Asbestos

By R. A. Clifton[1]

Shipments of asbestos (mostly chrysotile) in 1976 from mines in the United States increased 16% over those in 1975. With the continued high demand for domestic asbestos, all previously operating mines, plus the newly reopened Calaveras (Pacific) mine, were producing at capacity. Imports were 22% higher than those in 1975 because of recovery from the Canadian strike, but demand may still be depressed owing to the economic recession and/or environmental factors.

Canadian production in 1976 was 47% more than that for 1975, and shipments from Canada to the United States were 23% more than those in 1975. Imports from the U.S.S.R. were nearly 2% of total U.S. imports, and those from the Republic of South Africa accounted for 3%.

Table 1.—Salient asbestos statistics

		1972	1973	1974	1975	1976
United States:						
Production (sales)	short tons	131,663	r150,036	r109,091	98,654	114,842
Value	thousands	$13,409	$16,288	$13,759	$14,220	$23,693
Exports and reexports (unmanufactured)	short tons	58,624	66,442	61,723	36,447	46,923
Value	thousands	$9,051	$9,342	$9,192	$10,667	$12,791
Exports and reexports of asbestos products (value)	do	$32,110	$40,777	$60,396	$60,776	$60,572
Imports for consumption (unmanufactured)	short tons	735,515	792,473	766,164	538,553	657,851
Value	thousands	$87,732	$98,914	$123,822	$111,011	$142,145
Released from stockpile (unmanufactured)	short tons	13,174	6,761	28,851	6,877	552
Consumption, apparent[1]	do	821,728	882,908	845,825	607,637	726,322
World: Production	do	4,163,675	r4,613,717	4,582,320	r4,564,130	5,565,910

rRevised.
[1]Measured by quantity produced, plus imports, plus stockpile releases, minus exports.

Legislation and Government Programs.—As of December 31, 1976, the Occupational Safety and Health Administration (OSHA) had not yet set a date for the mandatory public hearing on its proposed revision of the asbestos standard for manufacturing. The regulated allowable exposure to asbestos had been lowered on July 1 from 5.0 to 2.0 fibres per cubic centimeters (f/cm³); the OSHA proposal was for a permissible-exposure level of 0.5 f/cm³. However, the National Institute of Occupational Safety and Health (NIOSH) recommended a still lower level. In a December 15, 1976 letter to OSHA, the Director of NIOSH recommended a level of 0.1f/cm³. Thus, during 1976, changes made and proposed represent a fiftyfold reduction in the regulated allowable exposure to asbestos in the manufacturing workplace.

The President signed the Toxic Substances Control Act into law on October 11, 1976, too late to allow meaningful evaluation of its impact on the asbestos industry.

[1]Physical scientist, Division of Nonmetallic Minerals.

Minerals Yearbook: Asbestos Chapters, 1976
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New stockpile goals were announced by the Federal Preparedness Agency (General Services Administration) in a press release dated November 24, 1976. The announced stockpile goal for chrysotile was zero; and for amosite, the goal was 26,291 short tons. Crocidolite was not named as a strategic material. As shown in table 2, there were few asbestos sales from the national stockpile in 1976.

Table 2.—Stockpile goals and Government inventories as of December 31

(Short tons)

	Stockpile goals	Total inventories		Sales of excesses, 1976
		1975[r]	1976	
Amosite	26,291	45,293	42,623	2,670
Chrysotile	None	10,956	[1]10,955	--
Crocidolite	None	2,478	[1]2,474	--
Total	--	58,727	56,052	2,670

[r]Revised.
[1]Adjusted figure, Federal Preparedness Agency.

Environmental Impact.—Disruptions in the marketplace in 1976 left consumption of asbestos by U.S. industry at 82% of the 1973 alltime high. These disruptions cannot be blamed entirely on either the economy or environmental factors. With the possible exception of the textile portion of the industry, much of the decline in consumption can be argued to have come from recession-related factors. The decrease in exports of asbestos-textile products and the increase in imports lend validity to this position. UNIROYAL Inc., announced that its Fiber and Textile Div. would no longer be manufacturing asbestos-containing textiles after July 1, 1976, because of marginal profitability and the cost of full compliance with OSHA regulations.

The costs of environmental compliance to asbestos producers, however, have readily been absorbed by consumers. The Vermont Asbestos Group announced that the purchase costs of their Lowell mine, formerly a GAF Corp. property, had been recouped in less than 2 years. The management of Calaveras Asbestos Corp. stated that the firm was profitable after 1 year of operation.

