ASBESTOS

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Asbestos is a generic name for six fibrous minerals that have been used in commercial products. The six types of asbestos are chrysotile, crocidolite, amosite, anthophyllite asbestos, tremolite asbestos, and actinolite asbestos. Several properties that make asbestos so versatile and cost effective are high tensile strength, chemical and thermal stability, high flexibility, low electrical conductivity, and large surface area. Nearly all the asbestos produced worldwide is chrysotile.

Production and sales of asbestos declined slightly worldwide in 2001. The continued opposition to asbestos, decisions to enact partial or full bans, and slightly declining economies in many countries contributed to the decreased consumption. Liability issues continue to be a major source of concern for former manufacturers of asbestos products. Additionally, through the acquisition of former asbestos product manufacturers, several major corporations are facing the same liability issues as those former product manufacturers.

Legislation and Government Programs

The Agency for Toxic Substances and Disease Registry (ATSDR) announced the availability of toxicological profiles for asbestos (amosite and chrysotile) from the National Technical Information Service. The ATSDR prepared these profiles according to the requirements of the Superfund Amendments and Reauthorization Act (Agency for Toxic Substances and Disease Registry, 2001).

The U.S. Environmental Protection Agency (EPA) announced the availability of a guideline for testing the toxicity of respirable fibrous particles. The guideline is for use when developing data for submission to EPA under the Toxic Substances Control Act, the Federal Food, Drug, and Cosmetic Act, or the Federal Insecticide, Fungicide, and Rodenticide Act. This action by the EPA is part of a program to harmonize test guidelines of the Office of Prevention, Pesticides, and Toxic Substances with those of the Organization for Economic Cooperation and Development (U.S. Environmental Protection Agency, 2001).

The EPA continued to test for the presence of asbestos in and around a vermiculite mine, the local environment, and homes in Libby, MT. The agency also is continuing to assess the risk posed by exposure to the Libby material. Reports on the epidemiological and monitoring activities are available on the web site for EPA region 8 (U.S. Environmental Protection Agency, 2001§[1]).

In connection with the Libby work, the EPA also was involved in two other activities. In May, the 2001 Asbestos Health Effects Conference was held in Oakland, CA. The meeting was sponsored by the EPA, the National Institute for Occupational Safety and Health, the ATSDR, the Mine Safety and Health Administration (MSHA), and the California Office of Environmental Health Hazard Assessment. The presentations covered mineralogy, exposure assessment, epidemiology, toxicology, pathology, and disease mechanisms (U.S. Environmental Protection Agency, 2001§).

The EPA issued a report investigating whether any of the mineralogical and chemical characteristics of vermiculite products might serve as a tracer to help regulators identify product sources. Interest in tracking sales of vermiculite products arose because of the presence of asbestos in some of the Libby vermiculite products that were sold in the past. The objective of this study was to form the groundwork for additional studies on tracer components. Two of the more promising areas for future study were compositional variations in amphiboles and micas and trace element variations in the ores from different locations. The study recommends various methods of analysis for further study and a sampling protocol (Frank and Edmond, 2001).

The MSHA indicated in its regulatory agenda of December 3, 2001, that it was evaluating its 8-hour time-weighted average permissible exposure level (PEL), which currently is set at 2 fibers per cubic centimeter. The Occupational Safety and Health Administration (OSHA) set its PEL at 0.1 fibers per cubic centimeter in 1994. As part of the process, the MSHA will evaluate air samples it has been collecting since spring 2000 and will take into consideration comments from miners and mine operators concerning potential hazards of asbestos and preventative measures that could be implemented to reduce exposure. The MSHA will then develop a preliminary economic analysis for any proposed ruling (U.S. Department of Labor, 2001, p. 61230-61232).

The Senate Committee on Health, Education, Labor, and Pensions met on July 31, 2001. One portion of the hearing was devoted to the asbestos issue, particularly with regard to the presence of asbestos in vermiculite ore from Libby. Industry and regulatory agenciess (MSHA and OSHA) and public advocates presented statements before the Senate committee. Among the presentations, the regulatory agencies assured the Senate committee that they were dedicated to protecting the health and safety of workers and that asbestos issues were high on their priority lists (U.S. Senate, 2001§).

