Asbestos

By R. A. Clifton[1]

U.S. apparent consumption of asbestos continued to decline in 1982 because of the depressed construction and automotive industries and because of its unfavorable public ecological image. U.S. apparent consumption declined 29% compared with that of 1981 and 72% compared with the all-time high of 1973. Shipments from domestic mines, all chrysotile, decreased 16% and imports decreased 28% compared with those of 1981.

Domestic Data Coverage.—Domestic production data for asbestos are developed by the Bureau of Mines by means of a voluntary industry survey. Of the three canvassed operations to which a survey collection request was made, all responded and 100% of the total production data shown in table 1 were represented.

Table 1.—Salient asbestos statistics

	1978	1979	1980	1981	1982
United States:					
Production (sales) metric tons	93,097	93,354	80,079	75,618	63,515
Value thousands	$27,987	$28,925	$30,599	$30,685	$24,917
Exports and reexports (unmanufactured) metric tons	r41,783	43,291	48,671	64,419	58,771
Value thousands	r$13,396	$17,381	$21,067	$21,508	$19,713
Exports and reexports of asbestos products (value) do	r$127,052	$137,690	$141,653	$145,130	$127,867
Imports for consumption (unmanufactured) metric tons	570,020	513,084	327,296	337,618	241,737
Value thousands	$154,351	$135,210	$91,809	$103,893	$64,925
Released from stockpile (unmanufactured) metric tons	--	1	--	--	--
Consumption do	618,700	560,500	358,700	348,800	246,500
World: Production do	r4,693,217	r4,906,389	4,808,310	p4,479,783	e4,310,685

eEstimated. pPreliminary. rRevised.

Legislation and Government Programs.—The Occupational Safety and Health Administration (OSHA) published in the Federal Register (FR) of March 19 its proposed rule on workplace hazard communication and labeling. Employers in manufacturing facilities would be required by the proposal to communicate hazardous workplace chemical information to employees by use of labels and placards, material safety data sheets, lists of hazardous chemicals, and education and training.

In the May 27th FR, the Environmental Protection Agency (EPA) published its asbestos-in-school-buildings rule. Under the rule, inspections and identification of friable asbestos-containing material are required of all public and private elementary and secondary schools. Inspection results must be maintained and communicated to a school's parent-teacher association. Employees must be notified of the location of friable asbestos materials and be provided with instructions on exposure reduction.

In the July 30th FR, EPA issued a final asbestos reporting rule effective August 30, 1982. The rule, designed to "obtain current information about major aspects of asbestos manufacturing, processing, and importation to support the Agency's asbestos risk investigation," required a report containing detailed information from the primary processors of asbestos by November 30. The primary processors were identified as "those

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who mine, mill, or import bulk asbestos, or process it to form an asbestos mixture or products." October 30 was the reporting date for the secondary processors of asbestos, those who make products from asbestos mixtures, and the importers of asbestos or other asbestos-containing products.

In the September 2d FR, EPA published a final rule under the Toxic Substances Control Act (TSCA) with an effective date of October 4 requiring submission of unpublished health and safety studies on specifically listed chemicals. On the rationale that it "is being considered for control" under TSCA, asbestos was included.

Environmental Impact.—On August 26, 1982, the Manville Corp., formerly Johns-Manville, Inc., filed a bankruptcy petition under Chapter 11 of the Federal Bankruptcy Code. Despite this, Manville, and the news media, indicated that supply would continue to meet U.S. demand. Manville is the largest producer of asbestos among the market economy countries, from its Canadian mines, and the largest manufacturer of asbestos-containing products in the United States. The purpose of the bankruptcy filing was to relieve the burden of 16,500 outstanding lawsuits against Manville in the asbestos-related-disease area. Manville was also hopeful of legislative relief.

The continuing Reserve Mining Co. case came before more than three dozen State and Federal judges in six courts up to and including the Supreme Court. This widely publicized case, *United States of America versus Reserve Mining Co.*, finally ended in May in St. Paul, Minn. It was one of the country's foremost environmental disputes and required more than 12 years and 25,000 pages of testimony to conclude. Reserve Mining, under court orders, had previously spent more than $370 million establishing a land disposal system and paid about $1 million in fines and penalties. Under the consent decree, the company must pay $1.8 million toward water filtration plants in four communities and $1.1 million to Minnesota.

