

Chrysotile

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SUMMARY

As a result of fierce competition for market shares by other world producers and a contraction in demand following the adoption of regulatory restrictions by a number of countries, Canadian chrysotile shipments decreased by 13.1% in 2002 compared to the previous year. Total shipments for 2002 are estimated at 240 500 t valued at \$98.0 million, compared to revised shipment figures for 2001 of 276 790 t valued at \$118.7 million. Canadian exports of chrysotile in 2002 are estimated at 235 138 t, which represents a 13.7% decrease in volume from the previous year. However, the value of these exports only decreased by 8.5% to \$140.2 million.

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 open-pit and Bell underground mines operated by LAB Chrysotile, Inc. near Thetford Mines and the Jeffrey mine operated by Jeffrey Mine Inc. located on the outskirts of the town of Asbestos. This industry provides nearly 4000 direct and indirect jobs to these two communities. The asbestos product manufacturing industry (friction materials, gaskets, roofing products and textiles) is the source of 1000 jobs in 15 businesses. Some of these businesses are found in Ontario and Manitoba, but the majority are located in Quebec.

The world's production of chrysotile is believed to have decreased by about 1.0% to reach 1.97 Mt in 2002. This decrease is mostly attributable to the closure of production capacity in South Africa and the United States and to reduced production in Canada. Production in other countries such as Kazakhstan, Russia, Brazil and Zimbabwe is expected to have remained stable at 2001 levels.

As a consequence of the European ban movement, related regulatory changes in other countries, and the impact of the Asian financial crisis where economies are still recovering in some cases, worldwide chrysotile asbestos use will remain low in coming years compared to that of the mid-1990s. However, the general strengthening of the global economy in 2003 and the gradual recognition by regulatory bodies of the potential toxicity of the main substitute fibres may help stabilize worldwide chrysotile use in the medium term.

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 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 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% is used in friction products such as brake linings and clutch facings; and 3% is used 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

On June 20, 2002, the Government of Quebec adopted a policy for the increased and safe use of chrysotile asbestos. This policy, aimed at silencing critics who accuse Quebec of producing chrysotile only for export, will enable Quebec to set an example and showcase to the world how to use the fibre safely. In fact, while Quebec only uses about 2-3% of its production, its current use per capita (1 kg/person) is about equal to that of other producers such as Brazil, but lower than Russia's (2.8 kg/person). Products targeted for greater use in Quebec include chrysotile-cement pressure pipes, structural tube support for lighting purposes, fireproof paper for archiving, chrysotile-reinforced plastics, and chrysotile asphalt. This latter product has been used successfully in Quebec over the past few years and has proven its cost benefit advantages. Quebec used about 120 000 t of chrysotile asphalt in 2001.

Production

As a result of financial pressure put on it by plummeting market demand and the costs associated with the development of an underground operation to extend the life of its mine, Jeffrey Mine Inc. filed for bankruptcy protection under the *Companies' Creditors Arrangement Act* on October 7, 2002, to enable it to develop a settlement plan with its creditors. Slated to gradually replace production from the open pit over a period of 12 months, the underground mine is designed to have a maximum capacity of 250 000 t/y of chrysotile fibre until 2020. The capital cost of this development, estimated to be \$133 million, is financed from the operation's cash flows and from a \$65 million loan of which 70% was guaranteed by the Quebec government in October 1998 through "Investissement Québec." Jeffrey Mine Inc. has already invested \$68 million in the project.

However, the permanent closing of the Jeffrey mine was postponed following the United States' National Aeronautics and Space Administration (NASA) space shuttle program offer of a multi-million-dollar contract, through ATK Thiokol Propulsion, for the supply of a special chrysotile fibre needed to manufacture thermal insulant for the space shuttle's solid rocket boosters. Ever since the maiden launch of space shuttle Columbia in 1981, the Jeffrey mine has supplied material for the two giant

solid-fuel reusable rocket motors that boost each shuttle into orbit. The asbestos fibres protect the rockets' case from the burning fuel during liftoff. The NASA contract will enable the Jeffrey mine to treat ore stockpiled at the mine to produce about 40 000 t of chrysotile fibres, including about 590 t of the high-grade fibre "plastibest" for NASA, enough to supply the shuttle's solid-fuel rocket systems until 2020. For this purpose, 250 of the 320 former workers at the Jeffrey mine were recalled for about four months starting on December 2, 2002. The Jeffrey mine's closure would have forced NASA and ATK to switch to another chrysotile asbestos supplier and would have required years of extensive testing, such as building full-scale motors for field tests, before the material was certified again as safe for human spaceflight by NASA.