Production

KCAC Inc. in San Benito County, CA, was the only company mining asbestos in the United States in 2001. The company mined a highly sheared serpentinite containing matted, short-fiber chrysotile and unfractured serpentinite (also called a mass-fiber deposit). Domestic production (sales) was unchanged in

[1]References that include a section twist (§) are found in the Internet References Cited section.

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2001 at 5,260 metric tons (t) although its value increased to $3.7 million (table 1). Domestic production data for asbestos were collected by means of a voluntary survey of the one domestic mining operation, representing 100% of the sales data shown in table 1.

Consumption

U.S. consumption of asbestos was estimated to be 13,100 t, an 11% decline from that of 2000. The three leading domestic markets were roofing products, gaskets, and friction products, with 71%, 18%, and 5%, respectively, of the asbestos market. This represents a shift in sales from 2000, when the percentages for roofing, gaskets, and friction products were 62%, 22%, and 12%, respectively. Roofing has maintained more of its market share over the past 10 years than the other major end uses, and friction products have lost the largest market share. This has resulted largely because of the availability of substitutes for gasket and friction products and the fact that asbestos fibers in roofing products are encapsulated in bituminous materials and there is little chance for their release during application or removal. For comparison, roofing held 48% of the 33,000-t asbestos market in 1992; gaskets accounted for 9%, and friction products, 30%. Another indicator of how the industry has changed is that in 1973 asbestos consumption peaked at 801,000 t. Now, 30 years later, usage is barely 13,100 t, and chrysotile is essentially the only type of the asbestos used in the United States. Of the chrysotile used in 2001, 95% was grade 7, followed by grades 6, 5, 4, and 3, in decreasing order of consumption.

In addition to the slow erosion of the asbestos market, many companies continue to face liability issues. Included on the list are Halliburton Co. because of its purchase of Dresser Industries Inc. (which owned the former Harbison-Walker Refractories Co., a vendor of some asbestos-containing products); USG Corp. for its past manufacture of joint compounds and plasters that contained asbestos; and W.R. Grace and Co. for its vermiculite products that contained asbestos. Others include Dow Chemical Co. for its purchase of Union Carbide Corp. (which mined asbestos and produced sealants and coatings containing asbestos in the past), 3M Co. for a controversy over the effectiveness of some of its respirator masks, PPG Industries Inc. for manufacturing asbestos products in the past, and Kelly-Moore Paint Co. with a controversy over some of its joint compounds and wall-texture products (France, 2001; North American Minerals News, 2001; Paint and Coatings Industry, 2001; Seewald, 2001; Sissell, 2002).

Prices

The average unit value of domestically produced asbestos increased from that of 2000 to $703 per metric ton in 2001. The average free alongside ship (f.a.s.) unit value of asbestos exports and reexports was $225 per ton, a decline from $384 per ton in 2000. The average U.S. customs unit value for imported crude chrysotile increased by 23% to $145 per ton in 2001. The average unit value for imports of spinning-grade (grade 3) chrysotile was $1,580 per ton, an 8% increase from that of 2000. The unit value of the other grades of chrysotile increased by 17% to $190 per ton in 2001. Imports of chrysotile from South Africa and Zimbabwe had the highest unit values. The average unit value of chrysotile imported from South Africa was $2,090 per ton and from Zimbabwe, $1,890 per ton (table 6).

The U.S. customs unit values for the crude and spinning grades of chrysotile fiber from Canada were $145 per ton and $104 per ton, respectively (tables 3 and 6). Imports of "Other, chrysotile" from Canada were valued at $149 per ton (tables 3 and 6).

Prices for Canadian chrysotile were $132 to $274 per ton for group 7, $268 to $384 per ton for group 6, $431 to $599 per ton for group 5, $649 to $909 per ton for group 4, and $941 to $1,135 per ton for group 3. Prices for South African chrysotile were $200 to $290 per ton for group 7, $680 to $750 per ton for group 6, and $360 to $440 per ton for group 5 (Industrial Minerals, 2001c). Quoted prices should be used only as a guideline because actual prices depend on the terms of the contract between seller and buyer.

Foreign Trade

The f.a.s. value of exported asbestos fibers and products containing asbestos or asbestos substitutes increased by 2% to $302 million in 2001 from $296 million in 2000. Mexico and Japan were the leading importers of asbestos fiber from the United States. Canada was the leading importer of U.S. products manufactured using asbestos or asbestos substitutes, followed by Germany, Mexico, Japan, and the United Kingdom (table 4). These five countries accounted for 79% of the value of asbestos products exported from the United States.

