ASBESTOS

By Robert L. Virta

Mr. Virta, a physical scientist with 14 years Bureau of Mines experience, has been the commodity specialist for asbestos since 1986. Domestic survey data were prepared by Michael McTootle, mineral data assistant; and international data tables were prepared by Harold Willis, international data coordinator.

The most noteworthy event within the industry was the enactment of a regulation by the Environmental Protection Agency (EPA), after 3 years of review, that phases out the use of asbestos in most products by 1997. Health and liability issues also continued to adversely affect the industry. The number of firms that produce asbestos-containing products declined dramatically in the past few years in response to these issues. Domestic asbestos consumption decreased 22% from that of 1988, continuing a 16-year decline from 800,962 tons in 1973 to 55,306 tons in 1989. Only two companies in California and Vermont mined asbestos in the United States. Approximately 97% of the asbestos consumed in the United States was imported from Canada. Domestically, asbestos was consumed in roofing products, 34%; friction products, 23%; asbestos-cement pipe, 15%; packing and gaskets, 8%; and other, 20%.

DOMESTIC DATA COVERAGE

Domestic production data for asbestos are developed by the Bureau of Mines by means of a voluntary industry survey. Of the two canvassed operations to which a survey request was sent, both responded, representing 100% of the total production data shown in table 1.

LEGISLATION AND GOVERNMENT PROGRAMS

EPA issued a final rule banning the manufacture, importation, processing, and distribution of most asbestos-containing products on July 12, 1989. The ban will be implemented in three stages. The first stage, effective August 27, 1990, bans asbestos-containing flooring and roofing felt, pipeline wrap, asbestos-cement corrugated and flat sheet, vinyl asbestos floor tile, and asbestos clothing. The second stage, effective August 25, 1993, bans asbestos-containing gaskets, transmission components, and original equipment drum and disk brake components. The third stage, effective August 26, 1996, bans asbestos-cement pipe, commercial and corrugated asbestos paper, roll board and mill board, asbestos-cement shingle, asbestos-containing roof and non-roof coatings, brake blocks, and after-market drum and disk brake components. The sale and distribution of asbestos-containing products, product labeling, exemptions from the ban, and record keeping are covered by provisions in the regulation.[1] The Asbestos Information Association of North America, Asbestos-Cement Pipe Producers Association, the Asbestos Institute, and several other organizations have petitioned the courts to review the EPA ban.

TABLE 1

SALIENT ASBESTOS STATISTICS

		1985	1986	1987	1988	1989
United States:						
Production (sales):						
Quantity	metric tons	57,457	51,437	50,600	18,233	17,427
Value[1]	thousands	$20,485	$17,367	$17,198	W	W
Exports and reexports (unmanufactured):						
Quantity	metric tons	45,656	47,281	60,084	31,544	27,004
Value	thousands	$16,489	$14,520	$16,149	$8,468	$7,690
Exports and reexports of asbestos products:						
Value	do.	$193,765	$163,896	$180,602	$194,858	$153,081
Imports for consumption (unmanufactured):						
Quantity	metric tons	142,431	108,352	93,763	85,326	55,306
Value	thousands	$44,093	$26,537	$22,022	$21,528	$14,031
Consumption, apparent[2]	metric tons	162,000	119,627	84,279	71,354	e55,306
World: Production	do.	r4,248,988	r4,032,213	4,227,662	p4,322,805	e4,325,487

e Estimated. p Preliminary. r Revised. W Withheld to avoid disclosing company proprietary data.
[1] F.o.b. mine.
[2] Production, plus imports, minus exports, plus adjustments in Government and industry stocks.

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The Mine Safety and Health Administration issued proposed revisions to its existing standards for air quality and chemical substances, including the lowering of permissible exposure levels to asbestos from 2.0 fibers per cubic centimeter (f/cc) to 0.2 f/cc.[2] The Occupational Safety and Health Administration extended an administrative stay through November 30, 1990, on the regulation governing exposure to the nonasbestiform varieties of actinolite, anthophyllite, and tremolite and continued to study the economic impact of the regulation on the mining and construction industries.[3]

EPA proposed changes in the national emission standard for hazardous air pollutants. The proposed revisions require daily monitoring of visible emissions for milling, manufacturing, and fabricating operations, weekly inspection of air-cleaning devices, and record keeping. Notification requirements for demolitions and renovations are revised and record keeping is required for asbestos waste disposal.[4]