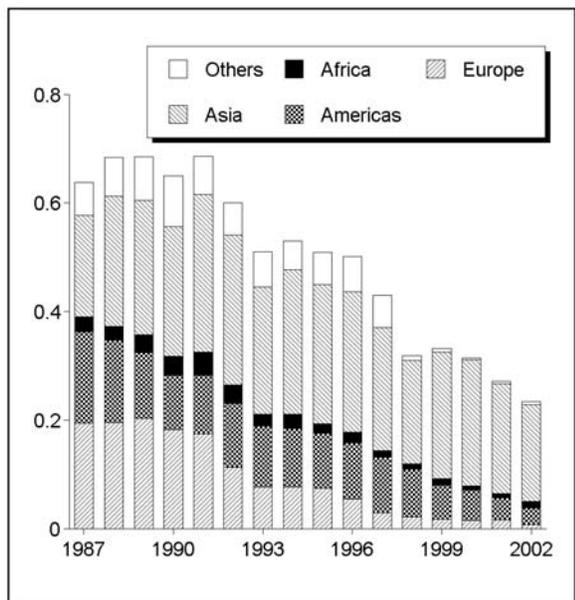
In 2002, because of periodic shut-downs of operations and temporary layoffs throughout the year, Jeffrey Mine Inc.'s production level decreased to 92 493 t, compared to 125 152 t in the previous year.

Pressured by markets to make up for the drop in supply brought about by the extensive shut-down at the Jeffrey mine during the year, LAB Chrysotile, Inc. (the largest Canadian chrysotile producer) increased its production level. However, hampered by a seven-month lockout at its Black Lake open-pit operation that started on April 28, 2002, the company had to make up the balance by drawing from inventories accumulated in 2001. Because of this, LAB Chrysotile's production in 2002 only reached 149 728 t, a drop of 1.3% compared to 2001. The company pursued its \$40 million slope stabilization project at its Black Lake operation during the year. Reserves at this site are sufficient for the next 13 years at current production rates.

Trade

Asian countries are still the main markets for Canadian fibres, accounting for about 75% of Canadian exports. In 2002, exports to Asian countries decreased by 12% compared to 2001 on account of significant drops in exports to Japan and Hong Kong. Pursuing the trend established in recent years, India remained Canada's preferred export destination during 2002 although its imports were 8.0% lower than in 2001. Use in India is nonetheless expected to remain strong in the short and medium term, mainly due to increased demand for infrastructure development, but fierce competition from India's iron and steel industry may limit the growth in demand for chrysotile-cement products. Moving in the opposite direction, exports to Japan dropped by 78% during the same period. This was brought about by the depressed state of the Japanese economy and by the gradual move of its manufacturing industry to substitute materials. In doing so, it relinquished its position as Canada's second most important shipping destination to Thailand, where exports increased by 18% in 2002 to reach close to 41 000 t. Similarly, Canada's

Figure 1
Canadian Chrysotile Exports, 1987-2002



Sources: Natural Resources Canada; Statistics Canada.

exports to China, Pakistan, Vietnam and Bangladesh increased while those to Indonesia, South Korea, Malaysia, Sri Lanka and Taiwan decreased.

In Europe (which still accounts for close to 4% of Canada's exports), the gradual compliance of countries to the European Union ban decision on chrysotile use led to a 49% drop in Canada's exports to the area in 2002 compared to 2001. The drastic change in demand registered during the year stems from Spain's gradual switch to substitute fibres. Further decreases are still expected in the coming years as Portugal, the last remaining European country not to have restricted the use of chrysotile, reluctantly complies with the EU ban directive by 2005.

Influenced by tendencies in Europe and under corporate pressure to substitute chrysotile asbestos (an important percentage of Latin American chrysotile-using 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 2002, accounting for just under 13% of Canada's exports. In 2002, exports to Mexico decreased by 64% to 7300 t compared to 2001, partly as a result of the country's shift in use to substitutes and increased imports from Brazil. However, reversing a turn to Russian imports that started in 1997, Cuban chrysotile imports from Canada shot to nearly 2700 t in 2002 from close to nil in 2001. Cuban imports from Canada are expected to increase in the short term, making Cuba an important destination for Canadian chrysotile. Exports to the United

States during the year pursued their slow decrease, falling to slightly more than 6600 t compared to more than 10 500 t in 2001. However, exports are expected to soon reach a base level where they will stabilize for the coming years given that the remaining uses for chrysotile are more difficult to substitute. For reasons similar to the ones mentioned above, Canadian chrysotile exports to Argentina, Brazil, Colombia, the Dominican Republic, Ecuador, Panama, Peru and Venezuela decreased compared to 2001. Other than that mentioned above, the only significant increase in imports reported were from El Salvador (20%).

