Asbestos

By Robert L. Virta[1]

U.S. apparent consumption of asbestos declined in 1985. Shipments from domestic mines remained unchanged while imports for consumption decreased 32% from those of 1984. Adverse publicity on asbestos-related health risks and a proposed Environmental Protection Agency (EPA) ban of certain asbestos products contributed to the poor market conditions in the United States.

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 request was made, all responded, representing 100% of the total production data shown in table 1.

Table 1.—Salient asbestos statistics

		1981	1982	1983	1984	1985
United States:						
Production (sales):						
Quantity	metric tons	75,618	63,515	69,906	57,422	57,457
Value[1]	thousands	$30,685	$24,917	$27,866	$24,238	$20,485
Exports and reexports (unmanufactured):						
Quantity	metric tons	64,419	58,771	54,634	39,919	45,656
Value	thousands	$21,508	$19,713	$19,683	$18,346	$16,489
Exports and reexports of asbestos products:						
Value	do	$145,130	$127,867	$129,582	$163,347	$193,765
Imports for consumption (unmanufactured):						
Quantity	metric tons	337,618	241,737	196,387	209,963	142,431
Value	thousands	$103,893	$64,925	$57,956	$64,749	$44,093
Consumption[2]	metric tons	348,800	246,500	217,000	226,000	162,000
World: Production	do	r4,349,466	r4,036,213	4,178,660	p4,105,884	e4,111,298

eEstimated. pPreliminary. rRevised.
[1]F.o.b. mine.
[2]Calculated as the total of U.S. beginning stocks plus production plus imports minus ending stocks and exports.

Legislation and Government Programs.—On February 1, 1985, the EPA announced that occupational safety and consumer risks associated with asbestos would be referred to the Occupational Safety and Health Administration (OSHA) and the Consumer Product Safety Commission under section 9 of the Toxic Substances Control Act (TSCA).[2] This action was reviewed by the House Energy and Commerce Subcommittee on Oversight and Investigations. As a result of the investigation, EPA halted the referral plan on March 8, 1985.

The EPA proposed a temporary rule to limit asbestos exposures for State and local government employees who were not covered by OSHA regulations or by State plans adopted under the Occupational Safety and Health Act.[3] The ruling specifies that the average asbestos exposure for workers engaged in the removal, enclosure, or encapsulation of any material containing more than 1% asbestos by weight cannot exceed 2 fibers per cubic centimeter per 8-hour work period.

The EPA proposed a rule to establish Recommended Maximum Contaminant Levels (RMCL) for synthetic organic chemicals, inorganic chemicals, and microbiological parameters in drinking water.[4] Asbes-

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tos was included under the inorganic chemicals category. The proposal recommends establishing a RMCL for asbestos fibers exceeding 10 micrometers in length.

On December 13, the EPA submitted to the Office of Management and Budget a proposal to immediately ban the manufacture, importation, and processing of certain asbestos construction materials (asbestos cement pipe and fittings, roofing felts, flooring felts, felt back sheet floorings, vinyl asbestos floor tile, and asbestos clothing) under section 6 of the 1976 TSCA.[5] In addition, the mining and importation of asbestos and importation of asbestos products not directly banned would be placed under a permit system. The permit system would limit the mining and importation of asbestos to 30% of the 1981, 1982, and 1983 average values and would phase out asbestos use within 10 years.

OSHA continued to review a proposed standard for occupational exposure to asbestos.[6] The two permissible exposure limits to airborne asbestos being considered, 0.2 fiber per cubic centimeter or 0.5 fiber per cubic centimeter, would be a reduction from the existing asbestos exposure standard of 2 fibers per cubic centimeter per 8-hour work period.

Stockpile goals for asbestos were unchanged from those of 1984.

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

(Metric tons)

	Stockpile goals	Total inventories		
		1983	1984	1985
Amosite	15,422	38,591	30,855	30,855
Chrysotile	2,722	9,753	9,754	9,772
Crocidolite	--	754	33	33
Total	18,144	49,098	40,642	40,660

Source: General Services Administration, Federal Property Service.

Environmental Impact.—Fifty asbestos producers and insurance companies agreed to establish an asbestos claims facility in the United States.[7] The facility will settle asbestos liability claims with the objective of avoiding long and costly litigations. Only about one-third of the $1 billion spent on asbestos compensation cases in the past 10 years has been paid to the claimants.