EPA proposed changes in the national primary and secondary drinking water regulations. The proposal covers 30 organic chemicals and 8 inorganic chemicals, including asbestos. The proposed maximum contaminant level goal for asbestos is 7 million fibers (longer than 10 micrometers) per liter.[5]

STRATEGIC CONSIDERATIONS

A wide variety of asbestos-containing civilian products also have military applications. Examples include friction materials (brakes and clutches), electrical and thermal insulations, packings and gaskets, asbestos-reinforced plastics, etc. for use on military vehicles, ships, rockets, missiles, and in military construction. During World War II and the Korean war, strict controls were placed on the export of asbestos because the United States was dependent on foreign sources for about 90% of its requirements of all grades of asbestos. The United States was totally dependent on foreign sources for low-iron, spinning-grade chrysotile. Since that time, equipment components have been redesigned, new products have been introduced, and substitutes for asbestos are being used more frequently.

TABLE 2

STOCKPILE GOALS AND GOVERNMENT INVENTORIES FOR ASBESTOS, DECEMBER 31

(Metric tons)

	Stockpile goals	Total inventories		
		1987	1988	1989
Amosite	15,422	30,849	30,849	30,849
Chrysotile	2,722	9,709	9,710	9,710
Crocidolite	—	33	33	33
Total	18,144	40,591	40,592	40,592

Source: Department of Defense.

Many of the asbestos-containing civilian products that are used by the military will be eliminated because of the EPA-mandated phaseout of asbestos. Because of the trend toward lower asbestos consumption, the Department of Defense has authorized the disposal of 6,155 tons of chrysotile, 15,427 tons of amosite, and 33 tons of crocidolite and is currently considering the removal of these materials from the stockpile of strategic and critical minerals.

ISSUES

Environmental and liability issues continue to affect the asbestos industry. EPA enacted a regulation that phases out the use of asbestos in most products by 1997 because of concerns over the risks of low-level exposures. The regulation is controversial because it assumes that there is no threshold level of exposure to asbestos beyond which there is no risk. Industry representatives maintain that there are insufficient data available to support this assumption, that environmental risks posed by asbestos are far less than many of those encountered in everyday living, and that stricter control of asbestos can reduce the risks even further.

PRODUCTION

Asbestos was produced in the United States by two companies, KCAC Inc., San Benito County, CA, and Vermont Asbestos Group Inc. (VAG), Orleans County, VT. Domestic production was limited to chrysotile, one of six commercial varieties of asbestos. KCAC operated a mine in a highly sheared serpentinite composed of matted short fiber chrysotile and unfractured serpentinite (also referred to as a mass fiber deposit). The ore was stripped and wet processing was used to beneficiate the fiber. VAG operated an open pit mine in a serpentinite containing cross-fiber veins of chrysotile. Dry milling was used to process the fiber. While the California company produced only short fiber chrysotile, the Vermont company produced a wide range of chrysotile grades.

Domestic production decreased slightly in 1989. The two domestic producers were able to maintain production levels despite the EPA ban and phaseout because export markets remained strong.

CONSUMPTION AND USES

Asbestos was used in a wide variety of products because of its high tensile strength, chemical and thermal stability, high flexibility, low electrical conductivity, and large surface area. Products made from asbestos were more heat resistant (and often incombustible), more resistant to chemical attack (particularly for alkalis), stronger (asbestos acted as a physical reinforcer), less conductive (asbestos had a low dielectric constant), more viscose (asbestos stiffened compounds and coatings), faster setting (asbestos hastened water drainage in asbestos-cement pipe production), and more cost efficient than many nonasbestos products.