In Africa, Canadian exports in 2002 improved significantly and reached more than 12 500 t, compared to a level of slightly more than 7750 t in 2001. This was essentially achieved through higher exports to Algeria, Angola, Morocco and Senegal, whereas exports to Nigeria fell significantly. Canadian exports to the Middle East, mostly to the United Arab Emirates and Iran, increased substantially while those to Egypt dropped. 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.

INTERNATIONAL AND REGULATORY DEVELOPMENTS

The world's production of chrysotile is believed to have decreased by about 1.0% to reach 1.97 Mt in 2002 (see table below). This decrease is mostly attributable to the closure of production capacity in South Africa and the United States and to reduced production in Canada. Production in other countries such as Brazil, Kazakhstan, Russia and Zimbabwe is expected to have remained stable at 2001 levels.

CHRYSTOLE, WORLD PRODUCTION BY COUNTRY, 2002

Country	Tonnes (e)
Russia	750 000
China	360 000
Canada	240 500
Kazakhstan	235 000
Brazil	180 000
Zimbabwe	135 000
India	20 000
South Africa	13 400
Colombia	8 000
United States	3 000
Others	25 000
Total	1 969 900

Sources: Natural Resources Canada; United States Geological Survey.
(e) Estimated.

Taking advantage of the devaluation of their currency and of their low production costs, Brazil, Kazakhstan, Russia and Zimbabwe increased their market shares at the expense of that of Canada.

The Americas

Brazil

Brazil is an important producer of chrysotile asbestos, ranking fifth worldwide. Its sole producer, Sociedade Anonima Mineraçao do Amianto (SAMA), produced approximately 180 000 t in 2002, about 10% less than in 2001. Most of this production – on average 160 000 t – is used by Brazil's chrysotile-cement manufacturing industry while the rest is exported mostly to Latin American countries. SAMA's mine is located at Minaçu in the state of Goiás.

At the regulatory level, two important national Brazilian bodies, the Federal Supreme Court and a House of Representatives Committee, ruled in favour of maintaining the controlled use of chrysotile asbestos in their country. On September 26, 2001, the Brazilian Federal Supreme Court had remanded the law of the state of South Mato Grosso that forbade the manufacture, entry, marketing and storage of all asbestos fibre for civil construction or for products made of asbestos by declaring it unconstitutional. Similar legislation formerly adopted in three other states (Sao Paulo, Rio de Janeiro and Rio Grande do Sul) were all confronted with the same verdict. The federal law in force since 1995 is reconfirmed as applying to all of Brazil. It stipulates health protection and security measures for workers in contact with the product and forbids the use of the most dangerous types of asbestos (amphiboles) by virtue of Convention 162 of the International Labour Organization.

On October 15, 2002, a Brazilian Chrysotile Institute called "Crisotila Brasil" was formed by executives of the mining and fibre cement industry and the partnership of the Secretary of Industry and Commerce of Goiás, the National Department of Mineral Production, the city of Minaçu, and the Union of the Workers of the Non-Metallic Minerals Industry of Minaçu. The purpose of this agency is essentially to promote the safe use of chrysotile by disseminating information on the issue on domestic and international markets, and by stimulating and supporting studies and research related to the safe use of chrysotile fibres and their applications.

Mexico

In 2002, the Instituto Mexicano de Fibro-Industrias, A.C. (IMFI), a member of the Asbestos International Association (AIA) regional program for Latin American countries, the AIA/CLAS (Confederación Latinoamericana del Asbesto), held a conference on May 17, 2002, in collabo-

ration with the Asbestos Institute, to promote the safe use of chrysotile asbestos and assist in the implementation of the industry's responsible use policy. Emphasis was made on the need for better dialogue between industry and governments.

United States

The United States Geological Survey estimated 2002 asbestos fibre imports into the United States at 6849 t, compared to 12 700 t in 2001. Canada remains the largest exporter (97%) of chrysotile to the United States. The only U.S. asbestos producer, King City Asbestos Corporation's New Idria mine near Coalinga, California, closed in 2002 as a result of declining markets for its fibre grade. Shipments from this mine amounted to about 3000 t of chrysotile in 2002, down from about 5260 t in 2001.

In the United States, asbestos is used in roofing products (71%), gaskets (18%), friction products (5%), 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 southwestern states. The United States' main import based on tonnage is, however, asbestos-cement sheets, panels and tiles while, based on value, its main import is friction products such as brake linings and pads. Total imports of asbestos products in 2002 amounted to about US\$556 million, about equal to that in 2001.

U.S. exports of chrysotile fibres, essentially to Japan and Mexico, increased by 34% to 6554 t in 2002. U.S. exports of asbestos-containing products (mostly brake linings, mounted brake linings and other friction products) to several countries, including Australia, Belgium, Canada, Germany, Japan, Mexico, Saudi Arabia, South Korea, the United Kingdom and Venezuela, amounted to about US\$205 million, down 32% from 2001.