In 1985, the EPA awarded $45 million in grants and loans for controlling asbestos hazards in schools. Funds were authorized by the Asbestos School Hazard Abatement Act of 1984. Approximately $600 million is to be distributed to local jurisdictions for asbestos abatement over a 7-year period.

The State of New Jersey enacted legislation limiting asbestos exposure during the removal of asbestos from buildings to 330 nanograms per cubic centimeter (approximately 0.01 fiber per cubic centimeter).[8] The purpose of the regulation was to prevent improper or unnecessary removal of asbestos materials from buildings.

DOMESTIC PRODUCTION

Mine shipments were unchanged in quantity but decreased 15% in value from those of 1984. The decrease in value was due primarily to a depressed market and high producer inventories.

Asbestos was produced in three mines in California and Vermont. Calaveras Asbestos Ltd. in California was the leading U.S. producer of asbestos, followed by Calidria Corp. and Vermont Asbestos Group Inc. Calidria, a subsidiary of Union Carbide Corp., was sold to a private investor group and renamed KCAC Inc.[9]

Table 3.—Asbestos producers in the United States in 1985

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

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CONSUMPTION AND USES

Total U.S. asbestos consumption decreased 28%. Approximately 92% of the asbestos consumed was chrysotile and 3% was crocidolite. Small amounts of amosite were reported used. Chrysotile grade 7 was most commonly used, followed by grades 4, 6, and 5. Spinning grades 1, 2, and 3 represented approximately 1% of the total consumption.

The end-use pattern for chrysotile presented in table 4 has been estimated from data supplied by U.S. producers and the Asbestos Institute in Quebec in cooperation with the Government of Canada. The data account for 92% of the asbestos consumed.

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

(Thousand metric tons)

End use	Chrysotile[1]							Amosite	Crocidolite	Other[2]	Total asbestos
	Grades 1 and 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Total				
1984 total	0.1	2.0	25.1	21.7	17.4	153.6	219.9	0.4	5.7	--	226.0
1985:											
Asbestos-cement pipe	--	--	16.8	1.9	4.5	--	23.2	--	4.8	--	28.0
Asbestos-cement sheet	--	--	--	(3)	3.9	2.7	6.6	--	--	--	6.6
Coatings and compounds	--	--	--	--	--	23.1	23.1	--	--	--	23.1
Flooring products	--	--	--	--	--	7.0	7.0	--	--	--	7.0
Friction products	--	.2	.5	6.5	4.0	22.7	33.9	--	--	--	33.9
Insulation:											
Electrical	--	--	.1	--	--	.3	.4	.1	--	--	.5
Thermal	--	--	(3)	(3)	--	--	.1	--	--	--	.1
Packing and gaskets	--	.2	.6	3.3	.3	2.0	6.4	--	--	--	6.4
Paper	--	--	--	--	.5	16.3	16.8	--	--	--	16.8
Plastics	--	--	--	.1	--	.6	.7	--	--	--	.7
Roofing products	--	--	--	(3)	.5	25.7	26.2	--	--	--	26.2
Textiles	--	1.2	(3)	--	--	--	1.2	--	--	--	1.2
Other	.1	.1	.8	.2	(3)	3.6	4.8	.2	--	--	5.0
Total	.1	1.7	18.8	[4]12.1	13.7	104.0	150.4	.3	4.8	7.3	[5]155.5

[1]Estimated distribution based upon data provided by the Asbestos Institute, Montreal, Canada, and the Bureau of Mines, asbestos producer survey.
[2]Bureau of the Census.
[3]Less than 1/10 unit.
[4]Data do not add to total shown because of independent rounding.
[5]Does not include "Other" category in total. "Other" contains unspecified fiber type and end use.

PRICES

Depressed markets and high producer inventories of the last few years have caused negotiated asbestos prices to be lower than listed prices. The average unit value of domestically produced asbestos in 1985 was $357 per metric ton. The average unit value of exported asbestos was $361 per ton.

Table 5.—Customs unit values of imported asbestos

(Dollars per metric ton)

	1981	1982	1983	1984	1985
Canada:					
Chrysotile:					
Cement	272	234	257	284	--
Crude	--	380	199	1,084	576
Spinning	927	917	932	699	731
Other	373	334	384	431	283
South Africa, Republic of:					
Amosite	728	771	840	869	830
Crocidolite	676	646	629	705	569

Source: Bureau of the Census.