Exports and reexports of brake linings, disk pads, and mounted brake linings accounted for 82% of the value of all manufactured asbestos products (table 5). Products in these categories composed 92% of the value of goods manufactured using asbestos and asbestos substitutes that were exported to Canada, 86% of that exported to Mexico, 99% of that exported to Germany, and 71% of that exported to Japan.

In 2001, approximately 21,700 t of asbestos was exported, according to the U.S. Census Bureau. The exports included asbestos crudes, fiber, sand, refuse, and stucco. Exports of domestic origin were estimated to be approximately 5,000 t. Reexports of Canadian fiber accounted for the bulk of the remaining exports, although some manufactured products and nonasbestos mineral exports may have been included in the 21,700 t.

In 2001, Canada supplied 97% of the asbestos imported by the United States. Imports also were reported from South Africa (183 t) and Zimbabwe (142 t) (table 6). Transshipments also probably occurred through Mexico (103 t), Saudi Arabia (14 t), and the United Kingdom (1 t). Only chrysotile was imported into the United States in 2001.

The United States also imported $185 million products containing asbestos or asbestos substitutes. This includes approximately 48,000 t of asbestos- and cellulose-fiber cement products (A/C) valued at $23.3 million, including panels, pipe, and tile. The bulk of A/C products was imported in the form of flat sheets and panels (89%), followed by pipe (9%) and corrugated sheet (2%).

World Review

World production of asbestos was estimated to be 2.05

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million metric tons, a slight decrease from 2000. Russia continued to be the leading producer of asbestos, followed by China, Canada, Kazakhstan, Brazil, and Zimbabwe. These countries accounted for 96% of the world production (table 7).

Opposition to the use of asbestos continued to mount. In Australia, the Workplace Relations Ministers' Council indicated that it intended to develop legislation that would ban the importation and use of asbestos by the end of 2003. The Argentinian Government enacted a law placing a ban on the use of chrysotile in filters, gaskets, insulating products, paint, paper, plastic, rubber, and textiles, effective September 2001. The remaining uses would be prohibited after January 1, 2003. The use of amphibole asbestos already had been banned. In 2001, the President of Chile signed legislation banning the importation and use of asbestos with exceptions. On December 7, Spanish authorities agreed to a ban on the use of asbestos, effective May 2002. On March 12, the World Trade Organization's Appellate Body upheld the rights of France to ban the importation and use of asbestos-containing products (European Trade Union Confederation, 2001§; International Ban Asbestos Secretariat, 2001§).

Production at Public Jt. St. Co. Uralasbest, the leading Russian asbestos producer, was reported to have increased by 11% to 460,000 t in 2000. The company also continued with its plans to build a 50,000-metric-ton-per-year-capacity magnesium plant at its asbestos operation in Sverdlovsk. The $300 million plant is scheduled for completion in 2005. It will process serpentine tailings from the asbestos operation (Industrial Minerals, 2001d).

Public Jt. St. Co. Orenburgasbest upgraded its facilities at Yasny by installing a centrifugal screen separator to remove fines. The company also attained International Standards Organization 9002 certification. The company reported production of 69,000 t of asbestos in the first quarter of 2001, unchanged from that of 2000. In 2000, the company had increased production by 112% to 290,000 t compared with that of 1999 (Industrial Minerals, 2001b).

Public Jt. St. Co. Dzhetygarinskiy Asbestos Mining and Processing Combine announced that it will invest up to $15 million between 2001 and 2005 to modernize its plant in Zhitikara. The company reported production of 178,400 t of fiber in 2000, up 28% from that of 1999. Most was exported to China, Iran, Kyrgyzstan, Russia, and Uzbekistan for the manufacture of asbestos-cement pipe and roofing (Industrial Minerals, 2001a).

Outlook

With continued opposition to the use of asbestos, domestic use probably will continue to decline in the future. Friction products, gaskets, and roofing products will continue to be the only significant domestic markets of asbestos, although based on current trends, it appears that roofing will be the only sizable domestic market in the long term. Efforts to ban the use of asbestos are likely to continue worldwide. However, chrysotile asbestos producers and consumers are working to counteract these initiatives.