Asbestos litigation – affecting some 8400 companies – pursued its damaging effect on the U.S. economy during the year by forcing additional companies into bankruptcy. The failings of the U.S. judicial system were made apparent by the fact that most of the claimants involve people that were exposed to asbestos in one way or another but that have not developed a related illness because such claims must be filed before statutory deadlines are reached. The U.S. Congress is under mounting pressure to address the situation, such as having medical criteria established for non-malignant asbestos-related illnesses and exempting potential claimants from statutory deadlines for filing such claims until their condition meets the criteria.

During 2002, the U.S. Environmental Protection Agency (EPA) oversaw the development of a revised methodology for conducting risk assessments of asbestos to take into

account the substantial improvements that occurred since 1986 in asbestos measurement techniques and in the understanding of how asbestos exposure contributes to disease. The EPA's current assessment of asbestos toxicity, based primarily on an assessment completed in 1986, considers all mineral forms of asbestos and all asbestos fibre sizes to be of equal carcinogenic potency. However, the proposed risk assessment methodology distinguishes between fibre sizes and fibre types in estimating potential health risks related to asbestos exposure. It incorporates the knowledge gained over the last 17 years into the agency's toxicity assessment for asbestos. The EPA is scheduled to convene a peer consultation workshop in 2003 to seek input from a panel of experts on the scientific merit of the proposed methodology.

Europe

European Commission

During 2002, the European Commission (EC) pursued the phase-in of its asbestos ban directive (1999/77/EC) whereby member states of the European Union must phase out the placing on the market and use of chrysotile asbestos and of products containing this fibre no later than January 1, 2005. However, as stipulated in the directive, because of significant controversy during its development regarding the "relative safety" of substitutes, the EC proceeded in 2002 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 (SCTEE) 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."

As part of this commitment, the SCTEE reviewed all relevant new studies on chrysotile, including preliminary results from a toxicological study on chrysotile showing the lesser biopersistence of this fibre compared to the main substitute fibres. Biopersistence is one of three parameters identifying the potential toxicity of a fibre, the other two being the average dimensions of the fibres (affecting the respirability of the fibre) and the dose or amount of fibres subjects are exposed to. Despite highlighting the lack of epidemiological data on certain substitutes, the SCTEE re-affirmed its conclusions that the main substitutes to chrysotile are likely safer.

At the end of 2002, Portugal was the only European Union country still using chrysotile extensively, but was proceeding to comply with the new directive by the 2005 deadline.

United Kingdom

The implementation in the U.K. on November 24, 1999, of Commission Directive 1999/77/EC prohibiting the use, import and manufacture of chrysotile asbestos brought to the fore the issue of potential health risks associated with in-place asbestos products. To address this issue, the U.K.'s Health and Safety Executive developed a law to force property owners to remove from their buildings all asbestos-based products (even asbestos-cement products such as roof tiles) before being able to sell their properties. However, mounting negative publicity highlighting the significant costs of removing asbestos products compared to the trivial benefits derived forced the U.K. government to review its policy on the matter and postpone its entry into force.

Other Producers

China

Chrysotile asbestos production in China is estimated at 360 000 t in 2002, 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 use in the manufacturing of asbestos-cement products used in the development of the country's infrastructure. Asbestos use in China is expected to keep pace with the increasing construction activity, which may result in an increase in imports.

India

In India, small-scale mining occurs in a number of states, notably in Rajasthan and Bihar, which results in the annual production of about 20 000 t of asbestos. Other than from Canadian and domestic mines, India's asbestos requirements are sourced from Zimbabwe and Russia. Indian use of asbestos is nearly exclusively for the manufacture of asbestos-cement products used by the construction industry such as roofing sheets and pressure pipes for the transport of drinking water. Currently, there are about 75 plants engaged in the production of asbestos products across India. These are mainly located in the states of Gujarat, Karnataka, Madhya Pradesh and Andhra Pradesh.

Kazakhstan

Chrysotile asbestos production in Kazakhstan comes from the Kostanai region where the Joint Stock Combine (JSC) Kostanaiasbest operates the Dzhetysayinsk open-pit mine. Production in 2002 is estimated at 235 000 t, up from a level of about 200 000 t in the previous year. Taking advantage of its lower cost base, the combine has more than doubled its production since 1998 and is even planning additional investments by 2005 to further modernize its operations.

Russia

Russia, the world's largest asbestos producer, is estimated to have produced 750 000 t of chrysotile asbestos in 2002, an increase of 4.4% from 2001. The Russian chrysotile mining industry consists of three companies: JSC Uralasbest, JSC Orenburgasbest, and JSC Tuvaasbest, who 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 use or is transformed before being exported. About 40% is 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.

