

Chrysotile

Louis Perron

The author is with the Minerals and Metals Sector,
Natural Resources Canada.
Telephone: (613) 992-4828
E-mail: lperron@nrcan.gc.ca

After experiencing a 23.9% decline in 1998, Canadian chrysotile shipments increased by 7.4% in 1999 from 1998 levels. Total shipments for 1999 were estimated to be 345 000 t valued at \$162.5 million, compared to revised shipment figures for 1998 of 321 330 t valued at \$167.4 million. The average price (for all shipments) decreased by about 9.6%, reflecting a combination of a small drop in price for each fibre grade as a result of fierce competition for market shares by Russian producers and higher sales of cheaper, shorter fibre grades.

Since the closure of the Baie Verte, Newfoundland, operation in 1994, the Canadian chrysotile industry is concentrated in Quebec. Production comes from three mines: the Black Lake and Bell mines operated by LAB Chrysotile, Inc. and the Jeffrey mine operated by J.M. Asbestos Inc.

Canadian exports of chrysotile in 1999 were an estimated 332 406 t. This represents a 4.1% increase in volume from the previous year but a 22.7% decline when compared to 1997. The value of these exports decreased by 1.4% to \$195.9 million.

In 1999, world production of chrysotile is believed to have increased by about 3.1% to reach 2.003 Mt. This increase is attributable mostly to higher production in Canada, Kazakstan, Russia, Zimbabwe and Greece, while production in other countries is expected to have either remained stable at 1998 levels or to have decreased substantially, such as in China, Swaziland and South Africa.

Due to slowly recovering markets, employment in the Canadian chrysotile industry stabilized at about 1525 workers in 1999.

As a consequence of the European ban movement, but foremost because of the impact of Asia's financial crisis where economies are slowly recovering, worldwide chrysotile consumption will remain low compared to recent years. However, as a result of the drawdown of consumer stocks in 1999 and the strengthening economic recovery in 2000 (mostly in Thailand, India, Malaysia, Indonesia and South Korea), worldwide chrysotile consumption should increase by 8-10% in 2000.

CHRYSOTILE, WORLD PRODUCTION BY COUNTRY, 1999

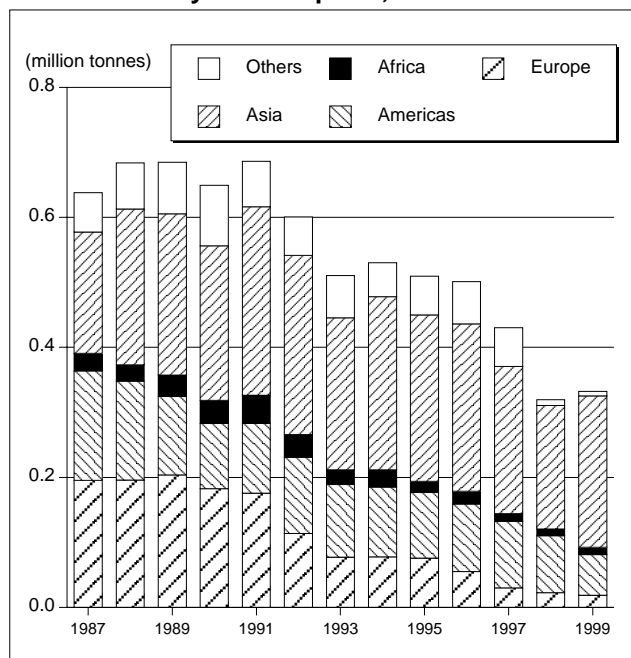
Country	Tonnes ^e
Russia	683 000
China	400 000
Canada	345 000
Brazil	200 000
Zimbabwe	137 400
Kazakstan	105 000
Greece	50 000
India	25 000
Swaziland	20 000
South Africa	18 000
Colombia	8 000
United States	7 200
Others	4 500
Total	2 003 100

Sources: Natural Resources Canada;
U.S. Geological Survey.
^e Estimated.

CHRYSOTILE AND ITS USES

Chrysotile (a natural fibrous hydrated silicate) is the only form of asbestos in the serpentine group. Crocidolite, amosite, anthophyllite, actinolite and tremolite form the amphibole group. Of these minerals, chrysotile is the least hazardous to human health

Figure 1
Canadian Chrysotile Exports, 1987-99



Sources: Natural Resources Canada; Statistics Canada.

and is the only one extracted in Canada. Chrysotile, which is sensitive to acid, tends to dissolve in the lungs, unless these are overburdened from exposure to excessive levels in the occupational environment. All fibres (asbestos or substitutes) that enter the lungs cause mechanical irritation. In the past, most of the problems associated with chrysotile have been due to the poor working practices that existed then in both the handling and use of chrysotile. With the marked improvements in today's work practices and the increased protection of workers, the occupational risks associated with chrysotile have been tremendously reduced and are controllable with existing technology.

