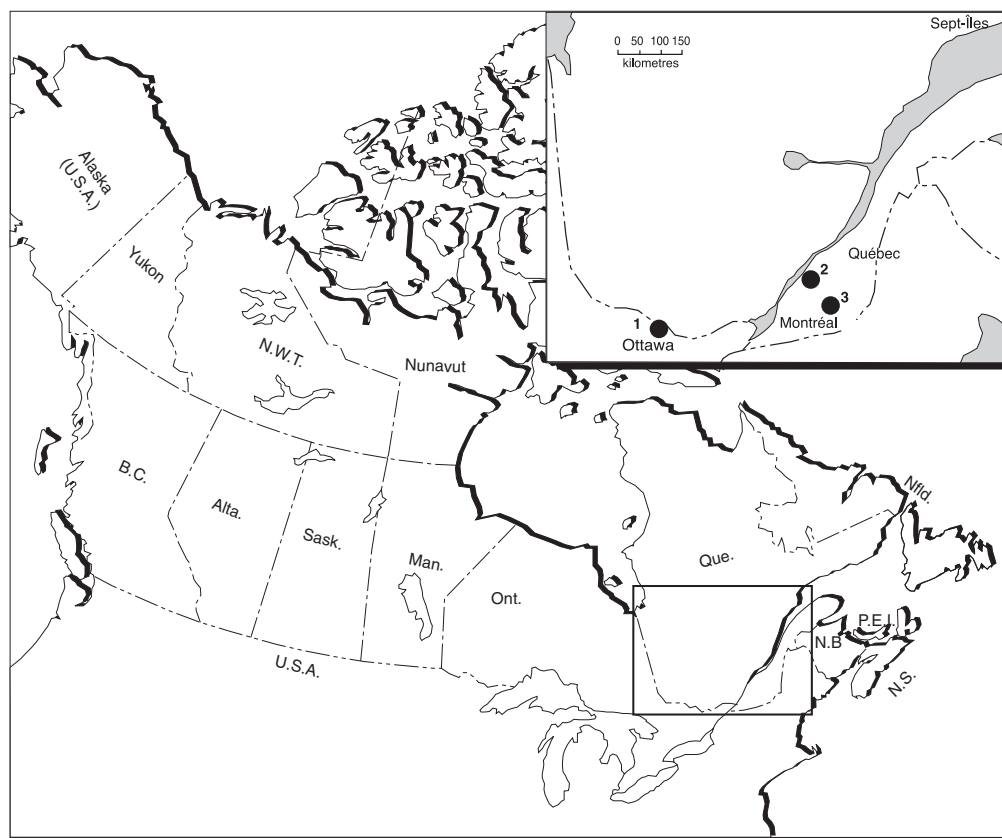
In 2001, Canada was the second largest producer of primary metal in the world after China.

In early 2001, Magnola Metallurgy Inc. (owned 80% by Noranda Inc. and 20% by Société générale de financement du Québec) completed construction of its 58 000-t/y commercial magnesium plant in Danville, Quebec. The plant started producing magnesium metal from the residues of local asbestos mines in October 2000, creating 350 jobs. Magnola reports the metal produced at the plant is of high quality and that it has had excellent reviews from its customers.

While the company faced some start-up problems, many of the initial technical problems were resolved at the end of 2001. It was reported that the voltage in cells had been increased to 65% of power rate capacity in early 2002. The plant was operating 16 cells at the end of 2001 and Noranda reported that the plant produced 9339 t of pure magnesium and alloys in 2001. The company expected to produce 30 000 t of metal in 2002 and to reach full capacity rates by late 2002 (www.norandamagnesium.com).

Norsk Hydro Canada Inc. (Norsk Hydro), a wholly owned subsidiary of Norsk Hydro ASA of Norway, has produced magnesium metal at a 43 000-t/y Bécancour, Quebec, plant using an electrolytic process since 1989. The plant also recycles magnesium scrap produced by its customers. Norsk Hydro

Figure 1
Magnesium Smelters, 2001



SMELTER	COMPANY	CAPACITY (t/y)
1. Haley Station, Ontario	Timminco Limited	6 000
2. Bécancour, Quebec	Norsk Hydro Canada Inc.	43 000
3. Danville, Quebec	Magnola Metallurgy Inc.	58 000