U.S. consumption of asbestos decreased 22% in 1989. Approximately 93% of the asbestos consumed domes-

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TABLE 3

U.S. ASBESTOS CONSUMPTION, BY END USE, GRADE, AND TYPE

(Thousand metric tons)

End use	Chrysotile[1]							Amosite	Crocidolite	Other[3]	Total asbestos[4]
	Grade 1 and 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Total[2]				
1988	—	0.4	7.6	5.1	5.4	46.4	65.0	—	1.3	5.1	66.2
1989:											
Asbestos-cement pipe	—	([5])	5.1	1.2	1.0	—	7.3	—	.6	—	7.9
Asbestos-cement sheet	—	—	—	—	1.6	1.4	3.0	—	—	—	3.0
Coatings and compounds	—	—	([5])	—	—	4.3	4.3	—	—	—	4.3
Flooring products	—	—	—	—	—	—	—	—	—	—	—
Friction products	—	—	—	1.6	.6	9.9	12.1	—	—	—	12.1
Insulation:											
Electrical	—	—	—	—	—	—	—	—	—	—	—
Thermal	—	—	—	—	—	—	—	—	—	—	—
Packing and gaskets	—	—	.1	.9	.2	3.1	4.3	—	—	—	4.3
Paper	—	—	—	—	—	1.0	1.0	—	—	—	1.0
Plastics	—	—	—	—	—	.5	.5	—	—	—	.5
Roofing products	—	—	—	—	—	17.5	17.5	—	—	—	17.5
Textiles	0.1	—	—	—	—	—	.1	—	—	—	.1
Other	—	.1	.5	([5])	—	.7	1.3	—	—	—	1.3
Total[2]	.1	.1	5.7	3.8	3.4	38.3	51.5	([5])	.6	3.2	52.1

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

tically was chrysotile, 1% was crocidolite, less than 1% was amosite, and 6% was an unspecified fiber type. Approximately 74% of the chrysotile consumed in the United States was grade 7, followed by grades 4, 5, 6, 3, 2, and 1.

The construction industry is the major consumer of asbestos fiber in the form of asbestos cement pipe, asbestos cement sheet, coatings, compounds, packings, and roofing products. These end uses accounted for 71% of the asbestos consumed in the United States.

Consumption has declined dramatically from 800,962 tons in 1973 to 55,306 tons in 1989 in response to environmental and liability issues. There is a continuing interest among manufacturers of both organic and inorganic fibers in acquiring portions of the asbestos market. Product manufacturers gradually have been replacing asbestos with substitute materials, redesigning old products to eliminate the need for asbestos, or designing new products which require neither asbestos nor asbestos substitutes. Economic, manufacturing, performance, and/or technical difficulties were considered before asbestos was replaced by a substitute material or product.

Examples of materials substituted for asbestos include aramid fiber, calcium silicate, carbon fiber, cellulose fibers, ceramic fiber, clay, fibrous glass, fumed silica powder, graphite flake and fiber, limestone, mica, polyacrylonitrile fiber, polybenzimidazole fiber, polyethylene fiber, polypropylene fiber, polytetrafluoroethylene fiber, steel fibers, talc, and wollastonite. Examples of alternative products include aluminum, vinyl, and wood siding; aluminum pipe and sheet; asphalt coatings; ductile iron pipe; fiberglass sheet; polyvinylchloride pipe; prestressed concrete and reinforced concrete pipe; semimetallic brakes; urethane coatings; and vinyl composition floors.

PRICES

The average unit value of domestically produced asbestos increased slightly in 1989. Unit values for imported asbestos ranged from $141 per ton to $3,728 per ton and averaged $234 per ton. Unit values for exported asbestos ranged from $128 per ton to $2,158 per ton and averaged $285 per ton. Customs unit values of imported crude chrysotile decreased 74% because high valued crude chrysotile from Zimbabwe was not imported under this import category in 1989. The unit value of imported spinning chrysotile decreased 49% because the change to the Harmonized System for import reporting resulted in the inclusion of lower valued chrysotile fiber in the "chrysotile, spinning" category.

FOREIGN TRADE

Beginning in 1989, the Bureau of the Census adopted the Harmonized System for reporting commodity imports and exports. Asbestos import categories under the Harmonized System were unchanged from those of previous years.

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TABLE 4

CUSTOMS UNIT VALUES OF IMPORTED ASBESTOS

(Dollars per metric ton)

	1985	1986	1987	1988	1989
Canada:					
Chrysotile:					
Crude	576	547	610	635	167
Spinning	731	507	598	756	387
Other	283	229	218	227	227
South Africa, Republic of:					
Amosite	830	—	—	—	3,728
Crocidolite	569	582	572	609	631

Source: Bureau of the Census.