DOMESTIC PRODUCTION

Mines in the United States shipped 16% more asbestos in 1976 than in 1975. Value was 67% higher than in 1975. Three States produced asbestos; California, was the leader, with 68%, followed by Vermont and Arizona. There was a possibility of some production from North Carolina. Total output was 114,842 tons valued at $23,693,000.

California led the increase in production. Reopening of the Calaveras Asbestos Corp. mine (formerly Pacific Asbestos Corp.) led to a production increase 39% above the 1975 State total. The value increased 160% over the 1975 value of the fiber. By yearend, Calaveras Asbestos Corp. was in full operation. At yearend mines were also active on the Joaquin Ridge near Coalinga. Atlas Asbestos Corp. worked its Santa Cruz mine in Fresno County and Union Carbide Corp. operated its Santa Rita mine in San Benito County.

The Vermont Asbestos Group mine in Orleans County, Vt., remained the mine with the highest production of asbestos in the United States. Its output decreased slightly from that in 1975. This mine is owned and operated by an employee group, which has been highly successful in its operation.

Arizona production in 1976 was below the 1975 level. The Jaquays Mining Corp., in Gila County, had the only active asbestos mine in the State.

Powhatan Mining Co.'s mine in North Carolina was inactive, but about 878 tons of anthophyllite were mined and shipped from North Carolina in 1976. U.S. asbestos producers and mine sites follow:

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State and company[1]	County	Name of mine	Type of asbestos
Arizona: Jaquays Mining Corp	Gila	Chrysotile	Chrysotile.
California:			
Atlas Asbestos Corp	Fresno	Santa Cruz	Do.
Calaveras Asbestos Corp	Calaveras	Copperopolis	Do.
Union Carbide Corp	San Benito	Santa Rita	Do.
Vermont: Vermont Asbestos Group	Orleans	Lowell	Do.

[1]In addition to the States listed, some anthophyllite was mined and shipped from North Carolina, but information on firm and location was not available.

CONSUMPTION AND USES

In a year of partial recovery from the effects of the recession and of the Canadian strike, enduse data for 1976 are difficult to analyze. Asbestos used in asbestos-cement pipe decreased 9%. Further decreases were asbestos cement sheet, 48%; flooring products, 16%; and paper, 53%. Asbestos used in friction products remained about the same, but that used in roofing products increased a surprising 447%, as reported by consumers.

Roofing products accounted for 35% of the asbestos consumed, and was the largest user. Asbestos-cement pipe was next with 19%, followed by flooring products with 16%. When the 3% used in making asbestos-cement sheet is added to the preceding three categories, products used in the construction industry accounted for nearly three-fourths of the asbestos consumed in 1976.

Other major asbestos-using end products were friction materials, 9%; paper, 4%; coatings and compounds, packing and gaskets, and plastics, 3% each; and textiles and insulation (thermal), 1% each.

PRICES

Quoted prices for Quebec asbestos, all chrysotile, were not raised during 1976. The last rise was effective on December 1, 1975. Effective December 1, 1976, British Columbia asbestos chrysotile prices rose 15%.

Prices for Vermont chrysotile asbestos rose 13% on January 1, 1976. Arizona prices rose twice during 1976, the latest on July 1. Quotations, f.o.b. Globe, follow:

Grade	Description	Per short ton
Group 1	Crude	$3,000
Group 2	do	1,800
AAA	do	1,300
Group 3	Nonferrous filtering and spinning	$750-840
Group 4	Nonferrous plastic and filtering	750-840
Group 7	White shorts	100-200

As of January 1, 1976, Vermont chrysotile asbestos, f.o.b. Morrisville, was priced as follows:

Grade	Description	Per short ton
4T	Fiber	$418
5D through 5R	do	$275-324
6D	Waste	200
7D through 7T	Shorts	83-160
7TF	Floats (shorts)	72
8S	Shorts	54
Hooker No. 1	Packaged in 50-pound woven polyvinyl bags	970
Hooker No. 2	Packaged in 100-pound woven polyvinyl bags	485

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Table 3.—U.S. asbestos distribution by end use, grade, and type, 1976

(Short tons)