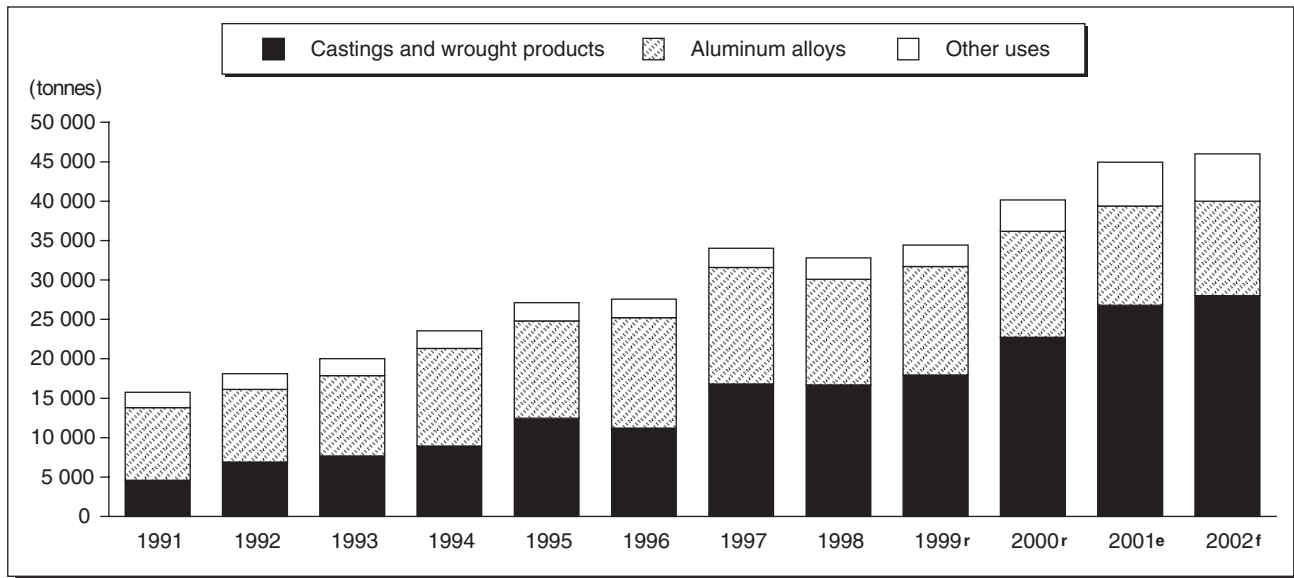
has focussed on debottlenecking the existing operations and making them more efficient, and this work was expected to increase capacity to 48 000 t/y in 2002. Expansion may take place in the future provided sufficient customer contractual commitments for the production are in place. Hydro Magnesium does not expect any large-scale increases to be initiated in the short term. Cost-cutting measures have been implemented at the plant and, as part of these measures, the company laid off 85 people in early 2001 (www.magnesium.hydro.com).

Timminco Limited operates a silicothermic reduction facility at Haley Station, Ontario. The operation includes a dolomitic limestone deposit and facilities for calcination, feed preparation, reduction, refining, and casting of magnesium ingots and billets. Pro-

cessing facilities include an extrusion and anode fabrication and assembly plant, as well as magnesium billet and slab processing facilities. In 2001, Timminco restarted operations and achieved commercial production levels at the Haley casthouse, which had been damaged after a metal spill in late 2000. The new casthouse re-opened in early 2001 and the company continues to upgrade the facility. The casting facility at Haley provides magnesium billets for Timminco's extrusion facilities at Haley Station, Ontario, and Aurora, Colorado. On a longer-term basis, the company intended to expand operations in the wrought products area (www.timminco.com).

Canada's two largest magnesium producers have developed new magnesium alloys for use in higher temperature applications. With the continued

Figure 2
Canadian Use of Magnesium, 1991-2002



Source: Natural Resources Canada survey of Canadian users of magnesium.

^e Estimated; ^f Forecast; ^r Revised.

involvement of metal producers in alloy development, increased uses will be found for magnesium on a longer term basis. Further information can be obtained from the Noranda Magnesium web site at www.norandamagnesium.com and from Norsk Hydro's web site at www.hydro.com.

In Canada, reported use of magnesium increased from a revised 40 154 t in 2000 to 44 925 t in 2001, due in part to an increased number of companies reporting. It should be noted that previously published figures on use have included some run-around scrap, which has been removed from data for 2001, and for 1999 and 2000, where known and significant. Work is nearing completion to ensure future data do not include these amounts.

Project Proposals

In Canada, as in the rest of the world, there has been continued interest in the production of magnesium metal from magnesite and dolomite deposits, and from previously mined asbestos deposits. The Canadian projects include: Globex Mining Enterprises Inc.'s magnesite-talc project at Timmins, Ontario; Leader Mining International Inc.'s project near Hope, British Columbia; Gossan Resources Limited at Inwood, Manitoba; Cassiar Resources Inc. at Cassiar, British Columbia; Canadian Magnesium Corporation at Baie Verte, Newfoundland and Labrador; and an asbestos-based project at Thetford Mines, Quebec.