Because of their chemical and physical properties, chrysotile fibres are an extremely useful material that has been, and still is being, widely used throughout the world. In Canada, chrysotile fibres are classified into seven groups, each one with its own sub-categories, with the longest fibres assigned to Group 1 and the shortest to Group 7. In decreasing length, chrysotile has been used in textiles, clothing, packings, woven brake linings, clutch facings, electrical insulation materials, high-pressure and marine insulation, asbestos-cement pipe, other asbestos-cement products (e.g., sheets and mouldings, shingles, extrusions), gaskets, paper products, vinyl sheet backings, and millboards. The shortest fibres (Group 7) are used in moulded brake linings and as a filler in

cement, plastics, roof coatings and caulking compounds. Some 90% of all chrysotile produced globally is used in asbestos-cement products such as pipes, plates and corrugated sheets, 7% in friction products such as brake linings and clutch facings, and 3% in textiles, clothing and various other uses. Low-density and friable products are no longer marketed and are prohibited in Canada under the *Hazardous Products Act*.

CANADIAN DEVELOPMENTS

In 1999, despite an increase in demand from recovering Asian economies, the production level of **LAB Chrysotile, Inc.** (the largest Canadian chrysotile producer), at 172 000 t, was 6.9% lower than in 1998. The company made up for its lower production by drawing from its inventory, which had been restocked in 1997. During the year, employment at LAB Chrysotile stood at the same level as in 1998 at about 1100 workers.

At LAB Chrysotile's Bell mine, which is the only underground chrysotile operation in Canada, reserves at the 1450 production level enabled operations to continue throughout 1999. However, production at the Bell mine is expected to stop in early March 2000 for 8-10 weeks to transfer the crusher from the 1450 level to the 1750 level where the company plans to have its \$30 million development project, which started in 1997, completed by mid-2000. Full production should be reached six months after production gets under way at the 1750 level. These new reserves, identified in a 1995 drilling program, will ensure the mine's life into the new century.

At its Black Lake operation, LAB Chrysotile pursued its \$40 million slope stabilization project. Reserves at this site are sufficient for the next 13 years at current production rates.

In 1999, the production level at **J.M. Asbestos Inc.** increased to 139 000 t, compared to 117 722 t in the previous year. The increase in production, brought about by higher consumer demand, enabled the company to regularize its production schedule compared to the previous year. However, J.M. Asbestos still had to proceed during the year with periodic shut-downs of operations and temporary layoffs. Its work force remained stable in 1999 at about 425 workers.

Despite financial pressure put on it by plummeting market demand, J.M. Asbestos pursued the development of an underground operation to extend the life of the Jeffrey mine. Work on production and haulage ramps, as well as on preparation of the ore zones, was pursued in 1999 while completing the sinking of the production shaft and installing the 7000-hp friction

hoist. Construction of the underground mine is expected to be completed by the end of 2001. Production at J.M. Asbestos will then be transferred from the open pit to the underground mine over a period of 12 months. Lower market demand enabled the company to stockpile 3.5 Mt of ore necessary to ensure a smooth transition period. The new underground operation will have a maximum capacity of 250 000 t/y of chrysotile fibre until 2020. The capital cost of this development is estimated to be \$135 million. The underground mine project is financed from the operation's cash flow and from a \$65 million loan of which 70% was guaranteed by the Quebec government in October 1998 through "Investissement-Québec." J.M. Asbestos has already invested \$60 million in the project.

Following the signature in 1997 of an agreement to sell J.M. Asbestos' magnesium-rich serpentine tailings to Magnola Metallurgy Inc. (Magnola), the latter company undertook the development of a magnesium metal production project in Asbestos. Mostly owned by Noranda Inc., Magnola started construction of a \$730 million plant in May 1998 that is slated to be completed by the fall of 2000. At full capacity the plant is expected to employ 375 workers and to produce 56 000 t/y of magnesium metal, mostly to be used as an alloying element in the automobile industry.

J.M. Asbestos pursued implementation of the ISO program to obtain ISO 9002 certification on quality assurance and ISO 14 000 certification on environmental protection. The company expects to be certified by the end of 2000.

After spending nearly \$10 million during the past four years at the site of the old Cassiar Mining Corporation operations in northern British Columbia, the Toronto, Ontario-based company **Cassiar Mines & Metals Inc.** (Cassiar) completed the rehabilitation of the dry mill and construction of the plant at the end of 1999. The company started commercial production of high-grade chrysotile fibres in early January 2000 at a rate of 18 000 t/y by treating tailings and residual stockpiles accumulated during the previous operation in the 1953-92 period. Cassiar expects to start shipments to clients in February 2000 and plans to expand its fibre production to 50 000 t/y by 2002 through the addition of a wet milling process. The tailings represent a resource of 20 Mt of ore grading 3.75% chrysotile.

Cassiar is confident that it will recapture the Asian asbestos-cement sheet and pipe markets it had formerly served. It is also actively pursuing the development of a US\$600 million magnesium metal production plant at the mine site with a capacity to produce 70 000-90 000 t/y. Initial production could start in 2003.

INTERNATIONAL AND REGULATORY DEVELOPMENTS

The Americas

Latin America

Brazil is an important producer of chrysotile, especially for the increasingly active Latin American market. Sociedade Anonima Mineração do Amianto (SAMA) produced about 200 000 t in 1999, a level similar to 1998. SAMA's mine is located at Minaçu in the state of Goiás. The company has programs for waste-site reforestation, the treatment of mine and mill waste-waters, and dust control (through the use of wet recovery processes).