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FOREIGN TRADE

There was a 16% increase in the total value of asbestos fibers and asbestos products exported from the United States. The asbestos fiber portion was 8% of total value. Exports of brake linings and disk pads accounted for 75% of the value of all asbestos products exported. It is the only export category that increased in value from that of 1984. Canada remained the largest importer of U.S. asbestos fibers and products, followed by Japan, Mexico, Brazil, and Venezuela.

Canada provided 92% of the asbestos imported into the United States, and the Republic of South Africa provided 8%. Several other countries provided minor amounts. Approximately 91% of asbestos fiber imports were chrysotile. The value of imported asbestos fiber decreased 32%.

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

(Thousand dollars)

Country	1984			1985		
	Unmanufactured fibers	Manufactured products	Total	Unmanufactured fibers	Manufactured products	Total
Australia	55	2,457	2,512	1	1,379	1,380
Brazil	215	3,683	3,898	251	3,592	3,843
Canada	r888	112,012	r112,900	714	148,663	149,377
Germany, Federal Republic of	1,023	2,540	3,563	75	1,948	2,023
Japan	3,279	9,062	12,341	3,294	10,140	13,434
Korea, Republic of	479	1,259	1,738	190	1,814	2,004
Kuwait	31	857	888	31	437	468
Mexico	6,997	4,649	11,646	6,261	6,483	12,744
Saudi Arabia	4	4,904	4,908	2	1,409	1,411
Thailand	1,916	179	2,095	2,330	332	2,662
Turkey	13	350	363	—	544	544
United Kingdom	192	619	811	50	926	976
Venezuela	571	3,975	4,546	267	3,487	3,754
Other	2,557	16,144	18,701	2,900	12,325	15,225
Total[1]	18,221	162,690	180,911	16,366	193,479	209,845

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

Source: Bureau of the Census.

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

Products		1983		1984		1985	
		Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
EXPORTS							
Unmanufactured:							
Crudes, fibers, stucco	metric tons	40,476	$14,879	26,381	$14,106	29,382	$12,705
Sand and refuse	do	13,760	4,519	13,398	4,115	15,693	3,661
Total	do	54,236	19,398	39,779	18,221	45,075	16,366
Manufactured:							
Asbestos fibers	do	1,537	5,198	958	5,067	607	3,793
Brake linings and disk brake pads	do	NA	70,456	NA	103,303	NA	144,262
Clutch facings and linings	number	NA	20,285	NA	23,206	NA	20,718
Gaskets	metric tons	337	2,196	275	1,815	78	900
Insulation	do	NA	3,270	NA	5,720	NA	4,566
Packing and seals	do	1,015	10,174	1,150	9,063	1,192	6,716
Shingles and clapboard	do	3,082	1,935	2,098	1,615	984	893
Other articles of asbestos	do	4,953	5,593	1,759	2,595	1,521	2,437
Other articles, n.s.p.f	do	NA	9,477	NA	10,306	NA	9,191
Total		XX	128,584	XX	162,690	XX	193,476

See footnotes at end of table.

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

Products	1983 Quantity	1983 Value (thousands)	1984 Quantity	1984 Value (thousands)	1985 Quantity	1985 Value (thousands)
REEXPORTS						
Unmanufactured:						
Crudes and fibers ---------- metric tons	333	$271	140	$125	369	$71
Sand and refuse ---------- do	65	14	--	--	212	52
Total ---------- do	398	285	140	125	581	123
Manufactured:						
Asbestos fibers ---------- do	3	7	1	5	(1)	3
Brake linings and disk brake pads ---------- do	NA	318	NA	47	NA	103
Clutch facings and linings ---------- number	NA	167	NA	194	NA	73
Gaskets ---------- metric tons	(1)	117	46	136	1	18
Insulation ---------- do	NA	10	(1)	10	NA	8
Packing and seals ---------- do	1	10	(1)	1	4	63
Other articles of asbestos ---------- do	59	203	NA	264	NA	20
Other articles, n.s.p.f ---------- do	NA	166	--	--	NA	1
Total ----------	XX	998	XX	657	XX	289

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

Source: Bureau of the Census.