	Chrysotile								Crocidolite	Amosite	Anthophyllite	Total asbestos
	Grades 1 & 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Total chrysotile				
Asbestos-cement pipe	--	600	86,300	26,600	3,100	200	--	116,800	20,300	2,900	--	140,000
Asbestos-cement sheet	--	1,000	2,100	3,600	9,800	5,900	--	22,400	--	200	100	22,700
Flooring products	1,500	1,100	--	6,300	600	104,000	--	113,500	--	--	--	113,500
Roofing products	--	--	--	400	1,900	251,300	--	253,600	--	--	--	253,600
Packing and gaskets	--	1,800	5,900	8,300	700	3,300	--	20,000	100	--	--	20,100
Insulation:												
Thermal	--	--	800	200	1,900	3,600	--	6,500	--	100	--	6,600
Electrical	--	100	--	100	200	1,900	--	2,300	--	--	--	2,300
Friction products	--	2,800	1,500	21,100	6,800	31,000	200	63,400	--	100	300	63,800
Coatings and compounds	--	--	300	300	100	19,200	--	19,900	--	--	--	19,900
Plastics	--	200	2,800	100	1,200	15,400	--	19,700	700	--	1,100	21,500
Textiles	--	--	--	--	--	--	--	--	--	--	--	--
Paper	200	6,900	300	3,300	22,200	3,500	--	7,400	300	--	--	7,400
Other	--	100	1,600	--	--	--	--	30,700	--	--	--	31,000
	--	300	800	2,500	4,400	14,700	--	22,700	--	1,200	--	23,900
Total	1,700	14,900	102,400	72,800	52,900	454,000	200	698,900	21,400	4,500	1,500	726,300

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Quotations for Canadian (Quebec) chrysotile, f.o.b. mine, as of December 1, 1976, follow:

Grade	Description	Per short ton
Group 1	Crude	Can $3,496
Group 2	do	1,879
Group 3	Spinning fiber	Can $891-1,463
Group 4	Asbestos-cement fiber	492- 829
Group 5	Paper fiber	278- 392
Group 6	Waste, stucco, or plaster	236- 244
Group 7	Refuse or shorts	89- 198

Prices for chrysotile asbestos from British Columbia and Yukon Territory, Canada, effective December 1, 1976, f.o.b. Vancouver, follow:

Grade	Description	Per short ton
	CASSIAR MINE	
C-1	Crude	Can $3,261
AAA	Nonferrous spinning fiber	2,093
AA	do	1,664
A	do	1,267
AC	do	913
AK	Asbestos-cement fiber	651
AS	do	563
AX	do	516
AY	do	362
AZ	do	268
	CLINTON MINE	
CP	Asbestos-cement fiber	Can $611
CT	do	553
CY	do	362
CZ	do	268

African asbestos producers privately negotiate sales, thereby ruling out market quotations. The following tabulation shows the average value per short ton, regardless of grade, of South African imports, calculated from U.S. Department of Commerce data:

Type	1972	1973	1974	1975	1976
Amosite	$187	$188	$228	$395	$461
Crocidolite	211	213	251	427	518
Chrysotile	202	234	282	940	235

The increased demand for and the shortage of all types of asbestos, plus increased mining costs, resulted in price increases in almost all categories. Other price rises were expected early in 1977.

The unit value of 1 ton of Canadian chrysotile has more than doubled in the past 4 years from $Can 122 in 1972 to Can $261 in 1976.

FOREIGN TRADE

No real change occurred from 1975 to 1976 in the value of exports of asbestos products manufactured in the United States. The number of articles exported increased slightly.

Major groupings of exported products and their share of the total value were textiles and yarns, 22%; friction products, 18%; packing and gaskets, 16%; asbestos-cement products, 14%; and insulation products, 7% (table 4).

Table 4.—Countries importing U.S. asbestos products in 1976, by type

(Thousand dollars)

	Canada	Mexico	Germany, West	United Kingdom	Australia	Other	Total
Friction products	9,382	138	441	73	342	2,820	13,196
Packing and gaskets	2,907	403	304	128	310	7,278	11,330
Asbestos-cement products	2,866	66	275	142	29	6,495	9,873
Textiles and yarn	3,897	4,084	459	344	987	6,213	15,984
Insulation products	1,059	126	37	67	36	3,494	4,819
Other	2,968	1,501	1,633	1,525	193	9,894	17,714
Total	23,079	6,318	3,149	2,279	1,897	36,194	72,916