The Asbestos International Association (AIA) regional program for Latin American countries, the AIA/CLAS (Confederación Latinoamericana del Asbesto), was again very active during the year. The objective of the program is to foster regional cooperation and identify joint priorities for action in Latin America in the context of broader efforts to gain wider global acceptance of the controlled-use approach for chrysotile. There is a firm commitment on the part of industry in all of the participating countries to implement the International Labour Organization Convention 162 on Safety in the Use of Asbestos.

In 1999, the AIA/CLAS, in collaboration with the Asbestos Institute, carried out missions to two Latin American countries (Colombia and Mexico). The objectives of the various missions were to promote the safe use of chrysotile asbestos, to assist in the implementation of the responsible use policy, and to emphasize the need for better dialogue between industry and governments. This was achieved either through meetings with consuming industry and government officials to evaluate the state of the situation or through information seminars attended by industry and government officials.

The third Annual Mines Ministries of the Americas Conference, held in Buenos Aires, Argentina, on November 9, 1998, resulted in the Buenos Aires Declaration, which includes an endorsement of the Safe Use Principle for minerals and metals. In this declaration the ministers and heads of delegation agreed: "To adopt, implement and communicate management policies aimed at continuous improvement within their countries and to promote the safe use of minerals and metals, regionally and internationally, taking into account the Conclusions of the Experts who attended the Pan-American Workshop on the Safe Use of Minerals and Metals held in Lima, Peru (July 1-3, 1998)." This declaration was signed by Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, the Dominican Republic, Ecuador,

Guatemala, Haiti, Mexico, Nicaragua, Paraguay, Peru, Uruguay, the United States and Venezuela.

Building on the momentum of the previous conference, delegations assembled at the fourth Annual Mines Ministries of the Americas Conference in Caracas, Venezuela, on October 25, 1999, agreed in the Caracas Declaration to: 1) "Strengthen the necessary relationships between mining ministries and the foreign affairs and environmental ministries of the various countries to address topics related to the defence and promotion of metals and minerals markets within the framework of international regulatory trends in this area"; and 2) "Propose to the governments to ratify or approve, according to their interests, Conventions and Recommendations of the International Labour Organization (ILO) referring to occupational health and safety in mines."

United States

The U.S. Geological Survey estimated asbestos imports into the United States at 15 808 t in 1999 compared to 15 823 t in 1998. Canada remains the largest exporter (90.7%) of chrysotile to the United States, which also produces chrysotile fibres at the King City Asbestos Corporation (KCAC) New Idria mine near Coalinga, California. Shipments from this mine amounted to about 7190 t in 1999, up from 5760 t in 1998.

In the United States, asbestos was consumed in roofing products (61%), gaskets (19%), friction products (14%), and other products (6%). Although no longer manufactured in the United States, asbestos-cement pipes are currently being imported from Mexico into the United States where there remains an important demand for this product in the southwestern states. The United States' main import based on tonnage, however, is asbestos-cement sheets, panels and tiles, while its main import based on value is friction products such as brake linings and pads. Total imports of asbestos products in 1999 amounted to about \$151.8 million, an increase of 9.4% compared to 1998.

U.S. exports of chrysotile fibres, mainly to Mexico and Japan, increased by 24% on account of increased demand in Mexico. U.S. exports of asbestos-containing products (mostly brake linings and other friction material) to several countries, including Australia, Canada, Germany, Japan, Mexico, Saudi Arabia, South Korea, the United Kingdom and Venezuela, amounted to \$237.5 million, up 22% from 1998.

Europe

European Union

On August 6, 1999, following approval by the Technical Progress Committee of a proposal submitted by the European Commission (EC) for the modification

of an existing Directive on asbestos (76/769/EEC), the EC announced a ban of asbestos.

The principal provisions of the new directive (1999/77/EC) are that member states of the European Union must phase out the placement on the market and the use of chrysotile asbestos and of products containing this fibre no later than January 1, 2005. The only exception to the prohibition is the use of chrysotile asbestos in diaphragms used for electrolysis in existing installations, a derogation that will be reviewed by the EC before January 1, 2008. However, because of significant controversy during the development of the new directive regarding the "relative safety" of substitutes, the EC agreed to review its ban measure as follows: "Whereas the scientific knowledge about asbestos and its substitutes is continually developing; whereas the Commission will therefore ask the Scientific Committee on Toxicity, Ecotoxicity and the Environment to undertake a further review of any relevant new scientific data on the health risks of chrysotile asbestos and its substitutes before January 1, 2003; whereas this review will also consider other aspects of this directive, in particular the derogations, in the light of technical progress; whereas, if necessary, the Commission will propose appropriate changes to legislation."

At the end of 1999, four countries (Greece, Ireland, Portugal and Spain) were still using chrysotile but were proceeding to comply with the new Directive by the 2005 deadline.

France

On July 7, 1998, following recommendations in its earlier report entitled *Health Effects of the Main Types of Asbestos Exposure*, the Institut National de la Santé et de la Recherche Médicale (INSERM) released a summary of the conclusions of an expert panel on the health effects of several asbestos substitute fibres. This study was conducted at the request of the Health Branch and the Labour Relations Branch of the French Department of Employment and Solidarity in follow up to the process that began with the INSERM expert panel on asbestos.