The World Symposium on Asbestos in Montreal, Canada, in May addressed the question, "Can society live with asbestos or must it learn to do without?" The consensus answer was that asbestos need not be banned.

The American Society for Testing and Materials (ASTM) published a voluntary consensus standard for occupational exposure to asbestos. The standard was titled "Standard Practice for Health and Safety Requirements Relating to Occupational Exposure to Asbestos" and numbered E 849-82. The main difference between this standard and OSHA's current one is that it endorses an aspect ratio, the ratio of a fiber's length to its width of 5 to 1.

ASTM also sponsored, in October, a conference and workshops on "The Need for Specific Definitions for Health Related Minerals." The conference papers, including a new recommended asbestos definition, were scheduled to be published in 1983.

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

(Metric tons)

	Stockpile goals	Total inventories		
		1980	1981	1982
Amosite	15,422	38,587	38,587	38,587
Chrysotile	2,722	9,034	9,034	9,034
Crocidolite	--	2,163	754	754
Total	18,144	49,784	48,375	48,375

DOMESTIC PRODUCTION

Mines in the United States shipped about 16% less asbestos in 1982 than in 1981, and the value decreased 19%. Only two States produced asbestos; California was the leader, followed by Vermont. The one Arizona mine ceased operation at the beginning of the year.

Calaveras Asbestos Corp. was California's and the Nation's leading producer, from its Copperopolis Mine. The other California producer, the Santa Rita Mine on the Joaquin Ridge near Coalinga, in San Benito County, was owned and operated by Union Carbide Corp.

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Table 3.—Asbestos producers in the United States in 1982

State and company	County	Mine	Type of asbestos
California:			
Calaveras Asbestos Corp	Calaveras	Copperopolis	Chrysotile.
Union Carbide Corp	San Benito	Santa Rita	Do.
Vermont: Vermont Asbestos Group	Orleans	Lowell	Do.

The Vermont Asbestos Group's Lowell Mine in Orleans County, Vt., was second in the country in production.

The Jaquays Mining Corp. mine in Gila County, Ariz., was closed in 1982. No production occurred in Arizona in 1982 but some shipments were made.

Employment in U.S. asbestos mines and mills decreased by approximately 10% to an average of about 400 persons during 1982.

An Alaskan newspaper described chrysotile deposits in the Eagle Quadrant.[2] Doyon, Ltd., a Native corporation, owns the mineral rights. The managing entity, Alaska Asbestos Co., is an equal partnership between International Paper Co. and Tanana Asbestos Co., a subsidiary of Doyon. After more than 100 cores had been drilled, the Slate Creek deposit was said to have a "drill indicated" reserve of 50 million metric tons of asbestos-bearing ore. Their Champion Creek deposit 13 miles away, after 16 drill holes, promised to be even larger. Initial evaluation indicated sufficient ore to support a mine producing 2.0 million tons per year of ore and a mill producing annually 150,000 tons of fiber. Such an establishment was projected to cost $120 to $150 million. Based on this, Alaska has the potential of becoming the country's leading asbestos State, could more than double total U.S. production capacity, and could have one of the world's largest mines.

CONSUMPTION AND USES

Total U.S. asbestos consumption decreased 29% in 1982 from that of 1981. Chrysotile was 93% of that consumed; crocidolite, 6%. Small amounts of amosite were reported used.

Included in this report are revised end-use data, table 4, for the years 1977 through 1981, the result of newly acquired data. An observable trend over the last few years has been the continued high usage of asbestos for friction products during a declining market. Although this use showed only a small rise in 1982 over that of 1981, its market share rose from 15% to 21%.

Less than 1% of the chrysotile used was spinning grades (1, 2, or 3); of the remainder, the grade 7's were the most used, 77%, followed by the 4's and 6's, 8% each, and the 5's, 7%.