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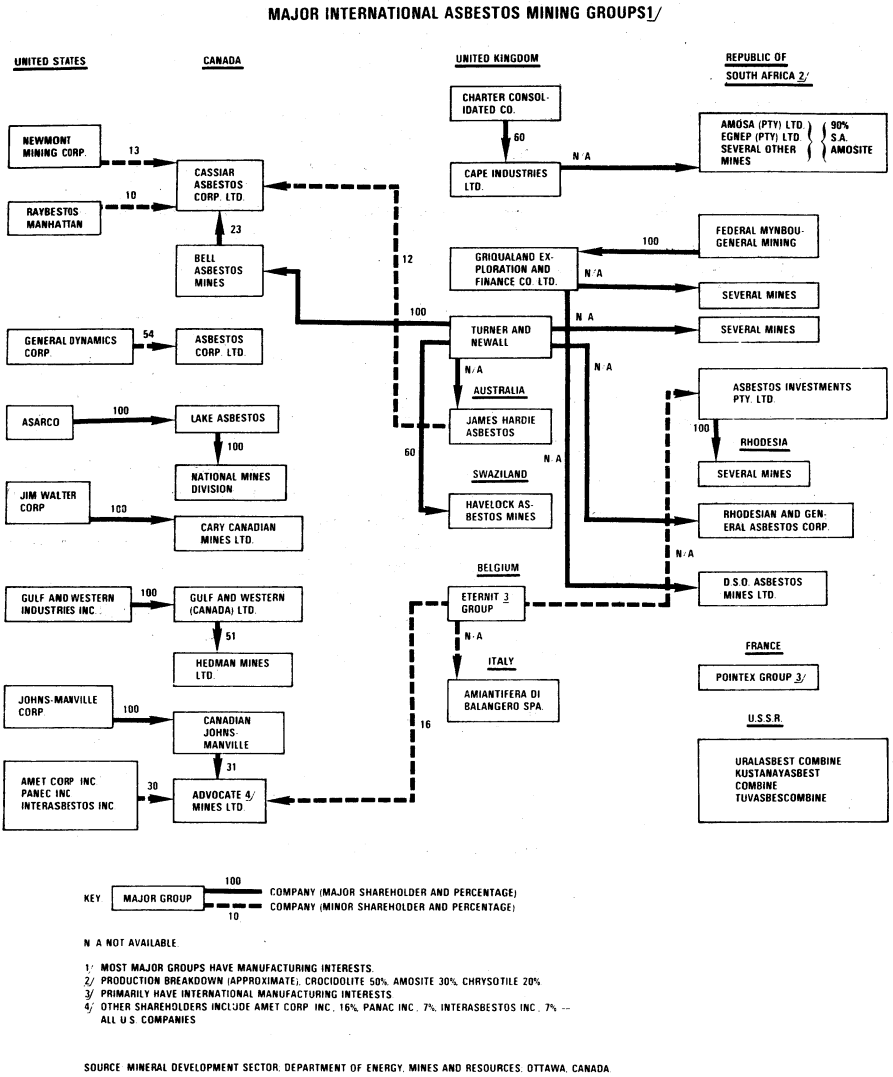


Figure 1.—Major international asbestos mining groups.

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In 1976, 52% of the cost of imported asbestos was recovered by exporting and reexporting fibers and products.

In 1976, the United States imported 91% of its asbestos consumption. This was above the 1975 percentage. Canada provided more than 93% of the imports, the Republic of South Africa provided 3%, the U.S.S.R. provided 2%, and six other countries provided the remainder. Chrysotile, with 96%, dominated the imported types. The dollar value of imported fibers was 28% higher than that in 1975.

The larger international asbestos groups and their affiliations are depicted in figure 1, taken from a recent Canadian Government publication.[2]

[2]Vagt, G. O. Asbestos. MR 155, Mineral Policy Series. Department of Energy, Mines, and Resources, Ottawa, Canada, July 1976, 26 pp.