The main conclusions reported are that: 1) because the "fibre" structure of asbestos is a major pathogenic factor, any new fibre proposed as an asbestos substitute (or for any other use) should automatically be suspected of being pathogenic because of its structure; 2) it was not possible to reach a firm conclusion on the cancer risk posed by substitutes because of a lack of data, especially epidemiological data; and 3) "most likely, similar concentrations of asbestos fibres (as are used currently in experiments to test the carcinogenicity of asbestos substitute fibres) would have yielded results of little or no significance in carcinogenicity studies." The final report entitled *Health Effects of Substitute Fibres to Asbestos* was released in late November 1999.

World Trade Organization

On May 28, 1998, following the French government's decision to ban the import, manufacture and sale of most asbestos products, and after having exhausted all diplomatic recourse with France to find a mutually satisfactory resolution to the issue, the Canadian government announced its decision to initiate an action at the World Trade Organization (WTO) for the settlement of the dispute with France on the issue of chrysotile asbestos. The government's objective in doing so is to maintain market access for all mineral and metal products, including chrysotile asbestos, in accordance with the Safe Use Principle of the Government of Canada's *Minerals and Metals Policy*.

On October 8, 1998, after unsuccessful consultations between the two parties on July 8, 1998 (the first step under the dispute settlement procedures of the WTO), the Government of Canada formally asked the WTO to establish a dispute settlement panel for the resolution of the dispute with France. The selection of the three panel members began in December 1998 and was finalized at the end of March 1999. Both parties submitted their first briefs, which was followed by the first hearing of the case in Geneva on June 1 and 2, 1999. The second step of the panel process (the submission of both parties' second briefs to the panel, the latter's consultation of a committee of experts to clarify contentious scientific issues, and a second hearing of the case in Geneva on January 20, 2000) has also been completed. The panel will now deliberate and is scheduled to render a ruling to be made public on August 15, 2000.

Brazil, Zimbabwe and the United States, which had reserved third-party rights, actively participated in the first round of the panel proceedings by providing their briefs and attending the hearing.

Greece

The Zidani chrysotile mine in Greece, which returned to production in 1993 under the terms of a renewable five-year lease to Hellenic Mineral Mining Co. Ltd. (HMMC), is estimated having produced 50 000 t of chrysotile fibres in 1999. The country's asbestos-cement industry, comprising three companies (Hellenic Plastics S.A. (Hellenit), General Company of Building Materials (GEDY), and Inocimenti S.A.), operated with a 45 000-t/y finished product capacity in 1999.

United Kingdom

In step with the August 6, 1999, EC asbestos ban announcement, the United Kingdom announced on August 24, 1999, the implementation of the amended Directive, which came into force on November 24, 1999.

Other Producers

China

Chrysotile asbestos production in China is estimated at 400 000 t for 1999, mostly emanating from the country's western provinces of Xinjiang and Qinghai and the eastern provinces of Liaoning and Hebei. This production is slated for domestic consumption in the manufacturing of asbestos-cement products used in the development of the country's infrastructure. Asbestos consumption in China is expected to keep pace with the increasing construction activity that may result in an increase in imports.

Kazakstan

Chrysotile asbestos production in Kazakstan comes from the Kostanai region where the Joint Stock Combine (JSC) Kostanaiasbest operates the Dzhetygarinsk open-pit mine. Production in 1999 is estimated at 105 000 t, up from 100 000 t in 1998.

Russia

Russia, the world's largest asbestos producer, is estimated to have produced 683 000 t of chrysotile asbestos in 1999, an increase of 8.4% from 1998. The Russian chrysotile mining industry consists of three companies: JSC Uralasbest, JSC Orenburgasbest, and JSC Tuvaasbest, which operate four open-pit mines located in the Urals (3) and in the Tuva region (1) north of Mongolia. An important portion of the country's production is for domestic consumption or is transformed before being exported. About 30% is said to be exported as fibre concentrates while the rest is used to manufacture asbestos-cement products (80%) and technical products (20%) such as friction material products, thermal and electric insulation materials, etc.

South Africa

Asbestos production in the Republic of South Africa decreased to approximately 18 000 t of chrysotile fibres in 1999, about 28% less than in 1998, due to production problems experienced by Msauli Asbes Beperk, which operates an underground mine and processing plant in the Barberton area of Mpumalanga. The rest of South Africa's production comes from two small operators, Kaapsehoop Asbestos and Stella Asbestos, which both operate mines in the same area as noted above and supply the local markets.

Swaziland and Zimbabwe

In Swaziland, because of declining reserves, production at the HVL Asbestos (Swaziland) Ltd.-owned Havelock underground chrysotile mine is estimated to have decreased to 20 000 t, or by 20%, compared to

1998. Conversely, at Zimbabwe's Shabanie and Mashaba asbestos mines, chrysotile production is reported at 137 415 t, an increase of 20% compared to the 1998 production level. This increase was brought about by higher demand in Asian markets. Political and economical instability in Zimbabwe is reported to have had no effect on operations. Sales of 151 000 t are projected for 2000.

Responsible Use Policy

To demonstrate its support for the promotion and implementation of the responsible use policy adopted by the chrysotile producers and exporters of six countries (Brazil, Canada, South Africa, Swaziland, Zimbabwe and Russia, the latter of which signed on February 3, 2000), the Canadian government signed, on March 3, 1997, a Memorandum of Understanding (MOU) in support of the responsible use policy with Canadian chrysotile producers. This MOU commits the government to assist the industry in encouraging the governments of asbestos-consuming countries to endorse the responsible use policy and to develop appropriate regulations where they do not already exist.