Asbestos export categories under the Harmonized System were considerably different from those of previous years. Export categories that were used prior to 1989 overlap under the Harmonized System and many of the Harmonized System categories were not exclusive for asbestos (i.e., included cellulose pipe and sheet and nonasbestos friction materials).

The total value of asbestos fibers and asbestos products exported and reexported from the United States was $160,771,000. This is a 21% decrease from 1988 and reflects a lower volume of asbestos and asbestos products being exported in 1989. Exports and reexports of brake linings and disk pads accounted for 83% of the value of all manufactured asbestos products. Canada remained the largest importer of unmanufactured fibers and manufactured products, followed by Japan, Mexico, Brazil, and the United Kingdom.

Canada provided 97% of the asbestos imported into the United States, and the Republic of South Africa provided 2%. Several other countries provided minor amounts. Approximately 93% of the asbestos fiber imports were chrysotile.

WORLD REVIEW

Canada continued to be the largest market-economy producer of asbestos, followed by Brazil, the Republic of South Africa, and Italy. The U.S.S.R. was the world's largest producer of asbestos. Canada and the U.S.S.R. accounted for 77% of the world production. Canada continued to be the largest exporter of asbestos.

Capacity

The data in table 8 are rated annual capacity for mines and refineries as of December 31, 1989. Rated capacity is defined as the maximum quantity of product that can be produced in a period of time on a normally sustainable long-term operating rate, based on the physical equipment of the plant, and given acceptable routine operating procedures involving labor, energy, materials, and maintenance. Capacity includes both operating plants and plants

TABLE 5

COUNTRIES IMPORTING U.S. ASBESTOS FIBERS AND PRODUCTS

(Thousand dollars)

Country	1988			1989		
	Unmanufactured fiber	Manufactured products	Total[1]	Unmanufactured fiber	Manufactured products	Total[1]
Australia	9	2,285	2,294	18	1,734	1,752
Brazil	656	4,662	5,317	785	4,203	4,988
Canada	694	144,305	144,999	884	98,974	99,859
Germany, Federal Republic of	228	2,316	2,544	93	3,801	3,894
Japan	3,312	8,538	11,850	3,314	7,211	10,526
Korea, Republic of	182	1,266	1,448	145	953	1,097
Kuwait	—	456	456	—	574	574
Mexico	1,636	7,677	9,313	370	5,797	6,166
Saudi Arabia	—	1,814	1,814	105	1,394	1,499
Thailand	150	757	908	10	167	177
Turkey	—	706	706	—	304	304
United Kingdom	97	2,127	2,224	75	4,841	4,916
Venezuela	106	1,805	1,912	50	709	759
Other	1,399	16,143	17,542	1,841	22,417	24,259
Total[1]	8,468	194,858	203,326	7,690	153,081	160,771

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

Source: Bureau of the Census.

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TABLE 6

U.S. EXPORTS AND REEXPORTS OF ASBESTOS AND ASBESTOS PRODUCTS

Products		Quantity	Value (thousands)
1988:			
Unmanufactured:			
Crudes, fibers, stucco	metric tons	26,356	$6,785
Sand and refuse	do.	5,188	1,683
Total	do.	31,544	8,468
Manufactured:			
Asbestos fibers	do.	1,394	5,431
Brake linings	do.	NA	140,186
Clutch facings and linings	number	NA	27,094
Gaskets	metric tons	536	2,244
Insulation	do.	NA	4,558
Packing and seals	do.	641	5,793
Shingles and clapboard	do.	1,095	662
Other articles of asbestos	do.	1,609	2,133
Other articles, n.s.p.f	do.	NA	6,757
Total		XX	194,858
1989:			
Unmanufactured:			
Asbestos[1]	do.	27,004	7,690
Manufactured:			
Asbestos fibers	do.	103,526	382
Brake linings and disk brake pads[2]		NA	127,182
Clutch facings and linings[3]	metric tons	NA	3,868
Clothing, cord, fabric, and yarn		NA	1,363
Gaskets, packing, and seals	metric tons	NA	6,206
Panel, sheet, title, and tube[4]	do.	NA	4,773
Paper and millboard		NA	1,188
Other articles[5]		NA	8,119
Total		XX	153,081

NA Not available. XX Not applicable.
[1] Includes crudes, fibers, stucco, sand, refuse.
[2] Includes asbestos and cellulose fiber brakes and similar materials.
[3] Includes clutches and other friction materials, excluding brakes and brake pads.
[4] Includes asbestos-cement and cellulose fiber cement products.
[5] Includes asbestos and cellulose fiber products.

temporarily closed that in the judgment of the author can be brought into production within a short period of time with minimum capital expenditure.