Table 5.—U.S. exports and reexports of asbestos and asbestos products

Products	1975		1976	
	Quantity	Value (thousands)	Quantity	Value (thousands)
EXPORTS				
Unmanufactured:				
Crude and spinning and nonspinning fibers short tons	15,173	$6,067	21,470	$7,179
Waste and refuse do	19,748	3,992	24,847	5,461
Total do	34,921	10,059	46,317	12,640
Products:				
Gaskets and packing do	2,643	12,401	2,460	11,330
Brake linings do	4,856	9,374	6,239	11,536
Clutch facings, including linings number	1,359,914	1,598	1,007,551	1,660
Textiles and yarn short tons	5,732	7,284	7,522	7,907
Shingles and clapboard do	14,277	4,649	10,610	3,547
Articles of asbestos cement do	18,952	7,628	15,151	6,326
Protective clothing	NA	810	NA	898
Insulation, heat and sound	NA	5,072	NA	4,819
Manufactures, n.e.c	NA	11,740	NA	12,253
Total	XX	60,556	XX	60,276
REEXPORTS				
Unmanufactured:				
Crude and spinning and nonspinning fibers short tons	1,391	573	606	151
Waste and refuse do	135	35	--	--
Total do	1,526	608	606	151
Products:				
Gaskets and packing do	r1	21	4	19
Brake linings do	127	145	221	251
Clutch facings, including linings number	27,645	16	28,143	23
Textiles and yarn short tons	1	11	--	--
Shingles and clapboard do	--	--	12	3
Articles of asbestos cement	NA	6	--	--
Manufactures, n.e.c	NA	21	--	--
Total	XX	220	XX	296

rRevised. NA Not available. XX Not applicable.

Table 6.—U.S. imports for consumption of asbestos from specified countries, by grade

(Short tons)

Grade	1975			1976		
	Canada	Southern Rhodesia	Republic of South Africa	Canada	Southern Rhodesia	Republic of South Africa
Chrysotile:						
Crude	71	1,633	940	635	3,451	1,745
Spinning fibers	7,637	382	115	5,872	247	61
All other	495,837	608	1,457	611,068	--	6,557
Crocidolite (blue)	--	--	11,570	--	--	10,177
Amosite	--	--	3,894	20	--	1,554
Total	503,545	2,623	17,976	617,595	3,698	20,094

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Table 7.—U.S. imports for consumption of asbestos (unmanufactured), by class and country

Year and country	Crude (including blue fiber)		Textile fiber		All other		Total	
	Quantity (short tons)	Value (thousands)	Quantity (short tons)	Value (thousands)	Quantity (short tons)	Value (thousands)	Quantity (short tons)	Value (thousands)
1975								
Belgium-Luxembourg	22	$3	--	--	48	$5	70	$8
Canada	71	9	7,637	$5,772	495,837	91,791	503,545	97,572
Finland	--	--	--	--	329	33	329	33
Gaza Strip	--	--	--	--	152	26	152	26
Italy	--	--	--	--	197	37	197	37
Mexico	--	--	--	--	73	15	73	15
Mozambique	118	16	--	--	--	--	118	16
Rhodesia, Southern	1,633	1,521	382	369	608	380	2,623	2,270
South Africa, Republic of	16,404	7,147	115	100	1,457	459	17,976	7,706
Swaziland	2,756	952	--	--	--	--	2,756	952
U.S.S.R.	4,525	921	--	--	5,854	1,361	10,379	2,282
United Kingdom	277	83	--	--	58	11	335	94
Total	25,806	10,652	8,134	6,241	504,613	94,118	538,553	111,011
1976								
Australia	99	46	--	--	--	--	99	46
Canada	655	272	5,872	4,613	611,068	121,977	617,595	126,862
Germany, West	--	--	--	--	1,909	383	1,909	383
Hong Kong	--	--	--	--	2	(1)	2	(1)
Mexico	378	209	--	--	1,091	146	1,469	355
Rhodesia, Southern	3,451	2,099	247	208	--	--	3,698	2,307
South Africa, Republic of	13,476	6,932	61	38	6,557	2,616	20,094	9,586
U.S.S.R.	--	--	--	--	12,421	2,324	12,421	2,324
United Kingdom	564	282	--	--	--	--	564	282
Total	18,623	9,840	6,180	4,859	633,048	127,446	657,851	142,145

[1]Less than 1/2 unit.