The responsible use policy, a voluntary industry policy aimed at increasing workers' protection worldwide, resulted from a 1994 meeting and was signed in late 1995/early 1996. The ultimate objective of this new policy, to be known as the "Responsible Use of Chrysotile," is to supply chrysotile only to those users that are in compliance with their respective national regulations or that have submitted a written commitment with an action plan in order to be in full compliance with their national regulations. The responsible use policy is based on the recognition and acceptance of the principles of the 1986 International Labour Organization Convention 162 and Code of Practice on Safety in the Use of Asbestos.

Acting on a conclusion of The International Conference on the Safe and Responsible Use of Chrysotile Fibres held in Montréal September 16-19, 1997, that "chrysotile producers should export their technology and their expertise with their fibre," the Asbestos Institute in 1999 travelled to Algeria, Colombia, Egypt, Ecuador, Morocco, Mexico, the Philippines, Taiwan, Thailand, Tunisia and the United Arab Emirates to either: 1) hold information seminars and/or training sessions; 2) meet government and industry officials; or 3) visit manufacturing plants, all to promote the safe use of chrysotile.

Developed by the Asbestos Institute in cooperation with labour and the governments of Canada and Quebec, the goal of the program, which began in October 1997, is to provide Canadian expertise to train workers in targeted consuming countries in order to increase their knowledge of safe and responsible chrysotile asbestos manufacturing techniques.

Supported by Natural Resources Canada, this training program promotes the International Labour Organization's Convention 162 on Safety in the Use of Asbestos.

Activities planned for 2000 for the promotion of the safe use of chrysotile include visits to over 10 consuming countries.

International Activities

In parallel with its efforts to assist the Canadian chrysotile industry in the implementation of the producers' responsible use policy, the Canadian government organized a visit to the Canadian chrysotile industry by journalists from Latin America (Chile, Colombia, El Salvador, Panama and the Dominican Republic) in January 1999. Following up on similar visits in 1997 and 1998 by journalists from Belgium, France, Morocco and the United Kingdom, this visit was organized to ensure a broader dissemination of the Safe Use Principle for the benefit of consumers, regulators and industries in consuming countries.

OUTLOOK

As a consequence of the European ban movement, but foremost because of the Asian financial crisis (lower demand resulted in a 39% decrease in Canadian exports to Asian countries in 1998 compared to 1996 levels), worldwide chrysotile consumption will remain depressed in 2000 when compared with pre-1997 levels. However, Canadian producers, which export about 70% of their production to Asia, are expecting an increase in their total sales in 2000. Markets should experience a further resumption in demand in the coming years as Asian economies gradually gain strength.

In developing countries, the benefits and safety of chrysotile-cement products continue to be recognized despite increasing competition from substitute fibres, PVC and galvanized steel. In particular, chrysotile-cement pipes are essential to the distribution of potable water and irrigation in many countries where aggressive soils and economic conditions are not appropriate for substitute products.

Asian countries are still the main markets for Canadian fibres, accounting for about 70% of Canadian exports. In 1999, exports to Asian countries recovered significantly but still remained 26% lower than in 1996. Slowly recovering from its recession (1999 imports were 68% that of 1996), Japan remained the preferred destination during the year with a 0.3% increase in imports compared to 1998, followed closely by India where imports increased by 18.6% during the same period. Exports to India have been growing steadily since 1994 and are expected to remain strong for the next few years mainly due to

increased demand for infrastructure. Shipments to Indonesia and Malaysia in 1999 returned to their pre-Asian crisis levels while those to Thailand and South Korea, although increasing respectively by 23% and 89% compared to 1998, remained at about half their pre-crisis levels. Exports to these two countries are expected to recover gradually in the coming years as the effect of the monetary crisis subsides. The full recovery of the Asian market is not expected before 2003.

In Europe (which still accounts for about 6% of Canada's exports), the impact of France's, and later the European Union's, ban decisions on chrysotile consumption in European consuming countries led to an 18% decrease in exports to the area in 1999 compared to 1998. Further decreases are expected in the coming years as the remaining European consuming countries (Spain, Portugal, Ireland and Greece) reluctantly comply with the new EU ban directive by the year 2005.

Influenced by tendencies in Europe and under corporate pressure to substitute chrysotile asbestos (an important percentage of Latin American consuming companies being subsidiaries of multinational companies headquartered in Belgium and France), the Americas decreased its relative position as an important destination for Canadian chrysotile in 1999, accounting for just under 19% of Canada's exports. This decline reinforces the trend started in 1998 when a 14% reduction in imports was experienced compared to 1997 although, in the latter case, the decrease in demand was also brought about by the impact of the Asian financial crisis on the export-based economies of the Latin American countries. In 1999, Mexico's imports decreased by 12% compared to 1998 partly as the result of a shift in use to substitutes; exports to Mexico in 2000 should stabilize at that level. In a similar fashion, Cuban imports from Canada in 1999 decreased by 49% compared to 1998, continuing a turn to Russian imports that began in 1997; in 2000, Cuban imports from Canada are not expected to increase but the country should remain an important destination for Canadian chrysotile. Exports to the United States continued their slow decrease in 1999, falling by about 9% compared to 1998. However, exports are expected to soon reach a base level where they will stabilize for the coming years because the remaining uses for chrysotile are more difficult or simply cannot be substituted. For reasons similar to the ones mentioned above, Canadian chrysotile exports to Argentina, Brazil, Chile, Colombia and Peru decreased by 40%, 55%, 85%, 48% and 53%, respectively, compared to 1998. The only significant increases in imports reported were to Ecuador (71%) and Venezuela (47%), while exports to the Dominican Republic, El Salvador and Panama remained stable at recent levels.