An international conference on Safety and Health in the Production and Use of Asbestos and Other Fibrous Materials was held in Ekaterinburg in June 2002. Organized by the Russian Asbestos Association in collaboration with the Asbestos Institute, this conference attracted delegates from industry, governments and labour unions of 19 chrysotile-producing and using countries. It was organized to update participants on the state of knowledge on asbestos and substitute fibres and to disseminate information on the safe and responsible use of chrysotile asbestos. During the two days, several speakers made presentations on legislation and regulation requirements, dust surveys in different fibre industries, monitoring for health protection and safety in the use of chrysotile and of other fibrous materials, occupational risk assessment, and the most recent control technology and work practices. The importance of acquiring the cooperation of all stakeholders (employers, government, labour) to ensure the implementation of the safe and responsible use of chrysotile was highlighted.

South Africa

Asbestos production in the Republic of South Africa plummeted to 245 t of chrysotile fibres in 2002 as a result of the closure of the country's mining operations. However, as a result of drawdowns from stockpiles, sales slightly above 13 400 t were recorded, including about 5600 t for exports. Production was provided in recent years by Msauli Asbes Beperk, which operated an underground mine and processing plant in the Barberton area of Mpumalanga, and by Kaapsehoop Asbestos and Stella Asbestos, who both operated smaller mines in the same area as above and supplied the local markets.

Zimbabwe

Despite political and economical instability during the year, chrysotile production at Zimbabwe's Shabanie and Mashaba mines reached about 135 000 t, a production level similar to that of the previous year. The company was also able to keep its sales at the 2001 level, despite lower world use, on account of the devaluation of the country's currency.

Other Developments

Rotterdam Convention

Adopted on September 10, 1998, the Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade is a multilateral environmental agreement jointly administered by the United Nations Environment Programme (UNEP) and the Food and Agriculture Organization (FAO) of the United Nations. The objectives of the Convention are:

- to promote shared responsibility and cooperative efforts among participating countries in the international trade of certain hazardous chemicals and pesticides in order to protect human health and the environment from potential harm; and
- to contribute to the environmentally sound use of those hazardous chemicals and pesticides by facilitating information exchange, by providing for a national decision-making process on their import and export, and by disseminating these decisions to participating countries.

This new tool will assist developing countries and countries with economies in transition to better understand and manage the risks associated with the use of toxic chemicals and pesticides. The PIC procedure currently covers 26 pesticides and 5 industrial chemicals referred to as PIC substances. In February 2002, a proposal was made to add all forms of asbestos to the PIC procedure. For this purpose a committee proceeded to draft a Decision Guidance Document (DGD) on asbestos. This document will provide a summary of toxicological and environmental characteristics, known usage, possible exposure routes, measures to reduce exposure, and regulatory actions taken by countries to ban or restrict the use of asbestos. Chrysotile will be described in a separate chapter to distinguish it from other more toxic forms of asbestos. The DGD for asbestos should be completed in March 2003 and submitted for approval to the governing body of the Convention at its meeting in November 2003. If the DGD is accepted, it is expected that chrysotile would be subject to the PIC procedure starting in the Spring of 2004.

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-using 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 policy, 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 on September 16-19, 1997, that "chrysotile producers should export their technology and their expertise with their fibre," the Asbestos Institute in 2002 met with or travelled to half a dozen countries to either: 1) hold information seminars and/or training sessions; 2) meet government and industry officials; or 3) visit manufacturing plants to promote the safe use of chrysotile.

Developed by the Asbestos Institute in cooperation with labour and the governments of Canada and Quebec, the program, which began in October 1997, is aimed at providing Canadian expertise to train workers in targeted chrysotile-using countries in order to increase their knowledge of safe and responsible chrysotile asbestos manufacturing techniques. Supported by Natural Resources Canada and by the Economic Development Agency of Canada for the Regions of Quebec, this training program promotes the International Labour Organization's Convention 162 on Safety in the Use of Asbestos.

Activities for the promotion of the safe use of chrysotile planned for 2003 include visits to half a dozen chrysotile-using countries.

OUTLOOK

Lower demand brought about by the European asbestos ban – and the impact it has on influencing legislation changes in other chrysotile-using countries – is expected to be partly counterbalanced by recovering Asian markets and to result in worldwide chrysotile use decreasing slightly relative to the 2002 level. Markets should experience a further resumption in demand in coming years as Asian economies gradually gain strength. More specifically, use in India and China is expected to remain strong in the short and medium term due to increased demand for infrastructure development, while demand from Japan is

expected to gradually decrease as its manufacturing industry turns to substitute materials. A further decrease in use is still expected in the coming years in Europe as Portugal complies with the EU ban directive by the year 2005.