WORLD REVIEW

An in-depth article in a Canadian mining paper,[3] described activities in world and Canadian asbestos markets in 1976. The strength of the Canadian industry, a long time major supplier to the world market, was demonstrated by its rebound in output from the low level experienced in 1975. A fire, landslide, and strike in 1975, resulted in output being reduced to the levels of 1960 and 1961, thereby tightening an already tight supply situation. Many producing companies had to allocate available supplies to their customers. The article also cited statements of Asbestos Corp., Ltd. officials that indicated the asbestos fiber market remained bouyant. Saturation of the markets in Western Europe and the United States, was compensated for by increased demand in Eastern Europe and Middle East and African countries. The firms' inventories of Groups 4, 5, and 6 fibers were expected to stay at minimum levels and those of Groups 3 and 7 to increase slowly. It was anticipated that any excess in Group 3 spinning fibers would be absorbed by the market in the second half of 1977. Only the market for Group 7 appeared to be weak.

Algeria.—Scheduled for June 1976 start-up were three identical asbestos-cement-product plants. These plants, designed and built by Belgian companies, will have a combined capacity of 150,000 tons of finished product. The new markets for asbestos fiber to feed these and similar plants being built throughout Mediterranean Africa and Asia are helping keep demand very strong.

Australia.—Woodsreef mine borrowed $A1.5 million to increase its annual capacity to 105,000 tons. Estimates of reserves at both contiguous ore bodies have been revised upward and the company has discovered a promising new ore body near Baryulgil in northern New South Wales. Exploration continued in that Province. Woodsreef acquired 95% of 10 asbestos claims in Western Australia.

Brazil.—The chrysotile mine at Cana Brava operated by S.A. Mineração de Amianto (SAMA) has a projected 1979 production of 115,000 tons, all for domestic consumption. Reserves were estimated at 3.5 million tons of fiber. In 1976 there were

[3]Northern Miner. V. 62, No. 37, Nov. 5, 1976, p. C-10.

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900 employees at the site, which is 160 miles northwest of Brasilia.

Canada.—Canadian asbestos production rebounded sharply from the problems of 1975. Total production in 1976 (all chrysotile) was nearly 47% above that of 1975, but still only 92% of the 1973 record.

Abitibi Asbestos Mining Co.'s deposit in northwestern Quebec is 55% owned by Brinco Ltd. At yearend discussions were underway with ASARCO, Inc., owner of Lake Asbestos of Quebec Ltd., as to ways to finance, operate, and market fibers from the proposed $292 million facility. A 220,000-ton-per-year capacity is proposed.

United Asbestos, Inc. was operating its mine at Midlothian Township in Ontario at yearend after having been closed during the spring by Ontario's environmental authorities.

Canadian Johns-Manville Corp. announced a $77-million capital investment program to improve its Jeffrey mine at Asbestos, Quebec. It is a 5-year program, and initial expenditures will be for acquiring property surrounding the mine, repairs, and new facilities. The mine produces 45% of Canada's asbestos and 15% of the world's production.

A possibly important new find in northern Ontario was announced by Talisman Mines, Ltd. and Shield Development Co., Ltd. The find, in Newtown Township, showed asbestos mineralization over 3 miles long and indicated that some fibers may be 1-1/2 inches long and of spinning quality.

China, People's Republic of.—Export data from China for the 1957-74 period reveal that asbestos is not a major export item, either in quantity or value. In 1974, the year of highest export, only 2,400 short tons worth $0.5 million were exported. A number of textile products from China are available on the world market.

Colombia.—Minera Las Brisas, S. A. announced completion of feasibility studies of its asbestos property in the Antioquia Province. Indications are that the deposit has 9.3 million short tons of ore capable of producing 390,000 tons of chrysotile asbestos. Production at a 20,000-ton annual rate is planned to begin in 1979.

France.—French imports of asbestos in 1975 were less than 80% of those in 1974, with the Canadian strike clearly responsible. In 1974, a typical year, the suppliers of asbestos to France were Canada, with 48% of the market; the U.S.S.R., with 31%; the Republic of South Africa, 11%; and Italy, 10%.

Japan.—The large market in Japan for asbestos also declined significantly in 1975. The 29% drop in imports from 1974 cannot be explained by the Canadian strike alone, because other vendors' sales were also down. In 1974 Australia had 5% of the market, Canada, 39%, the Republic of South Africa, 35%, the U.S.S.R., 18%, the United States, 2%, and other, 1%.

Oman.—The Sultanate of Oman, in announcing newly found mineral deposits in the northern part of the country, included asbestos among the minerals to be developed for use in domestic industry.