Table 4.—U.S. asbestos consumption by end use, grade, and type

(Thousand metric tons)

	Chrysotile							Crocidolite	Amosite	Total asbestos
	Grades 1 and 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Total			
1977:[r]										
Asbestos-cement pipe	--	--	68.1	32.8	2.4	--	103.3	11.2	0.5	115.0
Asbestos-cement sheet	--	--	5.1	8.9	7.1	5.8	26.9	--	.1	27.0
Flooring products	2.6	--	--	65.6	.1	81.7	150.0	--	--	150.0
Roofing products	--	--	.3	4.0	16.5	49.2	70.0	--	--	70.0
Packing and gaskets	.3	3.1	3.9	13.9	1.5	5.0	27.7	--	--	27.7
Insulation:										
Thermal	--	1.7	.5	.4	8.4	5.5	16.5	--	--	16.5
Electrical	--	.2	--	2.2	1.0	.3	3.7	--	--	3.7
Friction products	.1	1.1	1.5	18.9	6.9	28.5	57.0	--	--	57.0
Coatings and compounds	--	--	.2	.4	1.1	34.1	35.8	--	--	35.8
Plastics	--	.1	--	1.1	--	6.3	7.5	.5	--	8.0
Textiles	1.1	8.4	.2	--	--	--	9.7	--	--	9.7
Paper	--	--	.5	.3	4.8	1.4	7.0	.3	--	7.3
Other	.3	1.2	28.1	37.6	28.0	48.6	143.8	--	--	143.8
Total	4.4	15.8	108.4	186.1	77.8	266.4	658.9	12.0	.6	671.5

See footnote at end of table.

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Table 4.—U.S. asbestos consumption by end use, grade, and type —Continued

(Thousand metric tons)

	Chrysotile							Crocidolite	Amosite	Total asbestos
	Grades 1 and 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Total			
1978:r										
Asbestos-cement pipe	--	--	58.7	28.3	2.0	--	89.0	15.8	1.0	105.8
Asbestos-cement sheet	--	--	4.6	8.1	6.5	5.3	24.5	--	.2	24.7
Flooring products	2.4	--	--	60.3	.1	75.2	138.0	--	--	138.0
Roofing products	--	--	.2	3.7	15.2	45.2	64.3	--	--	64.3
Packing and gaskets	.3	2.8	3.6	12.7	1.4	4.6	25.4	--	--	25.4
Insulation:										
Thermal	--	1.6	.5	.4	7.9	5.1	15.5	--	--	15.5
Electrical	--	.2	--	2.2	1.0	.3	3.7	--	--	3.7
Friction products	.1	1.0	1.4	17.5	6.4	26.2	52.6	--	--	52.6
Coatings and compounds	--	--	.2	.4	1.0	31.2	32.8	--	--	32.8
Plastics	--	.1	--	1.0	--	5.6	6.7	.7	--	7.4
Textiles	1.0	7.5	.2	--	--	--	8.7	--	--	8.7
Paper	--	--	.4	.3	4.4	1.3	6.4	.4	--	6.8
Other	.4	1.2	29.3	34.5	25.0	42.6	133.0	--	--	133.0
Total	4.2	14.4	99.1	169.4	70.9	242.6	600.6	16.9	1.2	618.7
1979:r										
Asbestos-cement pipe	--	--	54.5	26.3	1.9	--	82.7	12.7	.4	95.8
Asbestos-cement sheet	--	--	4.2	7.4	5.9	4.8	22.3	--	.1	22.4
Flooring products	2.1	--	--	54.6	.1	68.2	125.0	--	--	125.0
Roofing products	--	--	.2	3.3	13.8	41.0	58.3	--	--	58.3
Packing and gaskets	.3	2.6	3.2	11.5	1.2	4.2	23.0	--	--	23.0
Insulation:										
Thermal	--	1.4	.4	.3	7.2	4.7	14.0	--	--	14.0
Electrical	--	.2	--	2.0	.9	.3	3.4	--	--	3.4
Friction products	.1	.9	1.2	15.8	5.8	23.8	47.6	--	--	47.6
Coatings and compounds	--	--	.2	.3	.9	28.3	29.7	--	--	29.7
Plastics	--	.1	--	.9	--	5.1	6.1	.6	--	6.7
Textiles	.9	6.7	.2	--	--	--	7.8	--	--	7.8
Paper	--	--	.4	.3	4.0	1.2	5.9	.3	--	6.2
Other	.4	1.2	25.7	31.4	22.8	39.1	120.6	--	--	120.6
Total	3.8	13.1	90.2	154.1	64.5	220.7	546.4	13.6	.5	560.5
1980:r										
Asbestos-cement pipe	--	--	21.5	7.9	1.3	.9	31.6	10.0	.3	41.9
Asbestos-cement sheet	--	--	--	.3	12.5	10.1	22.9	--	.1	23.0
Flooring products	--	.1	--	27.9	.1	41.9	70.0	--	--	70.0
Roofing products	--	.1	.3	.1	3.5	20.0	24.0	--	--	24.0
Packing and gaskets	--	.8	2.3	6.3	.1	2.8	12.3	--	--	12.3
Insulation:										
Thermal	--	--	.1	--	.7	5.2	6.0	--	--	6.0
Electrical	--	.2	--	.1	--	2.6	2.9	--	--	2.9
Friction products	--	.5	2.5	16.9	5.6	26.5	52.0	--	--	52.0
Coatings and compounds	--	--	.1	--	.1	10.7	10.9	--	--	10.9
Plastics	.2	--	--	.3	--	.7	1.2	.3	--	1.5
Textiles	.2	1.7	--	--	--	--	1.9	--	--	1.9
Paper	--	--	--	.2	.1	--	.3	.2	--	.5
Other	--	.5	61.8	34.3	1.0	14.2	111.8	--	--	111.8
Total	.4	3.9	88.6	94.3	25.0	135.6	347.8	10.5	.4	358.7
1981:r										
Asbestos-cement pipe	--	--	20.3	7.4	.3	--	28.0	14.0	--	42.0
Asbestos-cement sheet	--	.1	.3	2.8	2.8	13.6	19.6	--	.1	19.7
Flooring products	--	--	--	.4	--	66.6	67.0	--	--	67.0
Roofing products	--	.1	.2	.6	3.7	11.4	16.0	--	--	16.0
Packing and gaskets	--	1.0	1.6	5.2	.1	11.4	19.3	--	--	19.3
Insulation:										
Thermal	--	--	.2	--	--	5.8	6.0	--	--	6.0
Electrical	--	.3	--	--	--	.3	.6	--	--	.6
Friction products	--	--	1.2	15.1	6.2	28.5	51.0	--	--	51.0
Coatings and compounds	--	--	.1	.3	1.1	11.6	13.1	--	--	13.1
Plastics	.1	.1	--	.3	--	.6	1.1	--	--	1.1
Textiles	--	1.7	--	--	--	--	1.7	--	--	1.7
Paper	--	.1	--	.4	.9	.3	1.7	--	--	1.7
Other	--	.4	51.1	22.4	5.4	29.7	109.0	--	.6	109.6
Total	.1	3.8	75.0	54.9	20.5	179.8	334.1	14.0	.7	348.8