In Africa, Canadian exports in 1999 improved by more than 7% compared to 1998, most notably in Algeria and Senegal, whereas exports to Morocco fell significantly. Canadian exports to the Middle East, mostly to the United Arab Emirates, Egypt, Lebanon and Iran, remained fairly stable at similar levels to recent years. Varying Canadian export levels to African and Middle Eastern countries in recent years are the result of a number of factors such as social unrest, competitive Russian exports to these regions, and the influence of European policy changes.

The aggressive introduction of new chrysotile-containing products to address current health concerns may help turn markets around in the medium term.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 65. (2) Information in this review was current as of February 3, 2000. (3) This and other reviews, including previous editions, are available on the Internet at http://www.nrcan.gc.ca/mms/cmy/index_e.html.

NOTE TO READERS

The intent of this document is to provide general information and to elicit discussion. It is not intended as a reference, guide or suggestion to be used in trading, investment, or other commercial activities. The author and Natural Resources Canada make no warranty of any kind with respect to the content and accept no liability, either incidental, consequential, financial or otherwise, arising from the use of this document.

TARIFFS

Item No.	Description	Canada			United States
		MFN	GPT	USA	Canada
2524.00.10	Crude asbestos	Free	Free	Free	Free
2524.00.90	Other asbestos	Free	Free	Free	Free
6811.10	Corrugated sheets of asbestos-cement, of cellulose fibre-cement or the like	5%	Free	Free	Free
6811.20	Sheets, panels/tiles, etc., of asbestos-cement, cellulose fibre-cement, etc.	5%	Free	Free	Free
6811.30	Tubes, pipes, and tube or pipe fittings of asbestos-cement, of cellulose fibre-cement, etc.	5%	Free	Free	Free
6811.90	Other articles of asbestos-cement, of cellulose fibre-cement, or the like	5%	Free	Free	Free
6812.10	Fabricated asbestos fibres; mixtures with a basis of asbestos or with a basis of asbestos and magnesium carbonate	Free	Free	Free	Free
6812.20	Asbestos yarn and thread	Free	Free	Free	Free
6812.30	Asbestos cords and string, whether or not plaited	Free	Free	Free	Free
6812.40	Asbestos woven or knitted fabric	Free	Free	Free	Free
6812.50	Asbestos clothing, clothing accessories, footwear and headgear	15.5%	Free	Free	Free
6812.60	Asbestos paper, millboard and felt	Free	Free	Free	Free
6812.70	Compressed asbestos fibre jointing, in sheets or rolls	Free	Free	Free	Free
6812.90	Other asbestos fabricated products n.e.s.	Free	Free	Free	Free
6813.10.10	Asbestos brake linings and pads for motor vehicles of heading nos. 87.02, 87.03, 87.04 or 87.05	7%	Free	Free	Free
6813.10.90	Other asbestos brake linings and pads	5%	5%	Free	Free
6813.90.10	Asbestos clutch facings for motor vehicles of heading nos. 87.02, 87.03, 87.04 or 87.05	Free	Free	Free	Free
6813.90.90	Other asbestos friction material and articles	Free	Free	Free	Free

Sources: Customs Tariff, effective January 2000, Canada Customs and Revenue Agency; Harmonized Tariff Schedule of the United States, 2000.

n.e.s. Not elsewhere specified.

TABLE 1. CANADA, ASBESTOS PRODUCTION AND TRADE, 1998 AND 1999

Item No.	1998		1999P		
	(tonnes)	(\$000)	(tonnes)	(\$000)	
PRODUCTION (Shipments)					
By type					
Group 3, spinning	5 590	6 483	4 100	4 241	
Group 4, shingle	75 830	63 654	73 000	60 558	
Group 5, paper	75 577	44 070	72 400	40 631	
Group 6, stucco	96 981	37 325	123 500	39 948	
Group 7, refuse	67 352	15 854	72 000	17 072	
Total	321 330	167 386	345 000	162 450	
By province					
Quebec	321 330	167 386	345 000	162 450	
Newfoundland	—	—	—	—	
Total	321 330	167 386	345 000	162 450	
EXPORTS					
2524.00.10	Crude asbestos				
	United States	3 209	783	2 353	545
	Venezuela	—	—	150	48
	Japan	276	109	—	—
	Total	3 485	892	2 503	593
2524.00.21	Asbestos milled fibres, Group 3 grades				
	EC countries (12) ¹				
	Spain	396	653	383	633
	Portugal	93	125	14	19
	EC countries, subtotal	489	778	397	652
	Mexico	1 104	1 562	650	845
	India	248	298	408	498
	Lebanon	—	—	216	338
	United Arab Emirates	738	1 218	162	267
	Algeria	400	660	200	260
	Hungary	342	564	150	230
	Turkey	332	527	127	206
	South Korea	219	284	126	166
	Peru	288	374	126	164
	Brazil	56	77	112	153
	Cuba	301	370	90	149
	Other countries	513	579	299	325
	Total	5 030	7 291	3 063	4 253
2524.00.22	Asbestos milled fibres, groups 4 and 5 grades				
	EC countries (12) ¹				
	Spain	6 399	6 320	5 575	5 464
	Portugal	2 815	2 646	2 630	2 412
	United Kingdom	619	408	222	143
	Germany	70	94	60	82
	Ireland	171	110	—	—
	Greece	115	131	—	—
	France	18	33	—	—
	EC countries, subtotal	10 207	9 742	8 487	8 101
	Japan	26 757	25 015	27 651	26 930
	India	20 610	16 693	22 360	18 001
	Thailand	14 515	10 143	17 718	12 530
	Indonesia	5 101	3 442	11 505	7 962
	Mexico	9 734	7 976	7 905	6 738
	Colombia	12 380	10 587	4 882	4 332
	Malaysia	4 953	3 947	4 966	3 927
	Sri Lanka	3 768	3 622	3 960	3 704
	Algeria	3 020	2 554	3 680	3 288
	South Korea	4 718	3 057	4 592	3 164
	Ecuador	1 685	1 595	3 241	3 108
	Brazil	7 564	6 639	3 417	3 038
	Nigeria	2 966	2 321	2 838	2 249
	Egypt	2 363	2 428	2 010	2 095
	United Arab Emirates	3 163	3 100	1 480	1 527
	Other countries	19 087	15 724	11 716	9 942
	Total	152 591	128 585	142 408	120 636