South Africa, Republic of.—The Republic of South Africa's asbestos producers enjoyed what that nation's press called "spectacular" pre-tax gains from 1975 sales. World market price increases and the heightened demand brought on by the Canadian strike were the main reasons. Inventories were depleted as exports totaled an estimated 150% of production. Amosite production declined 6%, while local sales and exports increased by 136% and 92%, respectively. Chrysotile production was up 21%, and local sales and exports were up 14% and 57%, respectively. Crocidolite production was also up 6%, but local sales and exports rose 73% and 62%, respectively.

Sudan.—Gulf International (Sudan) and Johns-Manville Corp. were conducting a test drilling program on asbestos deposits in the Ingessana Hills of southeastern Sudan near the crossing of the Ethiopian border by the Blue Nile. Indications were favorable for a 100,000-ton-per-year fiber plant which would cost an estimated $115 million.

Turkey.—Among the minerals announced to be found in Eskisehir Province was 500,000 tons of asbestos.

United Kingdom.—Turner Asbestos Fibers Ltd. ordered 880 short tons of Soviet asbestos to replace some of the declining supply from Cassiar's Clinton Mine in the Canadian Yukon.

U.S.S.R.—A Soviet periodical[4] described the Kiyenbai asbestos deposit on the eastern slope of the southern Urals. Ore in the deposit contains 4% asbestos, and by 1979, it is anticipated that a quarter of a million tons will be produced. Output reportedly will increase to 500,000 tons by 1982. To achieve this ore output some 14 million cubic yards of earth and rock will be moved. A new town, Yasny, has been established and in a few years will attain a population of 50,000.

[4]Soviet Weekly. V. 13, No. 2, Jan. 10, 1976, pp. 14-32.

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Table 8.—Asbestos: World production, by country

(Short tons)

Country[1]	1974	1975	1976[p]
North America:			
Canada (shipments)	[r]1,811,938	1,163,673	1,706,999
Mexico	6	29	1
United States (sold or used by producers)	109,091	98,654	114,842
South America:			
Argentina	988	1,238	1,433
Brazil	68,201	81,547	82,673
Europe:			
Bulgaria	[r]27,558	24,251	22,046
Finland[2]	6,165	3,073	--
Italy	163,251	162,018	181,648
Portugal	198	(3)	--
U.S.S.R.[e]	1,500,000	2,090,000	2,520,000
Yugoslavia	13,500	14,330	14,143
Africa:			
Egypt	312	528	1,208
Mozambique	209	--	--
Rhodesia, Southern[e]	180,000	180,000	180,000
South Africa, Republic of	367,369	391,001	407,679
Swaziland	[r]41,796	[4]45,436	[4]46,128
Asia:			
China, People's Republic of[e]	165,000	165,000	165,000
Cyprus	[r]34,674	39,015	38,050
India	[r]25,653	22,654	24,965
Japan	[r]5,655	5,084	8,491
Korea, Republic of	6,294	4,790	5,249
Taiwan	[r]3,260	1,915	940
Thailand	(3)	(3)	17
Turkey	17,181	17,081	10,557
Oceania: Australia	[r]34,021	52,813	33,841
Total	[r]4,582,320	4,564,130	5,565,910

[e]Estimate. [p]Preliminary. [r]Revised.

[1]In addition to the countries listed, Czechoslovakia, North Korea, and Romania also produce asbestos, but available information is inadequate to make reliable estimates of output levels.

[2]Includes asbestos flour.

[3]Revised to zero.

[4]Exports.

TECHNOLOGY

In 1976, as in previous years, much of the research on asbestos concerned the problems arising from alleged health effects and regulations (both current and proposed) to minimize the hazards. By the July 1, 1976 changeover date to the 2-f/cm³ level, the asbestos-containing product industry and the domestic-asbestos-producing industry were generally in compliance, but engineering research aimed at further reduction of dust-exposure levels continued.

The NIOSH method of monitoring the workplace and identifying asbestos continued to be a matter of controversy. At least two separate actions took place late in 1976 because of this controversy:

The National Bureau of Standards agreed to determine the asbestos content of a series of talc samples for OSHA, using the NIOSH method (as given in 29 CFR 1910.1001) and OSHA's "Asbestos Fiber in Air" Method (No. P & CAM239, dated Mar. 30, 1976).