Demand from the Americas overall should be stable at the 2002 level as lower U.S. use is counterbalanced by increases in Argentina, Brazil and Peru. Similarly, use on the African subcontinent should remain at current levels in the short term.

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.

The aggressive introduction of new chrysotile-containing products to address current health concerns and the gradual recognition by regulatory bodies of the potential toxicity of the main substitute fibres may help turn chrysotile asbestos markets around in the medium term.

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 January 1, 2003. (3) This and other reviews, including previous editions, are available on the Internet at www.nrcan.gc.ca/mms/cmy/com_e.html.

NOTE TO READERS

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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
68.12	Fabricated asbestos fibres; mixtures with a basis of asbestos or with a basis of asbestos and magnesium carbonate				
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				
6812.90.10	Gaskets	Free	Free	Free	Free
6812.90.20	Fabricated asbestos fibres; mixtures with a basis of asbestos or with a basis of asbestos and magnesium carbonate	Free	Free	Free	Free
6812.90.30	Yarn and thread	Free	Free	Free	Free
6812.90.40	Cords and string, whether or not plaited	Free	Free	Free	Free
6812.90.50	Woven or knitted fabric	Free	Free	Free	Free
6812.90.90	Other	Free	Free	Free	Free
6813.10	Asbestos brake linings and pads				
6813.10.10	For motor vehicles of heading 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	Clutch facings for motor vehicles of headings 87.02, 87.03, 87.04 or 87.05	Free	Free	Free	Free
6813.90.90	Other asbestos friction material and articles thereof	Free	Free	Free	Free

Sources: Canadian *Customs Tariff*, effective January 2003, Canada Customs and Revenue Agency; *Harmonized Tariff Schedule of the United States*, 2003.

TABLE 1. CANADA, ASBESTOS PRODUCTION AND TRADE, 2000-2002

		2000		2001		2002 (p)	
		(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
PRODUCTION (Shipments)							
By type							
Group 3, spinning		4 345	4 751	4 173	4 176	4 536	4 454
Group 4, shingle		62 905	50 271	57 020	42 505	39 871	28 823
Group 5, paper		62 263	33 319	54 646	26 132	63 142	28 184
Group 6, stucco		113 752	38 282	100 808	32 986	81 176	25 194
Group 7, refuse		66 454	15 046	60 143	12 942	51 775	11 345
Total		309 719	141 670	276 790	118 741	240 500	98 000
By province							
Quebec		309 719	141 670	276 790	118 741	240 500	98 000
British Columbia		-	-	-	-	-	-
Newfoundland and Labrador		-	-	-	-	-	-
Total		309 719	141 670	276 790	118 741	240 500	98 000
EXPORTS							
2524.00.10	Crude asbestos						
	United States	3 415	651	2 298	542	1 554	317
	India	-	-	-	-	393	175
	Japan	142	21	-	-	-	-
	Total	3 557	672	2 298	542	1 947	492
2524.00.21	Asbestos milled fibres, group 3 grades						
	EC countries (12)						
	Spain	288	374	54	70	-	-
	Germany	-	-	12	22	-	-
	EC countries, subtotal	288	374	66	92		
	Mexico	1 440	1 869	1 214	1 579	1 196	1 551
	United Arab Emirates	18	23	684	889	840	1 092
	India	571	667	781	1 022	650	853
	Algeria	-	-	130	169	250	325
	China	114	153	163	220	150	202
	Hungary	162	211	162	211	138	181
	Brazil	154	210	155	210	112	153
	Indonesia	200	260	150	195	105	137
	Macedonia	-	-	-	-	75	101
	Other countries	846	1 068	333	385	244	284
	Total	3 793	4 835	3 836	4 972	3 760	4 879
2524.00.22	Asbestos milled fibres, groups 4 and 5 grades						
	EC countries (12)						
	Portugal	1 745	1 629	2 086	2 034	3 664	3 412
	Spain	5 646	5 111	6 542	5 276	1 437	829
	Germany	40	58	32	44	120	117
	United Kingdom	54	39	5	4	24	20
	France	-	-	10	14	-	-
	EC countries, subtotal	7 485	6 837	8 675	7 372	5 245	4 378
	Thailand	18 026	12 956	14 147	9 268	33 001	21 037
	India	26 448	20 048	24 334	17 892	30 951	20 038
	Indonesia	8 401	5 999	10 523	7 209	15 959	10 270
	Japan	22 583	21 872	19 118	18 877	12 452	10 210
	Algeria	720	602	3 160	2 643	8 130	7 404
	Malaysia	6 319	5 211	3 955	3 199	4 193	3 431
	Sri Lanka	4 535	4 302	5 010	4 402	3 032	2 632
	Cuba	660	564	-	-	2 540	2 023
	South Korea	5 434	3 532	2 578	1 756	2 858	2 006
	Mexico	7 323	6 768	4 909	4 061	2 607	1 900
	United Arab Emirates	830	742	958	748	2 226	1 672
	Ecuador	2 910	2 839	1 964	1 820	1 760	1 595
	El Salvador	1 090	913	1 552	1 270	1 814	1 542
	Philippines	790	621	1 240	976	1 529	1 168