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TABLE 1
SALIENT ASBESTOS STATISTICS 1/

		1997	1998	1999	2000	2001
United States:						
Production (sales)	metric tons	6,890	5,760	7,190	5,260	5,260
Exports and reexports: 2/						
Unmanufactured, value	thousands	$5,690	$6,410	$7,960	$7,220	$4,890
Asbestos products, value	do.	$197,000	$194,000	$237,000	$288,000	$298,000
Imports for consumption, unmanufactured						
Quantity	metric tons	20,900	15,800	15,800	14,600	13,100
Value 3/	thousands	$4,660	$3,240	$3,150	$2,510	$2,640
Consumption, apparent 4/	metric tons	21,000	15,800	15,800	14,600	13,100
World, production	do.	2,150,000 r/	1,820,000 r/	1,770,000 r/	2,070,000 r/	2,050,000 e/

e/ Estimated. r/ Revised.
1/ Data are rounded to no more than three significant digits.
2/ F.a.s. value; includes exports of crudes, fibers, stucco, sand, and refuse. May also include nonasbestos materials.
3/ U.S. customs declared value.
4/ Production plus imports minus producer exports of asbestos fiber plus adjustments in Government and industry stocks.

TABLE 2
U.S. ASBESTOS CONSUMPTION BY END USE, GRADE, AND TYPE 1/ 2/

(Metric tons)

	Chrysotile					
End use	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Total
2000	7	167	330	482	13,700	14,600
2001:						
Coatings and compounds	--	--	--	--	300	300
Friction products	--	--	13	76	519	608
Gaskets	--	--	--	308	1,990	2,300
Plastics	--	1	--	--	--	1
Roofing products	--	--	--	--	9,250	9,250
Other	3	74	207	--	395	679
Total	3	75	221	383	12,500	13,100

-- Zero.
1/ Data are rounded to no more than three significant digits; may not add to totals shown.
2/ Estimated distribution based upon data provided by the Asbestos Institute, Montreal, Canada, and the U.S. Geological Survey asbestos producer survey.

TABLE 3
CUSTOMS UNIT VALUE OF IMPORTED ASBESTOS

(Dollars per metric ton)

	2000	2001
Canada, chrysotile:		
Crude	118	145
Spinning	184	104
Other	159	149

Source: U.S. Census Bureau.

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TABLE 4
VALUE OF U.S. EXPORTS AND REEXPORTS OF ASBESTOS FIBERS AND PRODUCTS 1/ 2/

(Thousand dollars)

	2000			2001		
Country	Unmanufactured fiber 3/	Manufactured products 4/	Total	Unmanufactured fiber 3/	Manufactured products 4/	Total
Australia	56	1,180	1,240	--	1,200	1,200
Brazil	100	2,510	2,610	54	2,200	2,250
Canada	4	112,000	112,000	22	106,000	106,000
Germany	15	71,600	71,600	--	74,200	74,200
Japan	1,860	12,300	14,100	1,630	6,550	8,180
Korea, Republic of	302	1,100	1,400	102	1,480	1,580
Kuwait	--	313	313	--	401	401
Mexico	4,650	32,900	37,500	2,960	44,400	47,300
Saudi Arabia	--	2,020	2,020	--	2,650	2,650
Thailand	4	8	12	3	62	65
Turkey	--	51	51	--	58	58
United Kingdom	3	5,780	5,780	--	2,870	2,870
Venezuela	--	2,660	2,660	--	1,960	1,960
Other	234	44,300	44,500	120	53,500	53,600
Total	7,220 r/	288,000	296,000	4,890	298,000	302,000

r/ Revised. -- Zero.
1/ Data are rounded to no more than three significant digits; may not add to totals shown.
2/ F.a.s. value.
3/ Includes exports of crudes, fibers, stucco, sand, and refuse. May also include nonasbestos materials.
4/ Also includes products manufactured using asbestos substitutes.

Source: U.S. Census Bureau.