TABLE 1 (cont'd)

Item No.	1998		1999P	
	(tonnes)	(\$000)	(tonnes)	(\$000)
EXPORTS (cont'd)				
2524.00.29	Asbestos shorts, groups 6, 7, 8 and 9 grades			
	EC countries (12) ¹			
	Portugal	956	2 675	930
	Spain	822	2 303	918
	United Kingdom	235	340	101
	Germany	37	47	16
	Ireland	95	-	-
	EC countries, subtotal	5 726	5 365	1 965
	India	27 762	34 900	13 844
	Japan	31 117	30 735	12 704
	Thailand	20 794	25 629	10 283
	South Korea	6 382	16 691	5 729
	Indonesia	6 244	12 636	4 696
	Mexico	10 431	10 233	3 299
	United States	12 341	11 920	3 082
	Malaysia	4 223	7 073	2 992
	Colombia	5 395	4 390	1 743
	Taiwan	3 628	3 256	1 363
	Philippines	1 361	1 953	1 044
	Other countries	22 920	19 651	7 678
	Total	158 324	184 432	70 422
	Grand total, crude, milled fibres and shorts	319 430	332 406	195 904
6811.10	Corrugated sheets of asbestos-cement, of cellulose fibre-cement, or the like			
	Germany	-	..	23
	United States	8	..	11
	Total	8	..	34
6811.20	Sheets n.e.s., panels/tiles, etc., of asbestos-cement, cellulose fibre-cement, etc.			
	United States	11 340	..	18 217
	Cuba	68	..	58
	Russia	-	..	1
	Ukraine	-	-	-
	Other countries	84	..	-
	Total	11 492	..	18 276
6811.90	Articles n.e.s. of asbestos-cement, of cellulose fibre-cement, or the like			
	United States	422	..	219
	Taiwan	18	-	-
	Total	440	..	219
6812.10	Fabricated asbestos fibres; mixtures with a basis of asbestos or with a basis of asbestos and magnesium carbonate			
	United Kingdom	-	..	83
	United States	50	..	6
	Cuba	6	-	-
	Total	56	..	89
6812.20	Asbestos yarn and thread			
	Brazil	178	125	547
	Venezuela	89	74	375
	United Kingdom	14	32	122
	Colombia	-	14	57
	United States	1	2	35
	Mexico	-	5	15
	Other countries	58	-	-
	Total	340	252	1 151

TABLE 1 (cont'd)

Item No.	1998		1999P	
	(tonnes)	(\$000)	(tonnes)	(\$000)
EXPORTS (cont'd)				
6812.30	Asbestos cords and string, whether or not plaited			
	United States	.. 22	..	7
	Cuba	.. 5	-	-
	Total	.. 27	..	7
6812.40	Asbestos woven or knitted fabric			
	United Kingdom	77 700	99	626
	United States	23 341	22	334
	Venezuela	-	21	150
	Morocco	-	22	149
	Brazil	25 155	7	22
	Other countries	2 49	1	16
	Total	127 1 245	172	1 297
6812.50	Asbestos clothing, clothing accessories, footwear and headgear			
	Singapore	.. 29	-	-
	Taiwan	.. 14	-	-
	Total	.. 43	-	-
6812.60	Asbestos paper, millboard and felt			
	United States	.. 19	..	22
	Saint Vincent and the Grenadines	-	..	1
	Taiwan	.. 17	-	-
	Total	.. 36	..	23
6812.70	Compressed asbestos fibre jointing, in sheets or rolls			
	United States	.. 947	..	1 124
	Other countries	.. 155	..	59
	Total	.. 1 102	..	1 283
6812.90.10	Asbestos building material, n.e.s.			
	China	-	..	39
	Chile	-	..	27
	Iran	-	..	18
	Bermuda	-	..	17
	Israel	-	..	11
	Costa Rica	-	..	11
	Japan	-	..	4
	India	.. 21	-	-
	Cuba	.. 17	-	-
	Total	.. 38	..	127
6812.90.90	Other asbestos fabricated products, n.e.s.			
	United States	.. 51	..	75
	Saudi Arabia	-	..	60
	Other countries	.. 31	..	7
	Total	.. 82	..	142
6813.10	Asbestos brake linings and pads			
	United States	.. 48 769	..	52 386
	Other countries	.. 586	..	48
	Total	.. 49 355	..	52 434
6813.90	Asbestos friction material and articles, n.e.s.			
	China	-	..	23
	United States	.. 62	..	6
	Total	.. 62	..	29
Total exports, asbestos manufactured		264 272		271 015