TABLE 1 (cont'd)

		2000		2001		2002 (p)	
		(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
EXPORTS (cont'd)							
	Colombia	3 480	3 235	2 584	2 405	1 267	1 044
	Turkey	1 439	984	596	439	1 492	1 000
	Other countries	11 210	9 735	10 223	8 092	8 701	6 031
	Total	129 736	107 760	115 526	92 429	139 757	99 381
2524.00.29	Asbestos shorts, groups 6, 7, 8 and 9 grades						
	EC countries (12)						
	Portugal	954	317	1 414	503	932	367
	Spain	2 299	909	4 639	1 870	211	60
	United Kingdom	86	26	–	–	17	5
	Germany	56	20	88	31	–	–
	EC countries, subtotal	3 395	1 272	6 141	2 404	1 160	432
	India	31 970	12 402	30 445	11 336	19 824	8 466
	Japan	27 855	11 583	24 079	9 909	11 774	5 634
	South Korea	18 270	6 788	16 821	5 837	12 426	4 654
	Thailand	27 068	10 313	19 388	7 308	7 931	3 386
	United States	11 002	2 940	8 137	2 075	4 988	1 792
	Colombia	5 041	2 026	3 995	1 550	4 702	1 665
	Indonesia	14 256	5 163	11 805	4 292	3 802	1 420
	Malaysia	7 652	3 135	5 159	1 942	3 051	1 213
	Sri Lanka	1 809	927	1 720	888	1 780	923
	Mexico	8 902	2 826	5 855	1 760	3 497	919
	Other countries	22 820	7 853	17 111	6 041	14 739	4 945
	Total	178 240	67 228	150 656	55 342	89 674	35 449
Total exports, crude, milled fibres and shorts		315 326	180 495	272 316	153 285	235 138	140 201
6811.10	Corrugated sheets of asbestos-cement, of cellulose fibre-cement, or the like						
	United States	..	51	–	–	..	8
6811.20	Sheets n.e.s., panels/tiles, etc., of asbestos-cement, cellulose fibre-cement, etc.						
	United States	..	17 909	..	17 401	..	15 403
	South Korea	–	–	–	–	..	840
	Portugal	–	–	–	–	..	46
	Cuba	..	53	–	–	–	–
	Total	..	17 962	..	17 401	..	16 289
6811.30	Articles of asbestos-cement, of cellulose fibre-cement or the like						
	Tubes, pipes and tube or pipe fittings						
	United States	–	–	–	–	..	17
	Cuba	–	–	..	..	–	–
	Total	–	–	..	..	..	17
6811.90	Articles n.e.s. of asbestos-cement, of cellulose fibre-cement, or the like						
	United States	..	66	..	43	..	91
	Jamaica	–	–	–	–	..	19
	China	..	19	..	15	..	12
	Total	..	85	..	58	..	122
6812.10	Fabricated asbestos fibres; mixtures with a basis of asbestos or with a basis of asbestos and maganesium carbonate	–	–	–	–	–	–

TABLE 1 (cont'd)

		2000		2001		2002 (p)	
		(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
EXPORTS (cont'd)							
6812.20	Asbestos yarn and thread						
	Brazil	39	200	26	270	-	-
	United Kingdom	6	39	11	72	-	-
	Morocco	51	274	13	70	-	-
	Venezuela	69	299	14	58	-	-
	Other countries	17	143	..	14	-	-
	Total	182	955	64	484	-	-
6812.30	Asbestos cords and string, whether or not plaited						
	Cuba	..	5	..	8	-	-
	United States	..	15	-	-	-	-
	Mexico	-	-	..	1	-	-
	Total	..	20	..	9	-	-
6812.40	Asbestos woven or knitted fabric						
	United Kingdom	54	473	61	590	-	-
	United States	9	165	16	364	-	-
	Morocco	13	68	26	143	-	-
	Venezuela	28	123	8	38	-	-
	Other countries	12	69	1	5	-	-
	Total	116	898	112	1 140	-	-
6812.50	Asbestos clothing, clothing accessories, footwear and headgear						
	Saudi Arabia	..	15	-	-	..	110
	Taiwan	-	-	-	-	..	50
	Other countries	..	42	..	41	..	13
	Total	..	57	..	41	..	173
6812.60	Asbestos paper, millboard and felt						
	Fiji	-	-	-	-	..	1
	Japan	..	1	-	-	-	-
	Saint Vincent and the Grenadines	..	6	..	1	-	-
	United States	..	3	..	9	-	-
	Australia	-	-	..	1	-	-
	Total	..	10	..	11	..	1
6812.70	Compressed asbestos fibre jointing, in sheets or rolls						
	United States	..	1 107	..	1 141	..	964
	Other countries	..	338	..	342	..	86
	Total	..	1 445	..	1 483	..	1 050
6812.90.10	Asbestos building material, n.e.s.						
	Japan	..	136	..	102	..	497
	Hong Kong	-	-	..	249	..	355
	Cuba	-	-	..	41	..	168
	United Kingdom	-	-	-	-	..	94
	Other countries	..	120	..	445	..	448
	Total	..	256	..	837	..	1 562
6812.90.90	Other asbestos fabricated products, n.e.s.						
	United States	..	74	..	389	..	311
	Other countries	..	124	..	16	..	25
	Total	..	198	..	405	..	336

