Asbestos

By R. A. Clifton[1]

U.S. apparent consumption of asbestos continued to decline in 1983 because of its unfavorable public ecological image. U.S. apparent consumption was 88% of that in 1982 and 27% of the alltime high of 1973. Shipments from domestic mines, all chrysotile, increased 10%, and imports decreased 19%. The Manville Corp., formerly Johns-Manville Inc., the largest producer of asbestos in the market economy countries and the largest U.S. manufacturer of asbestos products, ceased all asbestos mining and product manufacturing. Manville's Canadian mine, the world's largest, was purchased by a Canadian group and production was expected to continue.

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, representing 100% of the total production data shown in table 1.

Table 1.—Salient asbestos statistics

	1979	1980	1981	1982	1983
United States:					
Production (sales) metric tons	93,354	80,079	75,618	63,515	69,906
Value thousands	$28,925	$30,599	$30,685	$24,917	$27,866
Exports and reexports (unmanufactured) metric tons	43,291	48,671	64,419	58,771	54,634
Value thousands	$17,381	$21,067	$21,508	$19,713	$19,683
Exports and reexports of asbestos products (value) do.	$137,690	$141,653	$145,130	$127,867	$129,582
Imports for consumption (unmanufactured) metric tons	513,084	327,296	337,618	241,737	196,387
Value thousands	$135,210	$91,809	$103,893	$64,925	$57,956
Released from stockpile (unmanufactured) metric tons	[1]				
Consumption do.	560,600	358,700	348,800	246,500	217,000
World: Production do.	r4,758,022	r4,699,300	4,337,140	p4,080,314	e4,157,256

eEstimated. pPreliminary. rRevised.

Legislation and Government Programs.—The Occupational Safety and Health Administration (OSHA) published in the Federal Register of November 4 its Emergency Temporary Standard (ETS), which lowers, by a factor of four, the permissible level of workplace exposure to asbestos. The ETS was challenged in the Fifth Circuit Court of Appeals by the asbestos industry and, on November 23, was stayed pending judicial review.

On July 27, in testimony before the Senate Subcommittee on Toxic Substances and Environmental Oversight, the Environmental Protection Agency (EPA) testified that within 1 year it would propose a ban on certain asbestos products. The products to be covered by the proposed ban are saturated asbestos roofing felt, unsaturated roofing felt, asbestos flooring felt, asbestos sheet flooring, vinyl-asbestos floor tile, and asbestos-cement pipe. It was EPA's intention to propose another rule in October 1984, which would set production ceilings for remaining asbestos products. These limits would decline until all products containing asbestos would be eventually phased out.

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The Consumer Products Safety Commission (CPSC) published its final report of the Chronic Hazard Advisory Panel on Asbestos. Copies of the report are available from the Office of the Secretary, Consumer Products Safety Commission, Washington, DC 20207. Copies may also be obtained by calling the Office of the Secretary at (301) 492-6800.

In July, EPA, CPSC, and OSHA set up a formal task force on asbestos. The group was to develop a coordinated Federal approach to protect the public from health hazards of asbestos in the workplace, during use of a product, or from disposal practices. The group's goals include assessing available data on asbestos health hazards, coordinating scientific research, identifying control measures, and developing a uniform approach to issuing regulations.

Environmental Impact.—The mortality rate of Reserve Mining Co.'s employees exposed to asbestos-containing taconite dust was the subject of a medical journal article.[2] It was found that men employed by Reserve from 1952 to 1976 had a mortality rate significantly lower than that expected for white males in the State of Minnesota and that deaths from malignant diseases were marginally below those expected for the State.

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

(Metric tons)

	Stockpile goals	Total inventories		
		1981	1982	1983
Amosite	15,422	38,587	38,587	38,591
Chrysotile	2,722	9,034	9,034	9,753
Crocidolite	--	r2,163	754	754
Total	18,144	r49,784	48,375	49,098

rRevised.

DOMESTIC PRODUCTION

Mines in the United States shipped about 10% more asbestos than in 1982, and the value increased 12%. Only two States produced asbestos; California was the leader, followed by Vermont.

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. This mine was the second largest U.S. producer. The third U.S. producer was the Vermont Asbestos Group's Lowell Mine in Orleans County, VT.

Table 3.—Asbestos producers in the United States in 1983

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.