Canada

Developmental work continued on the underground portion of Cassiar Mining Co.'s McDame asbestos mine in British Columbia. The mine is expected to become operational in March 1990. Reserves in the open pit are sufficient to continue operation through late 1990.[6]

South America

Swiss Eternit Group (SEG) planned to divest itself of asbestos cement operations in Brazil, Colombia, and Bolivia and its holdings in SA Mineracao de Amianto (SAMA), a chrysotile operation in Brazil. SEG will begin to focus on the use of asbestos substitutes.[7]

CURRENT RESEARCH

Fifteen fiber-cement products that are used commercially in place of asbestos-cement products were tested for accelerated absorption, aging, color stability, combustion, density, flexural strength, humidity, impact resistance, porosity, thermal conductivity, warping, and the degree to which a product was waterproof. The fiber-cement products tested performed exceedingly well in the impact resistance test and poorly in the combustibility tests. Mixed results were obtained for the other tests. The study concluded that the overall performance of asbestos-cement products exceeded that of the fiber-cement products.[8]

The Asbestos Information Association (AIA) compiled the results of its third survey of worker exposure to asbestos. Surveys were sent to 32 countries and 26 responded. The survey covered 45,696 workers in mining (30%), asbestos-cement production (39%), friction materials production (22%), textile production (5%), and other asbestos industries (4%). Less than 2% of the workers covered in the survey were exposed to concentrations of more than 2 f/cc. Over 90% were exposed to concentrations of less than 1 f/cc. The bulk of the exposures over 2 f/cc were in the textile industries.[9]

OUTLOOK

Domestic markets will continue to decline because of the EPA ban and phaseout of asbestos and consumer demand for asbestos substitutes. Asbestos mining was not banned under the new EPA regulation so domestic producers will be able to continue to export asbestos fiber. Foreign markets for asbestos fiber should remain strong for several years because of the high demand in Southeast Asian and developing countries for proven, low-cost construction materials.

The prospects for the domestic asbestos manufacturing industry are poor because of the EPA mandated phaseout of most uses of asbestos within 7 years. Asbestos consumption probably would continue to decline even if the EPA ban and phaseout of asbestos were rescinded in favor of stricter regulations because of the continuing concern over environmental, health, and liability issues.

[1] Federal Register. Environmental Protection Agency. Asbestos: Manufacture, Importation, Processing, and Distribution in Commerce Prohibitions; Final Rule. V. 54, No. 132, July 12, 1989, pp. 29460-29513.

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[2] Federal Register. Mine Safety and Health Administration. Air Quality, Chemical Substances, and Respiratory Protection Standards. V. 54, No. 166, Aug. 29, 1989, pp. 35760–35852; V. 54, No. 201, Oct. 19, 1989, p. 43026.

[3] ———. Occupational Safety and Health Administration. Occupational Exposure to Asbestos, Tremolite, Anthophyllite, and Actinolite. V. 54, No. 139, July 21, 1989, pp. 30704–30705.

[4] ———. Environmental Protection Agency. Asbestos NESHAP Revision, Including Disposal of Asbestos Containing Materials Removed from Schools. V. 54, No. 6, Jan. 10, 1989, pp. 912–937.

[5] Federal Register. Environmental Protection Agency. National Primary and Secondary Drinking Water Regulations. V. 54, No. 97, May 22, 1989, pp. 22062–22160.

[6] Mining Journal. McDame Schedule for Cassiar. V. 312, No. 8004, Jan. 27, 1989, p. 61.

[7] Industrial Minerals. Swiss Eternit Plans Asbestos Exit. No. 258, Mar. 1989, pp. 12–13.

[8] Asbestos. Comparative Study of Fiber-Cement Products. V. 4, No. 1, June 1989, p. 6.

[9] Asbestos. An International Dust Exposure Survey. V. 3, No. 4, Mar. 1989, pp. 2–3.