TABLE 1 (cont'd)

		2000		2001		2002 (p)	
		(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
EXPORTS (cont'd)							
6813.10	Asbestos brake linings and pads						
	United States	..	58 308	..	71 500	..	87 145
	Other countries	..	247	..	133	..	213
	Total	..	58 555	..	71 633	..	87 358
6813.90	Asbestos friction material and articles, n.e.s.						
	Germany	-	-	..	55	..	66
	United States	..	26	..	22	..	21
	Other countries	..	45	..	9	..	9
	Total	..	71	..	86	..	96
Total exports, asbestos manufactured products		..	261 058	..	246 873	..	247 213
IMPORTS							
2524.00.00.10	Crude asbestos	102	80	99	80	12	9
2524.00.00.90	Other asbestos	24	12	12	2	3	1
6811.10	Corrugated sheets of asbestos-cement, of cellulose fibre-cement, or the like	113	148	60	48	91	116
6811.20	Sheets n.e.s., panels/tiles, etc., of asbestos-cement, cellulose-fibre cement, etc.	6 892	6 297	10 772	10 140	17 752	16 190
6811.30	Tubes, pipes, and tube or pipe fittings of asbestos-cement, cellulose fibre-cement, etc.	805	888	1 039	1 047	1 273	941
6811.90	Articles n.e.s., of asbestos-cement, cellulose fibre-cement or the like	208	727	199	803	265	794
6812.10	Fabricated asbestos fibres; mixtures with a basis of asbestos or with a basis of asbestos and magnesium carbonate	59	193	114	553	-	-
6812.20	Asbestos yarn and thread	4	24	1	6	-	-
6812.30	Asbestos cords and string, whether or not plaited	25	115	17	138	-	-
6812.40	Asbestos woven or knitted fabric	37	281	24	207	-	-
6812.50	Asbestos clothing, clothing accessories, footwear and headgear	7	172	9	198	9	210
6812.60	Asbestos paper, millboard and felt	..	360	..	89	..	79
6812.70	Compressed asbestos fibre jointing, in sheets or rolls	75	1 420	60	949	58	1 111
6812.90.00.10	Asbestos belting	505	2 028	359	1 955	334	1 567
6812.90.00.90	Other asbestos fabricated products n.e.s.	..	584	..	439	..	762
6813.10	Asbestos brake linings and pads	..	84 534	..	71 529	..	76 859
6813.90	Asbestos friction material and articles n.e.s.	..	5 293	..	5 876	..	7 256
Total imports		..	103 156	..	94 059	..	105 895

Sources: Natural Resources Canada; Statistics Canada.

- Nil; .. Not available or not applicable; ... Amount too small to be expressed; 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, 2002

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.
Jeffrey Mine 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	

Sources: National Resources Canada; The Asbestos Institute; United States Geological Survey; South Africa Department of Minerals and Energy.

(1) A partnership involving two operating companies.

TABLE 3. CANADA, ASBESTOS PRODUCTION AND EXPORTS, 1987-2002

	Crude Asbestos	Milled Fibres	Short Fibres	Total
PRODUCTION (1)				
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	..	..	..	321 330
1999	..	..	..	337 367
2000	..	..	..	309 719
2001	..	..	..	276 790
2002 (p)	..	..	..	240 500
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	2 503	145 471	184 432	332 406
2000	3 557	133 529	178 240	315 326
2001	2 298	119 362	150 656	272 316
2002 (p)	1 947	143 517	89 674	235 138

Sources: Natural Resources Canada; Statistics Canada.

– Nil; .. Not available; (p) Preliminary.

(1) Producers' shipments.