Employment in U.S. asbestos mines and mills remained at about 400 persons.

Miners at the Asbestos Group's mine in Vermont went on strike in October and were still out at yearend. Despite this, the management was optimistic about the future. A foreclosure suit had been dismissed, and there was sufficient inventory at the mine to meet shipments for some time.

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CONSUMPTION AND USES

Total U.S. asbestos consumption decreased 12%; of the total, 97% was chrysotile and 3% was crocidolite. Small amounts of amosite were reported used. One percent of the chrysotile used was spinning grades 1, 2, or 3. Grade 7's were the most used, 76%, followed by grades 4 and 6, 8% each, and grade 5's, 7%.

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

(Thousand metric tons)

End use	Chrysotile							Crocidolite	Amosite	Total asbestos
	Grades 1 and 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Total			
1982 total	--	2.3	18.4	15.0	18.8	175.3	229.8	16.0	0.7	246.5
1983:										
Asbestos-cement pipe	--	--	14.4	4.6	.9	--	19.9	6.2	--	26.1
Asbestos-cement sheet	--	--	.2	.9	6.7	2.2	10.0	--	--	10.0
Coatings and compounds	--	--	--	--	--	22.8	22.8	--	--	22.8
Flooring products	--	--	--	--	--	44.6	44.6	--	--	44.6
Friction products	--	--	.9	7.3	6.2	33.9	48.3	--	--	48.3
Insulation:										
Thermal	--	--	--	--	--	--	--	--	.1	.1
Electrical	--	--	--	--	--	.6	.6	--	--	.6
Packing and gaskets	--	--	.4	.5	.7	10.8	12.4	--	--	12.4
Paper	--	--	--	.1	--	1.4	1.5	--	--	1.5
Plastics	0.2	--	--	.2	--	.2	.6	--	--	.6
Proofing products	--	--	--	--	2.8	3.7	6.5	--	--	6.5
Textiles	.2	1.1	--	--	--	--	1.3	--	--	1.3
Other	--	1.1	1.1	.3	.1	39.1	41.7	--	.5	42.2
Total	.4	2.2	17.0	13.9	17.4	159.3	210.2	6.2	.6	217.0

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. These averaged data represented most of the domestic market. The unit value of exported asbestos, $360 per metric ton, represented a 7% increase.

Table 5.—Customs unit values of imported asbestos

(Dollars per metric ton)

	1979	1980	1981	1982	1983
Canada:					
Chrysotile:					
Cement	238	251	272	234	257
Crude	201	158	--	380	199
Spinning	868	843	927	917	932
Other	292	296	373	334	384
South Africa, Republic of:					
Amosite	499	1,611	728	771	840
Crocidolite	711	686	676	646	629

FOREIGN TRADE

There was a 1% increase in the total value of asbestos fibers and asbestos products exported from the United States; of this, the fiber portion remained at 13%. Canada remained the largest recipient of U.S. exports, accounting for 51% of the value, followed by Japan, 8%; Saudi Arabia, 7%; and Mexico, 6%.

Canada provided 94% of the asbestos fiber imported into the United States, and

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the Republic of South Africa provided 6%. Several countries provided minor amounts. Chrysotile again dominated the imported types with 97% of the total. The value of imported fiber was only 89% of that of 1982.

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

(Thousand dollars)

Country	1982			1983		
	Unmanufactured fibers	Manufactured products	Total[1]	Unmanufactured fibers	Manufactured products	Total[1]
Australia	145	5,034	5,179	19	2,107	2,126
Brazil	242	367	609	221	1,432	1,653
Canada	1,144	43,714	44,858	1,539	73,739	75,278
Germany, Federal Republic of	980	2,417	3,397	985	2,367	3,352
Japan	3,933	6,475	10,408	3,787	8,036	11,823
Korea, Republic of	730	2,367	3,098	550	781	1,331
Kuwait	--	1,114	1,114	--	1,380	1,380
Mexico	4,902	9,837	14,739	4,649	3,565	8,214
Saudi Arabia	17	15,291	15,308	13	10,339	10,352
Thailand	1,199	325	1,524	2,599	189	2,788
Turkey	--	334	334	497	913	1,410
United Kingdom	178	2,761	2,939	204	2,116	2,320
Venezuela	259	5,747	6,006	329	1,773	2,102
Other	r5,815	r30,920	r36,735	4,005	19,846	23,851
Total[1]	19,543	126,704	146,247	19,398	128,584	147,981

[1]Data may not add to totals shown because of independent rounding.