See footnote at end of table.

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Table 4.—U.S. asbestos consumption by end use, grade, and type —Continued

(Thousand metric tons)

	Chrysotile							Crocidolite	Amosite	Total asbestos
	Grades 1 and 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Total			
1982:										
Asbestos-cement pipe	--	--	15.6	5.0	1.0	--	21.6	16.0	--	37.6
Asbestos-cement sheet	--	--	.2	1.0	7.2	2.4	10.8	--	--	10.8
Flooring products	--	--	--	--	--	49.0	49.0	--	--	49.0
Roofing products	--	--	--	--	3.0	4.0	7.0	--	--	7.0
Packing and gaskets	--	--	.4	.5	.8	11.9	13.6	--	--	13.6
Insulation:										
Thermal	--	--	--	--	--	--	--	--	.2	.2
Electrical	--	--	--	--	--	.7	.7	--	--	.7
Friction products	--	--	1.0	7.9	6.7	37.3	52.9	--	--	52.9
Coatings and compounds	--	--	--	--	--	25.0	25.0	--	--	25.0
Plastics	--	--	--	.2	--	.2	.4	--	--	.4
Textiles	--	1.1	--	--	--	--	1.1	--	--	1.1
Paper	--	--	--	.1	--	1.5	1.6	--	--	1.6
Other	--	1.2	1.2	.3	.1	43.3	46.1	--	.5	46.6
Total	--	2.3	18.4	15.0	18.8	175.3	229.8	16.0	.7	246.5

ʳRevised.

PRICES

Depressed markets and high producer inventories of the last few years have caused final negotiated asbestos prices to be lower than listed prices. A realistic set of unit values can be calculated using import data as shown in table 5. These averaged data represented most of the domestic market. The unit value of exported asbestos, $335 per ton in 1982, did not change significantly.