TABLE 1 (cont'd)

Item No.	1998		1999 ^P		
	(tonnes)	(\$000)	(tonnes)	(\$000)	
IMPORTS					
2524.00.00.10	Crude asbestos	82	78	154	93
2524.00.00.90	Other asbestos	57	30	50	8
6811.10	Corrugated sheets of asbestos-cement, of cellulose fibre-cement, or the like	70	80	279	233
6811.20	Sheets n.e.s., panels/tiles, etc., of asbestos-cement, cellulose-fibre cement, etc.	1 355	1 485	7 439	6 613
6811.30	Tubes, pipes, and tube or pipe fittings of asbestos-cement, cellulose fibre-cement, etc.	659	565	961	880
6811.90	Articles n.e.s., of asbestos-cement, cellulose fibre-cement or the like	169	856	150	668
6812.10	Fabricated asbestos fibres; mixtures with a basis of asbestos or with a basis of asbestos and magnesium carbonate	9	77	11	66
6812.20	Asbestos yarn and thread	3	24	2	18
6812.30	Asbestos cords and string, whether or not plaited	21	165	30	178
6812.40	Asbestos woven or knitted fabric	29	401	22	241
6812.50	Asbestos clothing, clothing accessories, footwear and headgear	12	273	12	303
6812.60	Asbestos paper, millboard and felt	..	382	..	504
6812.70	Compressed asbestos fibre jointing, in sheets or rolls	86	942	94	1 541
6812.90.00.10	Asbestos gaskets	513	1 958	536	1 986
6812.90.00.90	Other asbestos fabricated products n.e.s.	..	547	..	569
6813.10	Asbestos brake linings and pads	..	66 505	..	83 067
6813.90	Asbestos friction material and articles n.e.s.	..	6 683	..	5 958
Total imports		..	81 051	..	102 926

Sources: Natural Resources Canada; Statistics Canada.

– Nil; .. Not available or not applicable; n.e.s. Not elsewhere specified; ^P Preliminary.

¹ EC includes Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain and the United Kingdom.

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

TABLE 2. CANADIAN CHRYBOTILE PRODUCERS, 1999

Producers	Mine Location	Normal Mill Capacity		Remarks
		Ore/Day	Fibre/Year	
(tonnes)				
LAB Chrysotile Inc.¹				Partnership owned 55% by LAQ and 45% by Mazarin Mining Corporation Inc.
- Lac d'Amiante du Québec, Ltée (LAQ)	Black Lake, Que.	9 000	185 000	Open-pit. Since September 1989, LAQ has been owned by Jean Dupéré (President of LAB Chrysotile) and Connell Bros. Company, Ltd. of the United States.
- Bell Asbestos Mines, Ltd.	Thetford Mines, Que.	2 700	100 000	Sold to Mazarin Mining Exploration Inc. on September 2, 1992. Underground. Mine re-opened January 1989.
J.M. Asbestos Inc. Jeffrey mine	Asbestos, Que.	15 000	250 000	Open-pit (effective capacity reduced by one half since 1982).
Total of three producers at year-end		535 000		

¹ A partnership involving two operating companies.

TABLE 3. CANADA, ASBESTOS PRODUCTION AND EXPORTS, 1987-99

	Crude Asbestos	Milled Fibres	Short Fibres	Total
(tonnes)				
PRODUCTION¹				
1987	–	365 144	299 402	664 546
1988	14	399 550	310 793	710 357
1989	–	410 588	303 448	714 036
1990	–	379 047	306 580	685 627
1991	–	335 506	350 502	686 008
1992	–	259 819	327 175	586 994
1993	–	235 908	287 059	522 967
1994	–	249 862	280 995	530 857
1995	–	255 621	259 932	515 553
1996	..	241 188	265 088	506 276
1997	..	..	..	420 278
1998 ^r	..	..	..	321 330
1999 ^p	..	..	..	345 000
EXPORTS				
1987	1 696	353 321	293 808	648 825
1988	11 288	381 561	292 236	685 085
1989	17 198	379 601	312 915	709 714
1990	1 469	378 074	269 942	649 485
1991	2 302	353 391	330 360	686 053
1992	1 489	272 013	327 075	600 577
1993	1 739	229 000	279 695	510 434
1994	2 155	248 804	280 394	531 353
1995	968	251 251	257 356	509 575
1996	911	239 111	263 985	504 007
1997	2 793	196 967	230 482	430 242
1998	3 485	157 621	158 324	319 430
1999 ^p	2 503	145 471	184 432	332 406

Sources: Natural Resources Canada; Statistics Canada.

– Nil; .. Not available; ^p Preliminary; ^r Revised.

¹ Producers' shipments.