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

Products		1981		1982		1983	
		Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
EXPORTS							
Unmanufactured:							
Crudes, fibers, stucco	metric tons	50,131	$17,328	42,342	$14,752	40,476	$14,879
Sand and refuse	do.	13,995	4,021	16,183	4,791	13,760	4,519
Total	do.	64,126	21,349	58,525	19,543	54,236	19,398
Products:							
Asbestos fibers	do.	3,840	9,544	2,538	8,119	1,537	5,198
Shingles and clapboard	do.	21,771	3,686	4,011	3,235	3,082	1,935
Other articles of asbestos	do.	17,504	14,292	17,639	13,444	4,953	5,593
Gaskets	do.	451	4,144	358	3,020	337	2,196
Packing and seals	do.	1,598	18,179	1,311	15,309	1,015	10,174
Insulation	do.	NA	8,185	NA	6,799	NA	3,270
Other articles, n.s.p.f	do.	NA	23,660	NA	17,047	NA	9,477
Brake linings and disk brake pads	do.	NA	50,058	NA	42,852	NA	70,456
Clutch facings and linings	number	NA	12,783	NA	16,879	NA	20,285
Total		XX	144,531	XX	126,704	XX	128,584
REEXPORTS							
Unmanufactured:							
Crudes and fibers	metric tons	240	150	246	170	333	271
Sand and refuse	do.	53	9	XX	XX	65	14
Total	do.	293	159	246	170	398	285
Products:							
Asbestos fibers	do.	6	34	66	203	3	7
Shingles and clapboard	do.	34	20	--	--	--	--
Gaskets	do.	1	7	--	1	[1]	117
Packing and seals	do.	1	2	5	22	1	10
Insulation	do.	NA	17	--	--	NA	10
Other articles, n.s.p.f	do.	NA	120	NA	9	NA	166
Brake linings and disk brake pads	do.	NA	149	NA	539	NA	318
Clutch facings and linings	number	NA	234	NA	309	NA	167
Other articles of asbestos	metric tons	1	16	27	80	59	203
Total		XX	599	XX	1,163	XX	998

NA Not available. XX Not applicable.
[1]Less than 1/2 unit.

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

Type	Canada		South Africa, Republic of		Other		Total	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
1981	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
1983:								
Chrysotile:								
Crude	4	1	313	220	89	138	406	359
Spinning fibers	1,840	1,714	190	123	161	225	2,191	2,062
All other	182,459	48,018	4,465	2,998	80	120	187,004	51,136
Crocidolite (blue)	--	--	6,177	3,887	--	--	6,177	3,887
Amosite	--	--	609	512	--	--	609	512
Total	184,303	49,733	11,754	7,740	330	483	196,387	57,956

WORLD REVIEW

The market economy countries' asbestos industries suffered the same state of oversupply, reduced demand, mine layoffs, and general economic problems that characterized 1982. Increased demand in the last quarter did little more than reduce some of the high fiber inventories.

Canada.—Manville concluded the sale of the Jeffrey Mine at Asbestos in September. The purchasers included a number of former Manville executives headed by the president of their former auditing firm. J. M. Asbestos Inc., the new owner, promised to continue production of fine chrysotile fibers and provide technical services.

Preliminary figures were cited that showed a continued downturn of Quebec's fiber production.[3] The volume, estimated at 717,000 tons, was 4% below that for 1982, but the value, Can$316 million, increased 6%.

According to a published report, Asbestos Corp. planned to close its Asbestos Hill Mine for 1 year.[4] Inventory shortfalls caused by the closing were to be made up by increased production from its Thetford Mine. A closure of Asbestos Hill might cause a temporary shutdown of Asbestos Corp.'s mill in Nordenham, Federal Republic of Germany, which currently processes the concentrated ore.

Italy.—A mining periodical described the current operation of the Amiantifera Balangero S.p.A. Balangero Mine.[5] Asbestos was mined from a face 170 meters high by 700 meters long. The mine's annual capacity was rated at 3.1 million tons of ore yielding 150,000 tons of fiber. It was one of the few asbestos mines in the world with a salable byproduct. Nearly one-half million tons per year of high-quality crushed stone and sand have been sold from the Balangero Mine.