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

Type	Canada Quantity (metric tons)	Canada Value (thousands)	South Africa, Republic of Quantity (metric tons)	South Africa, Republic of Value (thousands)	Other Quantity (metric tons)	Other Value (thousands)	Total Quantity (metric tons)	Total Value (thousands)
1983 ----------	184,303	$49,733	11,754	$7,740	330	$483	196,387	$57,956
1984:								
Amosite ----------	--	--	715	621	--	--	715	621
Chrysotile:								
Crude ----------	85	92	--	--	--	--	85	92
Spinning fibers	2,041	1,369	--	--	93	123	2,134	1,492
All other ----------	193,525	54,806	7,541	3,423	307	326	201,373	58,555
Crocidolite (blue) --	--	--	5,656	3,989	--	--	5,656	3,989
Total ----------	195,651	56,267	13,912	8,033	400	449	209,963	64,749
1985:								
Amosite ----------	--	--	121	100	--	--	121	100
Chrysotile:								
Crude ----------	94	86	174	100	--	--	268	187
Spinning fibers	1,990	1,454	--	--	90	110	2,080	1,564
All other ----------	127,307	36,045	522	301	37	16	127,866	36,362
Crocidolite (blue) --	--	--	4,794	2,726	--	--	4,794	2,726
Other (unspecified asbestos type) ---	1,728	962	5,374	1,997	200	196	7,302	3,155
Total ----------	131,119	38,547	10,985	5,224	327	322	142,431	[1]44,093

[1]Data do not add to total shown because of independent rounding.

Source: Bureau of the Census.

WORLD REVIEW

World production of asbestos increased slightly from that of 1984. The major production changes occurred in Canada, where shipments were down 95,000 tons, and in the U.S.S.R., where production was estimated to be 100,000 tons greater than that of 1984. The U.S.S.R. remained the largest producer of asbestos, followed by Canada, the Republic of South Africa, Zimbabwe, Italy, China, and Brazil.

Depressed economic conditions and adverse publicity on asbestos-related health risks have contributed to poor market conditions, limited growth in asbestos produc-

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tion, and resulted in a decrease in exploration and development.

There were temporary shutdowns in several mining operations in Canada. In addition, four mining companies are forming a partnership to improve their position in the market. Many companies were delaying expansion of their operations until the effects of the proposed EPA asbestos ban on future markets are known. Expanding markets for asbestos were in the Far East and in developing countries.

Australia.—The New South Wales (NSW) State government rejected the Woodsreef Mines Ltd. application to extract 25 million tons of asbestos from mine tailings at its plant near Barraba.[10] Woodsreef Mines had received approval from the Australian Government to extract asbestos from mine tailings using a wet process. The NSW Minerals Resources Department was not satisfied with the safety provisions of the mining project.

Canada.—Four Canadian asbestos producers, Asbestos Corp. Ltd., Bell Asbestos Mines Ltd., Campbell Resources Inc., and Lac d'Amiante du Quebec, signed a memorandum of intent to form a partnership that would strengthen their resources and improve their position in domestic and export markets.[11] All four companies operated mines in the Thetford area of Quebec. The partnership would control over 50% of the asbestos output in Quebec. Earlier in 1985, Asbestos Corp. had devalued the book value of its Asbestos Hill Mine in northern Quebec and suspended operations indefinitely at the Thetford Mines' Quebec plant. Under the partnership, three mines and two of five processing mills owned by the four companies will be closed. Approximately 725 of the 2,225 employees will be dismissed, and production will be limited to 300,000 tons of chrysotile per year.

China.—A new asbestos dressing plant for concentrating ore began operation at Mangnai in Qinghai Province.[12] This plant has a production capacity of 12,000 tons per year. The construction of a second plant was being considered for the Province, where reserves are estimated at 20 million tons.

Cyprus.—Asbestos was produced from one mine in the Troodos Massif. The mine is operated by Cyprus Asbestos Mines Ltd. Prior to 1985, Cyprus Asbestos produced mainly chrysotile grades 3S and HSH. The company began developing new grades of chrysotile when sales of grades 3S and HSH declined. In 1985, full-scale production of chrysotile grades 4 through 7 was begun.[13] Approximately 40% of production is grade 4T, and 30% is grade 5R and 6D. Most of the asbestos produced is exported to Europe, the Middle East, the Far East, and India for asbestos cement products.

U.S.S.R.—Chrysotile asbestos production was estimated to be slightly greater than that of 1984.[14] Reconstruction and modernization of equipment at the Uralasbest complex was reported to have increased mine efficiency. In addition, the Baikal-Amor Mainline Railway was being developed to improve access to the Kiyembay complex in Siberia's South Muya mountain range.