TABLE 5
U.S. EXPORTS AND REEXPORTS OF ASBESTOS AND ASBESTOS PRODUCTS 1/

	2000		2001	
	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)
Unmanufactured, asbestos 3/	18,800	$7,220	21,700	$4,890
Manufactured:				
Asbestos fibers	NA	2,820	NA	6,030
Brake linings and disk brake pads 4/	NA	250,000	NA	245,000
Clutch facings and linings 5/	NA	9,540	NA	9,470
Clothing, cord, fabric, yarn	NA	2,300	NA	7,690
Gaskets, packing and seals	NA	2,470	NA	2,210
Panel, sheet, tile, tube 6/	NA	14,000	NA	14,100
Paper and millboard	NA	1,150	NA	1,150
Other articles 7/	NA	6,320	NA	11,900
Total	NA	288,000	NA	298,000

NA Not available.
1/ Data are rounded to no more than three significant digits; may not add to totals shown.
2/ F.a.s. value.
3/ Includes crudes, fibers, stucco, sand, and refuse. May also include nonasbestos materials.
4/ Includes asbestos and cellulose fiber brakes and similar materials.
5/ Includes clutches and other friction materials, excluding brakes and brake pads.
6/ Includes asbestos cement and cellulose fiber cement products.
7/ Includes asbestos and cellulose fiber products.

Source: U.S. Census Bureau.

TABLE 6
U.S. IMPORTS FOR CONSUMPTION OF ASBESTOS FIBERS, BY TYPE, ORIGIN, AND VALUE 1/

Type	Canada		South Africa		Other		Total	
	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)
2000:								
Chrysotile:								
Crude	3,350	$394	--	--	--	--	3,350	$394
Spinning fibers	31	6	53	$102	38	$71	122	179
All other	10,500	1,670	--	--	16	40	10,500	1,710
Crocidolite (blue) 3/	67	7	--	--	--	--	67	7
Other (unspecified asbestos type)	581	217	--	--	--	--	581	217
Total	14,500	2,300	53	102	54	111	14,600	2,510
2001:								
Chrysotile:								
Crude	2,300	333	--	--	--	--	2,300	333
Spinning fibers	42	4	71	157	65	121	178	282
All other	7,810	1,160	112	225	91	174	8,010	1,560
Other (unspecified asbestos type)	2,540	441	--	--	104	24	2,640	465
Total	12,700	1,940	183	382	260	319	13,100	2,640

-- Zero.
1/ Data are rounded to no more than three significant digits; may not add to totals shown.
2/ U.S. customs declared value.
3/ Reported by the U.S. Census Bureau. Its source suggests the imports labeled as crocidolite probably were a combination of chrysotile imports and transshipments of crocidolite through Canada.

Source: U.S. Census Bureau.

TABLE 7
ASBESTOS: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country 3/	1997	1998	1999	2000	2001 e/
Argentina	264 r/	309 r/	259 r/	254 r/	250
Brazil e/	170,000	170,000	170,000	170,000	170,000
Bulgaria e/	300 4/	300	350	350	350
Canada	455,000	309,000	337,000 r/	320,000 r/ e/	340,000
China e/	288,000	314,000	247,000	370,000 r/	360,000
Egypt e/	2,000	700 r/	1,000 r/	2,000	2,000
Greece e/	63,294 r/ 4/	50,000 r/	-- r/	-- r/ 4/	--
India	25,051	18,751	20,000 e/	21,000 e/	21,000
Iran e/	4,300	2,258 4/	2,000	2,000	1,500
Japan e/	18,000	18,000	18,000	18,000	18,000
Kazakhstan	182,000 r/	155,400 r/	139,300 r/	233,200 r/	235,000
Russia	710,000 e/	600,000 e/	675,000	750,000	750,000
Serbia and Montenegro	360	633	361	563 r/	100
South Africa	49,986	27,195	18,836 r/	18,782 r/	15,733 4/
Swaziland	25,888	27,693	22,912 r/	11,000 r/	10,000
United States (sold or used by producers)	6,890	5,760	7,190	5,260	5,260 4/
Zimbabwe	144,959	123,295	115,000	145,000 r/	120,000
Total	2,150,000 r/	1,820,000 r/	1,770,000 r/	2,070,000 r/	2,050,000

e/ Estimated. r/ Revised. -- Zero.
1/ World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.
2/ Marketable fiber production. Table includes data available through April 8, 2002.
3/ In addition to the countries listed, Afghanistan, North Korea, Romania, and Slovakia also produce asbestos, but output is not officially reported and available general information is inadequate for the formulation of reliable estimates of output levels.
4/ Reported figure.

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