Globex Mining Enterprises Inc. engaged Hatch Associates to complete a scoping study on Globex's Timmins area magnesium-talc deposit 13 km south of Timmins, Ontario. Previous work has indicated potential for the production of both magnesium metal and high-quality talc from the deposit. The study was completed in October 2001 and results were positive, indicating good economic potential. The study proposed a \$1.5 billion mine smelter complex comprising a mine near Timmins, Ontario, and a smelter at Rouyn-Noranda, Quebec. The project has the advantages of access to competitively priced power; ready access to consumer markets; access to a stable, high-calibre work force; excellent infrastructure, including highways and railways; and a high-quality talc by-product, to provide additional revenue.

At year-end, Globex was reviewing the results in anticipation of conducting the recommended full bankable feasibility study with an expected cost of US\$12 million for a mine-mill complex located near Timmins, Ontario, and a smelter complex located west of Rouyn-Noranda in Quebec. Further details are available on the Internet at www.globexmining.com.

Leader Mining International Inc. acquired property in 2001 over the Cogburn ultramafic intrusive near Hope, British Columbia, that contains magnesium-bearing silicates. Samples of outcrops were tested for extraction of magnesium and scoping-level studies

were undertaken and completed in October with positive results. The study indicated a capital cost estimate of US\$1.02 billion for a mine and smelter with a production rate of 120 000 t/y. A drilling program was under way at year-end and a number of contractors, including Hatch Associates, were engaged to complete studies by December 2002. Further details are available on the Internet at www.leadermining.com.

Cassiar Resources Inc. has a stockpile of 23 Mt of serpentine tailings that grade approximately 24% magnesium at the former Cassiar Asbestos Corporation Limited's mine at Cassiar in northern British Columbia. The metal project could be carried out in addition to the company's project to recover asbestos fibre from those tailings although, in December 2000, a fire damaged the fibre mill, slowing that project. In 2001, the company re-examined its options for re-opening the mill and sought potential investors (www.cassiarresources.com).

Gossan Resources Limited has maintained its interest and added to its property holdings in a dolomite property at Inwood, Manitoba, with a dolomite resource estimated at 67 Mt grading 21.6% magnesium oxide with additional inferred resources. Tests on this material have shown that production of commercial-grade magnesium metal is possible using the Magnetherm process (www.gossan.ca).

Canadian Magnesium Corporation (CMC) has proposed a project to extract magnesium oxide from serpentine in the tailings at the former Baie Verte asbestos mine in Newfoundland and Labrador. In 1999, CMC completed pre-feasibility studies and bench-scale testing on mineral residues. Results of the work were positive and indicated that a clean product could be produced. The company continues to review its financing options prior to committing to piloting and marketing studies.

The town of Thetford Mines, Quebec, worked on a prefeasibility study for a proposal to process mining residues from asbestos mines into magnesium metal. The town reports that more than 300 Mt of material with a grade of approximately 24% magnesium is available in the area for processing. Work continued to find and license a process that could be used to extract the magnesium. Discussions were also under way with possible partners in the project.

WORLD DEVELOPMENTS

The major factor in magnesium markets remains the increased production and export of magnesium from China. Pressure on markets from this production has resulted in a general decrease in the price of magnesium and has caused the United States and the European Union to impose high import duties on

Chinese magnesium. The pressure on prices, in combination with other factors such as environmental considerations, has caused three Western smelters to close, but has also increased the potential for growth in use.

China

Although a number of Chinese magnesium producers agreed in October 2001 to limit the production of magnesium to avoid continued surpluses of material, markets had not been noticeably affected at the time of writing. The prevalent low prices have caused a number of smaller plants to close in China. The remaining magnesium metal production capacity has been estimated at approximately 250 000 t/y. However, as most magnesium plants in China use a batch silicon thermal reduction process, the opening and closing of plants is relatively easy. In addition, the cost of ferrosilicon, an essential input into the production process, is relatively low within China, giving Chinese magnesium producers a cost advantage. Reported changes included:

- Norsk Hydro A/S completed construction of a 10 000-t/y magnesium alloy ingot foundry in China in Xi'an, approximately 800 km southwest of Beijing. Norsk Hydro started producing high-quality alloy ingot from locally produced magnesium for export to traditional markets for diecast alloys. The plant will also eventually produce 400 t/y of anodes.
- China Steel Corp. announced that it planned to build a new magnesium plant.
- Gold River Magnesium planned to expand its capacity from 9000 t/y to 40 000 t/y over the next four years.
- Ningxia Zhongning Aluminium planned to expand capacity from 7000 t/y to 19 000 t/y in 2002.
- Jinghua Magnesium in Shanxi planned to expand alloy capacity by 10 000 t/y.
- Jishan Huayu Enterprises in Shanxi planned to increase its capacity to 16 000 t/y from 6000 t/y.
- The Quinghai provincial government proposed a new 50 000-t/y electrolytic smelter using brines from Chearhan Salt Lake, with the start of construction originally proposed for 2001 and production in 2005. At the end of the year, it was seeking investors in the project.
- Tongxian Magnesium in Shanxi planned to expand capacity to 30 000 t/y of pure magnesium from 17 000 t/y. The first phase to reach 20 000 t/y was completed in 2001.

- Wenxi Yinguang Magnesium planned to expand capacity from 24 000 t/y to 28 000 t/y of pure metal and alloys in 2002.
- Xinlihua Magnesium Powder Company planned to increase its ingot capacity to 6000 t/y from 3000 t/y.
- Zunyi Titanium Works started production of magnesium and planned to produce at a rate of 5000 t/y and to increase its production of titanium.

Western Producers

Norsk Hydro has closed the 42 000-t/y Porsgrunn magnesium smelter in Norway. The existing cast-house will operate based on scrap and ingot remelt feedstock for magnesium alloy production. The Porsgrunn casthouse has a 20 000-t/y remelt capacity, which will remain open. Further information is available on the Internet at www.magnesium.hydro.com.

Pechiney Electrometallurgie has announced the closure of the 18 000-t/y Marignac magnesium smelter in France (www.pechiney.com).

Alcoa Inc. closed the 38 000-t/y Northwest Alloys magnesium smelter in Addy, Washington (www.alcoa.com).

Magnesium Corp. of America filed for protection from its creditors under Chapter 11 of the bankruptcy code. The company is modernizing equipment at its 43 000-t/y smelter in Rowley, Utah, to reduce emissions. Modernization of the plant is expected to eventually increase its capacity but, in the near term, production has been reduced.

Governments

The U.S. International Trade Administration determined, after a review, that imports of pure magnesium from China were sold at less than market value and determined duty margins of 24.67% for Minmetals and 305.56% country-wide.

The U.S. Department of Commerce (DOC) determined that sales of pure magnesium from Israel were made at less than fair value and determined counter-vail duty margins of 13.39% and anti-dumping at 12.68%. A subsequent determination of higher rates was countered by the U.S. International Trade Commission. A final determination was also made of a 0% margin on imports from Russia.

In late 2000, the Government of Quebec filed a request for a review by an independent binational panel under Chapter 19 of the North American Free Trade Agreement (NAFTA) of decisions resulting from a five-year sunset review in 2000. In early

2002, the Panel remanded the final results to the DOC to reconsider its determinations (www.usitc.gov and www.nafta-sec-alena.org).

In early 2001, the United States Automotive Materials Partnership (USAMP), as part of the United States Council for Automotive Research (USCAR), began a new structural cast magnesium development project to resolve the critical issues that limit the large-scale application of structural cast magnesium castings in automotive components. In addition, work was conducted through the Partnership for a New Generation of Vehicles (PNGV) on new power train components, including ones from cast magnesium alloys, although the focus of work shifted to the FreedomCAR Research Partnership in early 2002. The vision of FreedomCAR is petroleum-free cars and light trucks (www.uscar.org).

PROJECTS

Australia

Australian Magnesium Corporation (AMC), after some difficulty and government assistance of about A\$300 million in the last year, completed financing for construction of a 90 000-t/y plant at Stanwell, Queensland. The company expected to start construction in 2002. Metal production is expected to start in late 2004 and the plant is expected to reach full capacity in 2006. AMC has decided to use newer Alcan Ex2 cells, which have a higher capacity for production of magnesium than the older versions of this technology. For further information, see the company's web site at www.austmg.com and Australian government sites at www.minister.industry.gov.au and www.qld.gov.au.

Mt. Grace Resources NL continued work on its Northern Territory Batchelor magnesium project 85 km south of Darwin. Mt. Grace's stage one feasibility study proposed that an initial A\$76 million plant with a 14-MW furnace could have a capacity of 12 500 t/y of metal. Once the plant is running, depending on market conditions, the company would expand the operation to 50 000 t/y in 2007. The company planned to complete a bankable feasibility study by the end of 2001 and has signed an agreement for the sale of 10 000 t/y of metal with the Frank & Schulte Group, a subsidiary of Stinnes Interfer, which is a division of Stinnes AG, one of Germany's largest companies. The project received Major Project Facilitation status from the government and the company hoped to begin construction in 2002 with first production in 2003 (www.mtgrace.com).