Table 5.—Customs unit values of imported asbestos

(Dollars per metric ton)

	1978	1979	1980	1981	1982
Canada:					
Chrysotile:					
Crude	381	201	158	--	380
Spinning	902	868	843	927	917
Cement	250	238	251	272	234
Other	267	292	296	373	334
South Africa, Republic of:					
Amosite	569	499	1,611	728	771
Crocidolite	624	711	686	676	646

FOREIGN TRADE

There was a 12% decrease in the total value of asbestos fibers and asbestos products exported from the United States in 1982 from that of 1981; of this, the fiber portion remained at 13%. Canada remained the largest user of U.S. asbestos and products accounting for 31% of the value of exports of these products in 1982, followed by Saudi Arabia and Mexico, 10% each.

Canada provided 95% of the asbestos fiber imported into the United States in 1982, and the Republic of South Africa provided 5%. Several countries provided minor amounts. Chrysotile again dominated the imported types with 97% of the total. The value of imported fiber in 1982 was only 62% of that of 1981.

In 1982, the United States recovered 227% of the cost of imported asbestos by exporting and reexporting fibers and products.

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Table 6.—Countries importing U.S. asbestos fibers and products, by country

(Thousand dollars)

Country	1981			1982		
	Unmanufactured fibers	Manufactured products	Total	Unmanufactured fibers	Manufactured products	Total
Australia	117	4,480	4,597	145	5,034	5,179
Canada	1,029	55,754	56,783	1,144	43,714	44,858
Colombia	55	1,867	1,922	153	2,124	2,277
Germany, Federal Republic of	713	3,098	3,811	980	2,417	3,397
Japan	4,246	4,171	8,417	3,933	6,475	10,408
Mexico	5,267	18,344	23,611	4,902	9,837	14,739
Netherlands	14	1,680	1,694	4	980	984
Saudi Arabia	118	11,717	11,835	17	15,291	15,308
United Kingdom	206	3,627	3,833	178	2,761	2,939
Venezuela	222	4,951	5,173	259	5,747	6,006
Other	9,362	34,842	44,204	7,828	32,324	40,152
Total	21,349	144,531	165,880	19,543	126,704	146,247

Table 7.—U.S. exports and reexports of asbestos and asbestos products

Products		1980		1981		1982	
		Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
EXPORTS							
Unmanufactured:							
Crudes, fibers, and stucco	metric tons	36,426	$17,044	50,131	$17,328	42,342	$14,752
Sand and refuse	do	11,793	3,693	13,995	4,021	16,183	4,791
Total	do	48,219	20,737	64,126	21,349	58,525	19,543
Products:							
Asbestos fibers	do	2,695	8,610	3,840	9,544	2,538	8,119
Shingles and clapboard	do	4,535	2,560	21,771	3,686	4,011	3,235
Other articles of asbestos	do	16,646	14,236	17,504	14,292	17,639	13,444
Gaskets	do	438	3,542	451	4,144	358	3,020
Packing and seals	do	2,118	15,661	1,598	18,179	1,311	15,309
Insulation	do	NA	6,151	NA	8,185	NA	6,799
Other articles, n.s.p.f	do	NA	25,442	NA	23,660	NA	17,047
Brake linings and disk brake pads	do	NA	55,471	NA	50,058	NA	42,852
Clutch facings and linings	number	NA	9,626	NA	12,783	NA	16,879
Total		XX	141,299	XX	144,531	XX	126,704
REEXPORTS							
Unmanufactured:							
Crudes and fibers	metric tons	383	307	240	150	246	170
Sand and refuse	do	69	23	53	9	XX	XX
Total	do	452	330	293	159	246	170
Products:							
Asbestos fibers	do	--	--	6	34	66	203
Shingles and clapboard	do	477	78	34	20	--	--
Gaskets	do	--	--	1	7	--	1
Packing and seals	do	1	5	1	2	5	22
Insulation	do	NA	1	NA	17	--	--
Other articles, n.s.p.f	do	NA	14	NA	120	NA	9
Brake linings and disk brake pads	do	NA	219	NA	149	NA	539
Clutch facings and linings	number	NA	24	NA	234	NA	309
Other articles of asbestos	metric tons	3	13	1	16	27	80
Total		XX	354	XX	599	XX	1,163

NA Not available. XX Not applicable.