Approximately 45% of the production was exported, mainly to centrally planned economy countries. In recent years, surplus fiber also has been marketed in market economy countries.

United Kingdom.—The Health and Safety Commission introduced new proposals to improve control of asbestos in the workplace.[15] These proposals were in response to a European Economic Community directive on worker protection and asbestos usage. The key provisions included assessment of the nature and degree of exposure and preventive measures to minimize exposure. Emphasis was placed on air monitoring, medical surveillance, and provisions for washing, changing, eating, and drinking.

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

(Metric tons)

Country[2]	1981	1982	1983	1984[p]	1985[e]
Argentina	1,280	1,218	1,240	[e]1,250	1,200
Australia	45,494	18,587	3,723	[3]	---
Brazil (fiber)	[r]138,417	145,998	158,885	131,000	135,000
Bulgaria	400	600	700	500	600
Canada (shipments)	1,122,000	834,000	858,000	837,000	742,000
China[e]	106,000	110,000	160,000	[r]135,000	140,000
Colombia[e]	5,400	5,400	5,400	[4]9,982	10,000
Cyprus	24,440	18,952	17,288	7,429	6,000
Egypt	325	424	245	[e]325	325
Greece	457	17,016	31,811	45,376	48,000
India	24,515	26,761	24,873	25,450	25,000
Indonesia[e]	5,000	25,000	25,000	25,000	25,000

See footnotes at end of table.

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

(Metric tons)

Country[2]	1981	1982	1983	1984[p]	1985[e]
Italy	137,086	116,410	139,054	147,272	140,000
Japan	3,950	4,135	[e]4,000	[e]4,000	4,000
Korea, Republic of	14,084	15,933	12,506	8,062	10,000
Mozambique	[r]1,425	[r]852	[e]800	[e]800	800
South Africa, Republic of	235,943	211,860	221,111	167,389	165,000
Swaziland	35,264	[r]30,145	26,287	25,832	26,000
Taiwan	2,317	2,392	2,819	1,355	1,500
Turkey	3,860	958	1,510	1,499	1,500
U.S.S.R.[e]	2,105,000	2,180,000	2,250,000	2,300,000	2,400,000
United States (sold or used by producers)	75,618	63,515	69,906	57,422	[4]57,457
Yugoslavia	13,591	11,657	10,502	8,556	[4]6,916
Zimbabwe	247,600	194,400	153,000	165,385	165,000
Total	[r]4,349,466	[r]4,036,213	4,178,660	4,105,884	4,111,298

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

[1]Table includes data available through Apr. 29, 1986.

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

[3]Revised to zero.

[4]Reported figure.

TECHNOLOGY

Preliminary laboratory testing for the mutagenicity of surface-treated chrysotile indicated that it was less biologically reactive than untreated chrysotile.[16] The treated chrysotile, which is being developed by Société Nationale de l'Amiante of Quebec, was produced by exposing chrysotile to phosphorus oxychloride and phosphorus pentachloride vapors. Phosphorus compounds were chemically bonded to the chrysotile fiber surface when the gas reacted with the chrysotile. The lower mutagenicity was attributed to the phosphorus compound coating. If a safe form of modified chrysotile is developed, chrysotile could continue to be used commercially. Use of chrysotile rather than asbestos substitutes would be advantageous to industry because the engineering and physical properties of chrysotile are well known and existing technology could continue to be used. The use of substitute materials would require some modification to current industrial production processes and possibly require the development of new products. The long-term quality of products using substitute materials has not been documented, and long-term health effects also are unknown.

The concentrations of airborne asbestos in ambient environments were determined using transmission electron microscopy.[17] However, ambient asbestos levels determined by this technique varied by several orders of magnitude owing to the lack of standard reference materials (SRM). The National Bureau of Standards (NBS) in cooperation with EPA developed reference materials (RM) and SRM for use in testing, refining, and calibrating sample preparation and analysis procedures. These standards were prepared on polycarbonate filters and consist of chrysotile asbestos fibers mixed with NBS SRM 1648, an urban-air particulate matrix. The RM was typical of a general urban environment with low concentrations of ambient chrysotile. The SRM was representative of an ambient air sample collected near an asbestos source.

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[1]Physical scientist, Division of Industrial Minerals.

[2]Asbestos Information Association News and Notes. May 31, 1985, p. 1.

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