Pima Mining/Samag Ltd. continued work on a proposed metal plant based on magnesite deposits located near Leigh Creek in the Willouran Ranges

region of South Australia. Samag has increased the size of its initial proposal and now expects to construct an A\$700 million, 65 000-t/y smelter using Dow technology in Port Pirie, South Australia. The company received environmental approval from the South Australian government and secured a power contract with Australian National Power, which will build a 230-MW power station and provide up to 170 MW to the project. The company also received commitments that the South Australian government would spend up to A\$25 million to improve infrastructure. The company expected to complete a bankable feasibility study in 2002 and start construction, with metal production anticipated for 2004. The company also held discussions with possible investors and studied construction of a metal plant in New Zealand (www.mgil.com.au).

Pacific Magnesium Corporation Ltd. (formerly Golden Triangle Resources NL) continued work on its Woodsreef magnesium project in New South Wales based on feed from asbestos tailings. The company planned to proceed with a definitive feasibility study on the Woodsreef project that would be completed in late 2001. The company also held discussions with possible partners (www.pacificmagnesium.com).

Rambora Technologies planned to conduct a prefeasibility study on a 100 000-t/y smelter based on high-magnesium fly ash from the Hazelwood Power station in the Latrobe Valley, Victoria. The company also held discussions with the Victorian government and worked on financing for the project.

Indcor Limited (formerly Crest Magnesium NL) shelved its plans for a proposed 60 000-t/y magnesium metal plant near Bell Bay, Tasmania (www.indcor.com.au).

Netherlands

Antheus Magnesium BV continues to work on its magnesium metal production facility in the Delfzijl region. The company has commissioned a feasibility study for a 30 000-t/y plant and is seeking partners in the plant, which is hoped to be in production in 2005 (www.antheusmagnesium.nl).

Republic of the Congo (Brazzaville)

Magnesium Alloy Corporation (MagAlloy) continued work on its Kouilou project in the Republic of the Congo (Brazzaville). The project is based on two exploration permits in the Kouilou region where previous work has indicated the presence of potassium and magnesium salts. The company proposes a 60 000-t/y plant in Pointe-Noire to solution mine the salt beds and produce magnesium metal with by-product chlorine, sodium chloride and potassium chloride to provide additional revenue. The Russian National Aluminium and Magnesium Institute

(VAMI) and the Ukrainian Titanium Institute's magnesium extraction technology would be used in the plant. A government decree signed by the President in June was expected to help the project.

Magnesium Alloy Corporation signed a Memorandum of Understanding with Siemens Aktiengesellschaft Power Transmission and Distribution Division regarding several areas of cooperation. The company also entered into a framework agreement with Amphora Group Holding Luxembourg S. A. for funding, implementation and development of the project and related energy infrastructure. However, in November, the company announced termination of that agreement. At year-end, the company was continuing discussions with other potential investors in the project. MagAlloy planned to begin production by 2005 at a rate of 60 000 t/y of pure and alloyed metal (www.magnesiumalloy.ca).

Ukraine

After finding a new investor, the Kalush magnesium plant, originally with a capacity of 24 000 t/y, was expected to re-open in 2002. The production rate was expected to be about 10 000 t/y.

Russia

Solikamsk Magnesium Works continued work on a 15 000-t/y expansion of capacity.

RECYCLING

Several new magnesium recycling facilities and expansions of existing facilities were under way or announced during 2001 and early 2002. These include:

- Magnesium Elektron completed the first phase of construction of its new 10 000-t/y magnesium recycling plant in Prague, in the **Czech Republic**, using scrap from Germany (www.luxfer.com and www.magnesium-elektron.com).
- Xstrata AG completed construction and started production of recycled magnesium at a 25 000-t/y plant in Anderson, Indiana – its first scrap recycling facility in the **United States**.

CHANGING TECHNOLOGY

Lakefield Research, based in Ontario, has been conducting research into new technology for magnesium production. The LRP process uses a simple reactor for leaching, neutralization, separation and washing of residues to simplify magnesium recovery from serpentine ores. The company sought an industrial

partner to support further development of the technology (www.lakefield.com).

PRICES

Prices published by *Metals Week* for magnesium were relatively flat through the year. The U.S. Spot Western Mean started the year at US\$1.26/lb and ended it at US\$1.25/lb, while the mean U.S. dealer import prices decreased from US\$1.10/lb early in the year to US\$1.07/lb in December. The *Metal Bulletin's* World Free Market Price for minimum 99.8% magnesium metal started the year at US\$1950-\$2050/t and declined steadily to end the year at US\$1775-\$1875/t.