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Table 8.—U.S. imports for consumption of asbestos fibers by type, origin, and value

Type	Canada		Republic of South Africa		Other		Total	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
1980	315,540	$83,276	10,261	$7,202	1,495	$1,331	327,296	$91,809
1981:								
Chrysotile:								
Crude	--	--	957	554	--	--	957	554
Spinning fibers	4,450	4,124	471	175	90	91	5,011	4,390
All other	313,917	86,704	7,802	4,762	1,875	2,000	323,594	93,466
Crocidolite (blue)	--	--	7,376	4,988	--	--	7,376	4,988
Amosite	--	--	506	367	174	128	680	495
Total	318,367	90,828	17,112	10,846	2,139	2,219	337,618	103,893
1982:								
Chrysotile:								
Crude	36	14	--	--	8	1	44	15
Spinning fibers	1,328	1,218	904	453	202	283	2,434	1,954
All other	227,715	55,482	2,193	1,341	1,058	728	230,966	57,551
Crocidolite (blue)	--	--	7,904	5,105	--	--	7,904	5,105
Amosite	--	--	389	300	--	--	389	300
Total	229,079	56,714	11,390	7,199	1,268	1,012	241,737	64,925

WORLD REVIEW

An early 1982 review of the world asbestos industry in a trade magazine described it as "going through a period of rapid evolution."[3] Sales and mergers of asbestos mines and plants were almost as common as temporary mine closures due to excessive inventory.

Canada.—The Government announced in July that it would provide Can$400,000 toward establishment of a Canadian Asbestos Information Center. The principal function of the center was to be to distribute information on the health and technical aspects of asbestos use.

In an article in a September 1982 financial paper, asbestos industry representatives blamed the lowered demand for asbestos on the recession and not on environmental considerations.[4] At that time, a drop in 1982 production of 20% to 25% from that of 1981 was expected. Production in 1981 had been only 59% of that of the 1973 peak year and industry was producing at only 50% of its capacity.

The government of Ontario, Canada, made its permissible occupational exposure limits identical to those of the United Kingdom, effective August 20, 1982.

The Federal Government of Canada and the government of Newfoundland, working in concert, prevented, at least temporarily, the closing of the Advocate Asbestos Mine at Baie Verte, Newfoundland. The Newfoundland government expropriated the mine and sold it to Transpacific Asbestos, Inc. As part of the deal, the Federal Government announced that it would extend $14 million in credit guarantees to Transpacific over a 3-year period.

Cassiar Resources Ltd. closed its asbestos mine in British Columbia for 7 weeks to repair its tramway that had been damaged in an accident.

Greece.—Technical difficulties and other problems prevented the new 100,000-ton-per-year Zidani Mine and Kozani mill asbestos complex from reaching more than one-third of capacity. At least 80% of the product was aimed at export markets in the Mediterranean and the Middle and Far East for fabrication of asbestos-cement pipes and sheets.[5]

Sudan.—Three Sudanese asbestos deposits were described in a mining journal article.[6] A small deposit of chrysotile was found at Qala en Nahal that contained fibers in lengths up to 7 centimeters. Several thousand tons of 5% ore had been estimated. The Ingesanna deposit of chrysotile had an estimated 9 million tons of 3.4% or better ore. Another magazine article indicated that 30 million tons of low-grade ore occurs at this deposit.[7] Johns Manille Canada, Inc., was said to be reluctant to start commercial mining there. The Red Sea Hills deposit is reportedly anthophyllite

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and is of little interest.

U.S.S.R.—A trade magazine reported that a new high-quality deposit of asbestos was found in Siberia.[8] The deposit, near Taksimo on the Baykal-Amur railway in the Buryat Associated Soviet Socialist Republic, was described as very rich. Another source, the Molodezhnoye underground deposit, was evaluated as among the world's best.

United Kingdom.—The United Kingdom Health and Safety Commission decided to enact the recommendations of the Advisory Committee on Asbestos, effective January 1, 1983. The permissible occupational exposure limits without personal protective equipment was as follows: for chrysotile, 1 fiber per milliliter of air; for amosite, 0.5 fiber per milliliter of air; and for crocidolite, 0.2 fiber per milliliter of air.