The Bureau of Mines has established a Particulate Mineralogy Unit at its College Park, Md., Metallurgy Research Center. In the announcement made November 15, 1976, the Director of the Bureau stated, "Its job is to develop a solid scientific basis for research into particle-related pollution problems and for the process of decision-making by regulatory bodies." A major activity of the Particulate Mineralogy Unit will be characterizing morphological, compositional, and structural distinctions between asbestos and nonasbestos particles. The new unit also will work to develop new and improved methods for positively identifying small particles.

The National Institute of Environmental Health Science's animal-feeding study to determine if ingested asbestos is carcinogenic was proceeding on schedule, but no results were reported in 1976.

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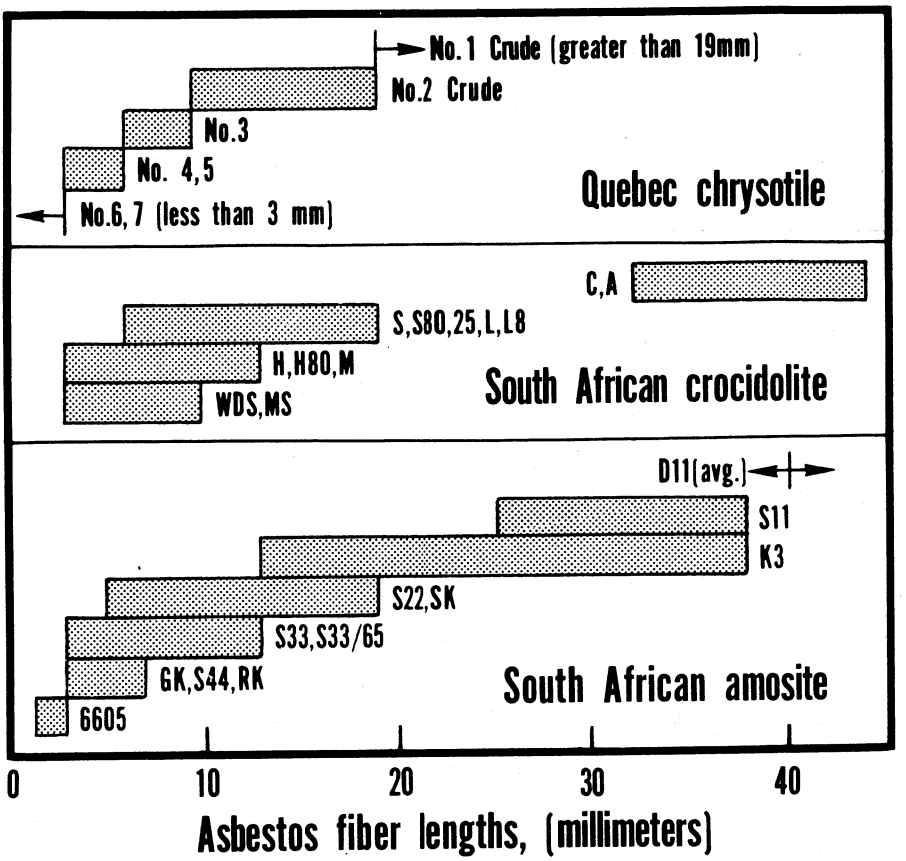


Figure 2.—Asbestos fiber lengths (millimeters).

The International Agency for Research on Cancer (IARC) of Lyon, France, initiated a three-pronged study into carcinogenic activity of man-made mineral fibers used as asbestos substitutes. The European glass-fiber and textile industries asked IARC to carry out epidemiological studies in 70 factories and 15 countries, laboratory studies on animals, and fiber-dust measurements in factories using these materials.

The search for asbestos substitutes continued. One product now available commercially in the United States and Europe that could affect the future of the asbestos industry is glass-reinforced cement. The glass used is a high-zirconia, alkali-resistant fiber developed by the United Kingdom's Building Research Station. However, several drawbacks to the product were reported: The glass fibers have inferior drainage characteristics; they require a costly spray-suction forming process; the strength gradually fails with time; and the fibers currently cost about four times as much as the equivalent asbestos.[5]

Asbestos shortages and projected demands indicated serious depletion of reserves by the end of the century. Accelerated research seems needed to find substitute fibers that will have at least some of the desirable asbestos characteristics of strength, chemical inertness, heat resistance, and economy in the same fiber.

Figure 2 provides the metric equivalent of fiber descriptions in the English system or Quebec Standard Classification.

[5]Industrial Minerals (London). Asbestos Alternatives, No. 109, October 1976, pp. 45-47.

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