Norsk Hydro's European producer price for pure magnesium started the year at €2.33/kg and, after declining to €2.22/kg in January, rose to €2.42/kg in July.

Reported prices of Chinese magnesium on a spot basis f.o.b. China started the year at approximately US\$1500/t. Prices weakened further in 2001 with reported sales at US\$1200-\$1300/t (US54¢-59¢/lb) at year-end.

ANNUAL AVERAGE PRICES, METALS WEEK (U.S. SPOT WESTERN MEAN)

1997	1998	1999	2000	2001
(US\$/lb)				
1.65	1.59	1.55	1.37	1.25

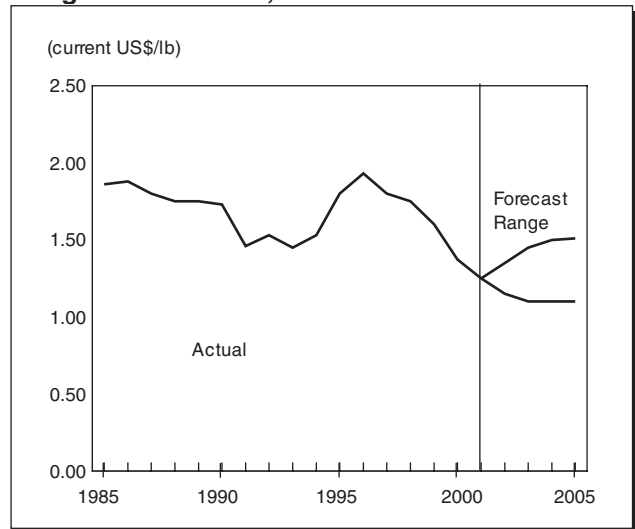
STOCKS

IMA data indicate that reported inventories of primary magnesium decreased slightly in 2001 to end the year at 45 180 t, down from 46 500 t at the end of 2000. This inventory represents approximately 50 days of world production of primary magnesium.

OUTLOOK

The biggest potential for growth in the use of magnesium lies in the aluminum alloy and automotive market sectors. The amount of magnesium used in automotive applications is relatively low compared to the use of other materials. Although some models contain larger quantities of magnesium, the average vehicle has been estimated to contain approximately 5 kg, while the plastic content is estimated at over 100 kg. As a result, a relatively minor increase in magnesium used in automotive parts could result in

Figure 3
Magnesium Prices, 1985-2005



Sources: Natural Resources Canada; *Metals Week* (U.S. Spot Western Mean).

a large increase in magnesium use. However, growth will be dependent on prices and price stability as magnesium continues to face stiff competition from other materials, including aluminum, steel and plastics, in the all-important automotive parts sector.

A number of projects around the world, primarily focussed in Australia, could, if all constructed, significantly increase magnesium production. With the plants currently under construction, world primary magnesium production is expected to rise from about 410 000 t in 2001 to approximately 550 000 t/y by 2006 and potentially higher if many new projects achieve their goals.

Western World primary magnesium production is again expected to fall in 2002 as the closures of plants in the United States, Norway and France will not be countered by increases in production in plants in the United States and Canada. However, with the currently prevailing low metal prices, it is expected that the increasing use of magnesium in die casting and the increasing intensity of use, particularly in automotive applications, should continue to grow in the short to medium term.

Given the rapid decline in Western World production, it is possible that magnesium prices may increase on a short-term basis. It is likely, however, that spot prices will remain weak and potentially volatile on a medium-term basis until new widespread transportation use increases demand and production volumes of the metal.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 64. (2) Information in this review was current as of March 30, 2002. (3) Some differences are noted in some data from independent sources. Work is under way to determine the reasons for these differences. (4) This and other reviews, including previous editions, are available on the Internet at www.nrcan.gc.ca/mms/cmy/index_e.html.