Zimbabwe.—Early in the year, a bill was passed enabling the Government to set up its Minerals Marketing Corp. (MMC).[9] One of the two mining company representatives on the MMC board was the managing director of African Associated Mines, the only asbestos producer in the country.

A considerable transportation cost saving was reported for the Shabaine Mines and mill.[10] A ropeway designed to carry 125 tons per hour of ore the 2.5 kilometers between mine and mill was commissioned in July.

Table 9.—Asbestos: World production, by country[1]

(Metric tons)

Country[2]	1978	1979	1980	1981[p]	1982[e]
Afghanistan	[e]13,000	[e]4,000	--	--	--
Argentina	1,069	1,371	1,261	1,400	1,300
Australia	62,744	79,721	92,418	44,647	45,000
Brazil	122,815	138,457	169,173	138,420	140,000
Bulgaria	700	600	700	400	400
Canada (shipments)	1,421,808	1,492,719	1,323,053	1,122,000	822,000
China[e]	250,000	250,000	250,000	250,000	250,000
Cyprus	34,342	35,472	34,535	24,440	24,000
Egypt	349	238	316	325	310
Greece	--	--	--	--	100,000
India	24,623	32,094	31,253	24,515	25,000
Italy	135,402	143,931	157,794	137,086	135,000
Japan	5,746	3,502	3,897	[e]3,500	3,500
Korea, Republic of	13,616	14,804	9,854	14,084	15,000
Mozambique	--	789	[e]800	[e]800	[e]800
South Africa, Republic of	257,325	249,187	277,734	235,943	[3]211,860
Swaziland[4]	36,957	34,294	32,833	35,264	35,000
Taiwan	2,031	2,957	683	2,317	2,500
Turkey	13,372	[r]38,967	8,872	2,833	3,000
U.S.S.R.[e]	1,945,000	2,020,000	2,070,000	2,105,000	2,180,000
United States (sold or used by producers)	93,097	93,354	80,079	75,618	63,515
Yugoslavia	10,360	10,041	12,106	13,591	12,500
Zimbabwe	248,861	259,891	250,949	247,600	240,000
Total	[r]4,693,217	[r]4,906,389	4,808,310	4,479,783	4,310,685

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

[1]Table includes data available through Apr. 21, 1983.

[2]In addition to the countries listed, Czechoslovakia, North Korea, and Romania also produced asbestos, but output is not officially reported, and available general information is inadequate for the formulation of reliable estimates of output levels.

[3]Reported figure.

[4]Exports.

TECHNOLOGY

The Quebec Provincial government's Société Nationale de l'Amiante (SNA) was rapidly becoming a center for research on asbestos fiber and on asbestos mines residue as a mineral resource. A Canadian Government magazine detailed how the toxicity of asbestos fibers can be reduced by phosphorylation with little reduction in physical properties and little increase in cost.[11] This development work was done at the SNA laboratory under its director of research technology. A U.S. professional journal described research done under a SNA contract to develop two refractory raw materials from asbestos tailings.[12] A magnetic separation process was used to separate an iron-rich fraction from the tailings. The iron-rich fraction is a potential heat storage material. The less magnetic fraction, an olivine, contained less iron than any olivine now used

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for periclase production. Another magazine described a cooperative development project between SNA and Noranda Mines Ltd.[13] A pilot plant was built at a Noranda smelter in which a flue gas containing 3% to 6% sulfur dioxide was to be sprayed with a slurry of magnesium-rich asbestos tailings. Byproducts of this flue gas desulfurization process were expected to be marketable magnesium sulfate crystals.

Transpacific, put their 1.5-ton-per-day prototype asbestos wet mill in operation in Australia in January.[14] Initial indications were that it could more than double fiber recovery from many ores using the dry process. The company estimates a new mill cost at about one-half that of a conventional dry mill.

Substitutes.—In an article in a trade magazine, asbestos was compared with other fibrous materials used in packing and gaskets.[15] The article showed that material costs for products with characteristics comparable to asbestos were several times higher than that for asbestos.

Several claims were made for asbestos substitutes in cement products. Among them were a rock wool developed by a Bureau of Mines contractor,[16] two acrylic fibers from Hoechst AG of the Federal Republic of Germany, and a polyvinyl alcohol fiber from Japan's Unitika Kasei.[17]

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