South Africa, Republic of.—A mining periodical detailed workings of a mine and mill that produced roughly one-half of the world's crocidolite in 1982.[6] The underground Pomfret Mine of the Griqualand Exploration and Finance Co. Ltd. was considered to be the premier crocidolite mine of the world. Ore selection at the face of grades not less than 6% was used to maintain an average ore grade of 12% to the mill. Except for a wash cycle to recover fibers, the mill process was dry. Pomfret's 2,400 employees live in the town of Pomfret, which is owned by the company.

Zimbabwe.—A weekly mining periodical painted a bleak picture for the country's asbestos industry.[7] Extrapolation of half-year production figures showed a 27% production decline from that of 1982, and a 56% production decline from that of 1976, its record year.

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

(Metric tons)

Country[2]	1979	1980	1981	1982[p]	1983[e]
Afghanistan	[e]4,000	--	--	NA	NA
Argentina	1,371	1,261	1,280	1,218	1,350
Australia	79,721	92,418	44,647	[r e]20,000	20,000
Brazil	138,457	169,173	138,420	[e]140,000	135,000
Bulgaria	600	700	400	600	600
Canada (shipments)	1,492,719	1,323,053	1,122,000	834,000	829,000
China[e]	[r]140,000	[r]131,700	106,000	110,000	110,000
Cyprus	35,472	34,535	24,440	18,952	18,000
Egypt	238	316	325	310	325
Greece	--	--	--	[e]100,000	100,000
India	32,094	31,253	24,515	26,761	25,000
Italy	143,931	157,794	137,086	116,410	120,000
Japan	3,502	3,897	3,950	4,135	4,000
Korea, Republic of	14,804	9,854	14,084	15,933	15,000
Mozambique	789	[e]800	[e]800	[e]800	800
South Africa, Republic of	249,187	277,734	235,943	211,860	220,000
Swaziland (exports)	34,294	32,833	35,264	26,413	[3]31,275
Taiwan	2,957	683	2,317	2,392	2,500
Turkey	[r]600	[r]18,162	3,860	958	4,000
U.S.S.R.[e]	2,020,000	2,070,000	2,105,000	2,180,000	2,250,000
United States (sold or used by producers)	93,354	80,079	75,618	63,515	[3]69,906
Yugoslavia	10,041	12,106	13,591	11,657	10,500
Zimbabwe	259,891	250,949	247,600	194,400	190,000
Total	[r]4,758,022	[r]4,699,300	4,337,140	4,080,314	4,157,256

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Apr. 18, 1984.

[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.

TECHNOLOGY

The U.S. Navy tested shipboard transformers, with and without asbestos, to demonstrate the superior properties of asbestos electrical insulating papers and boards.[8] Among the tests conducted was one to establish failure temperature under various overloads. The transformer containing asbestos surpassed all others by nearly 300° F. Asbestos emission tests demonstrated that little, if any, asbestos fiber was emitted from any of the transformers under actual operating conditions and that the tremendous overload resistance of the asbestos insulating system permits transformers on board U.S. Navy warships to operate under the most severe combat conditions.

A neoprene spray process was developed for coating asbestos fibers to prevent their escape from construction components used in building interiors.[9] The process is designed to both penetrate and surface coat the asbestos and eventually cure the coating to form a tough elastic cocoon. Use of the process was claimed to eliminate or greatly reduce the very high fiber counts generated during the disassembly of buildings.

Substitutes.—A glass industry publication describes a new alkali-resistant glass fiber.[10] The Japanese National Institute for Research in Inorganic Chemicals applied for Japanese and U.S. patents on its glass fiber, claimed to be at least 10 times higher fiber produced by England's Pilkington Bros. The process mixture for the glass consists of 25% each of silica and alumina and 50% of an intermediate material used in producing yttrium.

Two organic fibers were identified as having comparable properties to asbestos in certain uses. These were an acrylic fiber presented by the Badische Corp.[11] and a polyvinyl alcohol fiber developed by Eternits, the Swiss asbestos cement manufacturer, and the Osaka-based Kuraray Co., as an asbestos substitute in cement products.[12]

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[1]Physical scientist, Division of Industrial Minerals.

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