NOTE TO READERS

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TARIFFS⁽¹⁾

Item No.	Description	Canada			United States (2)	EU (2)
		MFN	GPT	USA	Canada	MFN
3824.90.90.42	Granular metallic magnesium coated with inorganic salts, mixed with lime	7.50%	3%	Free	Free	6.50%
3824.90.90.43	Other granular metallic magnesium coated with inorganic salts	7.50%	3%	Free	Free	6.50%
8104.11	Magnesium unwrought, containing by weight at least 99.8% of magnesium	2.50%	Free	Free	Free	5.30%
8104.19	Magnesium unwrought, other					
8104.19.10	Magnesium-rare earth, magnesium-didymium, magnesium-thorium, magnesium-zirconium and magnesium-thorium-neodymium-rare earth for use in the manufacture of magnesium castings	Free	Free	Free	Free	4%
8104.19.90	Other	2.50%	Free	Free	Free	4%
8104.20	Magnesium waste and scrap	Free	Free	Free	Free	Free
8104.30	Magnesium raspings, turnings and granules, graded according to size; powders	2.50%	Free	Free	Free	4%
8104.90	Other magnesium	2.50%	Free	Free	Free	4%

Sources: *Customs Tariff*, effective January 2002, Canada Customs and Revenue Agency; *Harmonized Tariff Schedule of the United States*, 2002; *Worldtariff Guidebook on Customs Tariff Schedules of Import Duties of the European Union* (41st Annual Edition: 2001); *Custom Tariff Schedules of Import Duties for Japan* (35th Annual Edition: 2001).

(1) Does not include countervail or anti-dumping duties, which may be applied to material of certain origin. (2) Duty suspension may apply for certain goods.

(3) WTO rate is shown; lower tariff rates may apply circumstantially.

TABLE 1. CANADA, MAGNESIUM EXPORTS AND IMPORTS BY COMMODITY AND COUNTRY, 2000 AND 2001

Item No.		2000		2001 (p)	
		(tonnes)	(\$000)	(tonnes)	(\$000)
EXPORTS					
8104.11	Magnesium unwrought, containing by weight at least 99.8% magnesium				
	Germany	1 783	6 467	4 638	12 928
	United States	3 098	15 047	1 625	8 053
	Netherlands	17	50	2 547	6 143
	Austria	1 190	4 003	1 700	4 838
	Japan	1 368	5 350	1 236	3 722
	United Kingdom	331	2 292	315	2 449
	Other countries	(r) 371	(r) 1 333	1 785	4 849
	Total	(r) 8 158	(r) 34 542	13 846	42 982
8104.19	Magnesium unwrought, other				
	United States	21 273	105 641	13 858	64 149
	Netherlands	226	1 243	783	3 084
	Italy	73	404	305	1 643
	United Kingdom	92	627	112	771
	Other countries	1 360	5 228	491	1 587
	Total	23 024	113 143	15 549	71 234

TABLE 1 (cont'd)

Item No.	2000		2001 (p)		
	(tonnes)	(\$000)	(tonnes)	(\$000)	
EXPORTS (cont'd)					
8104.20	Magnesium waste and scrap				
	United States	6 450	19 316	8 585	27 083
	Australia	–	–	34	202
	Other countries	638	1 982	2	5
	Total	7 088	21 298	8 621	27 290
8104.30	Magnesium raspings, turnings or granules, graded according to size, and powders				
	United States	5 993	17 943	1 571	6 496
	Ireland	231	1 794	290	2 210
	North Korea	60	372	121	716
	Other countries	514	3 444	160	1 229
	Total	6 798	23 553	2 142	10 651
8104.90	Magnesium and articles thereof, other				
	United States	1 842	10 439	2 564	20 169
	Australia	182	1 076	520	3 357
	Other countries	89	664	50	542
	Total	2 113	12 179	3 134	24 068
	Total exports	(r) 47 181	(r) 204 715	43 292	176 225
IMPORTS					
3824.90.90.42	Granular metallic magnesium coated with inorganic salts, mixed with lime				
	United States	742	3 437	607	2 376
8104.11	Magnesium unwrought, containing by weight at least 99.8% magnesium				
	China	(r) 3 907	(r) 9 243	7 458	18 121
	United States	2 738	11 421	2 701	10 506
	Russia	4 030	15 015	2 769	9 985
	Israel	747	3 110	687	2 315
	Brazil	719	2 818	340	1 140
	Other countries	593	2 175	450	1 500
	Total	(r) 12 734	(r) 43 782	14 405	43 567
8104.19	Magnesium unwrought, other				
	United States	(r) 4 478	(r) 22 019	2 444	12 316
	Norway	3 173	13 833	1 939	7 369
	Russia	...	2	1 288	5 383
	United Kingdom	(r) 181	(r) 2 273	239	2 393
	China	(r) 2 028	(r) 9 417	143	965
	Other countries	934	4 067	44	182
	Total	(r) 10 794	(r) 51 611	6 097	28 608
8104.20	Magnesium waste and scrap				
	United States	6 860	24 758	7 530	26 945
	Russia	(r) 726	(r) 3 158	2 563	9 839
	Israel	1 031	2 860	238	722
	Other countries	(r) 156	(r) 561	189	575
	Total	(r) 8 773	(r) 31 337	10 520	38 081
8104.30	Magnesium raspings, turnings or granules, graded according to size and powders				
	United States	474	2 217	692	3 317
	Switzerland	21	80	19	68
	Other countries	17	70	20	80
	Total	512	2 367	731	3 465
8104.90	Magnesium and articles thereof, other				
	United States	(r) 959	(r) 8 998	941	7 839
	China	53	338	173	1 057
	Other countries	21	165	35	146
	Total	(r) 1 033	(r) 9 501	1 149	9 042
	Total imports	(r) 33 846	(r) 156 246	32 902	141 428

Source: Statistics Canada.

– Nil; ... Amount too small to be expressed; (p) Preliminary; (r) Revised.

Note: Numbers may not add to totals due to rounding.

TABLE 2. CANADA, MAGNESIUM USE, ⁽¹⁾ 1995-2001

	1995 (a)	1996	1997	1998 (a)	1999 (a)	2000 (a)	2001 (p)
							(tonnes)
Castings and wrought products (2)	12 488	11 197	16 795	16 687	(r) 17 951	(r) 22 728	26 818
Aluminum alloys	12 323	14 022	14 793	13 417	13 741	13 466	12 551
Other uses (3)	2 329	2 357	2 438	(r) 2 685	2 727	3 960	(a) 5 556
Total	27 140	27 576	34 026	(r) 32 790	(r) 34 419	(r) 40 154	44 925

Source: Natural Resources Canada.

(p) Preliminary; (r) Revised.

(a) Increase in number of companies being surveyed.

(1) Available data as reported by users. (2) Die, permanent mould and sand castings, structural shapes, tubings, forgings, sheet and plate.

(3) Cathodic protection, reducing agents, deoxidizers and other alloys.

Note: Numbers may not add to totals due to rounding.

TABLE 3. WORLD PRODUCTION OF MAGNESIUM, 1995-2001

Country	Rank in 2001	1995	1996	1997	1998	1999	2000	2001 (e)
								(000 tonnes)
PRIMARY PRODUCTION								
China (2)	1	93.6	73.2	76.0	70.5	120.7	142.1	150.0
Canada (1,e)	2	48.1	54.0	57.7	77.1	80.0	80.0	70.0
United States	3	142.1	133.1	124.8	106.1	75.0	94.0	45.0
Russia	4	37.5	31.5	33.0	34.1	35.2	35.5	40.0
Norway	5	28.0	37.8	34.2	35.4	40.8	41.4	35.0
Israel	6	–	(r) 0.1	7.4	24.5	(r) 24.3	31.7	35.0
Kazakhstan	7	9.0	13.4	17.9	20.9	(r) 11.0	10.4	15.0
France	8	14.5	14.0	13.8	14.7	(r) 16.2	16.7	8.0
Brazil	9	9.7	9.0	9.0	9.0	(r) 8.0	5.7	8.0
India	10	1.0	1.0	1.0	1.5	1.5	1.5	1.5
Serbia & Montenegro	11	2.6	3.1	3.9	4.0	1.2	1.3	1.5
Ukraine	12	13.0	12.9	7.7	5.0	–	–	–
Japan	13	–	–	–	–	–	–	–
Total primary		399.1	(r) 383.1	386.4	402.8	413.9	460.3	409.0
RECYCLED PRODUCTION (3)								
United States	1	65.1	71.2	77.6	77.1	(r) 86.1	82.3	85.0
Japan	2	11.8	21.2	22.8	20.0	20.0	20.0	23.0
Brazil	3	1.6	1.6	1.6	1.6	1.6	1.6	2.0
United Kingdom	4	0.5	0.5	0.5	0.5	(r) 0.5	0.5	5.0
Austria	5	0.1	–	–	–	–	–	–
Total recycled		79.1	94.5	102.5	99.2	(r) 108.2	104.4	115.0
Total primary and recycled		478.2	(r) 477.6	488.9	502.0	(r) 530.5	674.7	524.0

Sources: Natural Resources Canada; International Consultative Group on Nonferrous Metals Statistics; industry publications.

– Nil; (e) Estimated by author; (r) Revised.

(1) Estimate per USGS, includes recycled. (2) Numbers used in table are from the International Consultative Group on Nonferrous Metal Statistics. China Magnesium Association reports higher numbers for Chinese production: 1994 - 25 000 t; 1997 - 92 000 t; 1998 - 120 000 t; 1999 - 157 000 t; 2000 - 194 000 t; 2001 - 195 000 t. (3) Recycled magnesium facilities exist in other locations, including Canada, which have not reported separate production figures for recycled magnesium due to confidentiality reasons and other considerations.