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TABLE 7

U.S. IMPORTS FOR CONSUMPTION OF ASBESTOS FIBERS, BY TYPE, ORIGIN, AND VALUE

Type	Canada		South Africa, Republic of		Other		Total[1]	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
1987	90,224	$20,096	3,246	$1,788	293	$137	93,763	$22,022
1988:								
Chrysotile:								
Crude	20	2	—	—	17	21	37	23
Spinning fibers	526	358	—	—	75	97	601	455
All other	77,779	17,421	488	273	61	73	78,328	17,767
Crocidolite (blue)	—	—	1,252	763	—	—	1,252	763
Other (unspecified asbestos type)	1,365	555	2,548	1,480	1,195	484	5,108	2,520
Total[1]	79,690	18,336	4,288	2,516	1,348	676	85,326	21,528
1989:								
Amosite	—	—	—	—	2	7	2	7
Chrysotile:								
Crude	205	34	—	—	—	—	205	34
Spinning fibers	5,214	1,877	39	46	130	161	5,383	2,084
All other	45,816	10,378	—	—	110	56	45,926	10,433
Crocidolite (blue)	19	16	574	359	—	—	593	374
Other (unspecified asbestos type)	2,318	656	427	224	452	218	3,197	1,098
Total[1]	53,572	12,961	1,040	628	694	442	55,306	14,031

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

Source: Bureau of the Census.

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TABLE 8

WORLD ASBESTOS ANNUAL PRODUCTION CAPACITY, DECEMBER 31, 1989

	Rated capacity [1] (thousand metric tons)
Chrysotile:	
North America:	
Canada	780
United States	30
Total	810
South America:	
Brazil	250
Colombia	20
Other	1
Total	271
Europe:	
Greece	100
Italy	150
U.S.S.R.	2,800
Yugoslavia	20
Total	3,070
Africa:	
South Africa, Republic of	150
Swaziland	30
Zimbabwe	250
Total	430
Asia:	
China	170
Cyprus	35
India	30
Japan	4
Korea, Republic of	5
Turkey	6
Other	(2)
Total	250
World chrysotile total	4,831
Crocidolite:	
South Africa, Republic of	210
Amosite:	
South Africa, Republic of	110

[1] Includes capacity at operating plants as well as at plants on standby basis.
[2] Less than 1/2 unit.

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TABLE 9

ASBESTOS: WORLD PRODUCTION, BY COUNTRY[1]

(Metric tons)

Country[2]	1985	1986	1987	1988[p]	1989[e]
Argentina	1,244	1,697	332	2,328	2,100
Brazil[3]	165,446	204,460	212,807	227,653	230,000
Bulgaria	400	300	400	[e]400	400
Canada (shipments)	750,190	662,381	664,546	704,989	709,800
China	150,000	150,712	144,673	157,478	160,000
Colombia	12,435	12,916	13,272	[r e]10,500	10,500
Cyprus	16,360	13,011	18,070	14,585	—
Egypt	229	476	209	166	160
Greece	46,811	51,355	63,000	[e]80,000	80,000
India	30,183	25,236	29,110	31,303	32,000
Indonesia	([4])	([4])	([4])	([4])	—
Iran (concentrate)[e]	2,500	3,000	3,300	3,000	3,000
Italy	136,006	115,208	100,834	94,549	94,500
Japan	2,971	3,593	3,143	[r e]3,000	3,000
Korea, Republic of	4,703	2,983	2,518	2,428	2,500
Mozambique	55	—	—	—	—
South Africa, Republic of	164,247	138,862	135,074	145,678	150,000
Swaziland	25,130	20,908	25,925	22,804	23,000
Taiwan	625	—	—	—	—
Turkey	[e]1,500	1,098	360	[e]100	100
U.S.S.R.[e]	2,500,000	2,400,000	[5]2,554,600	2,600,000	2,600,000
United States (sold or used by producers)	57,457	51,437	50,600	18,233	[5]17,427
Yugoslavia	6,916	8,596	10,964	17,030	17,000
Zimbabwe	173,580	163,984	193,925	186,581	190,000
Total	[r]4,248,988	[r]4,032,213	4,227,662	4,322,805	4,325,487

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

[1] Table includes data available through Apr. 13, 1990.

[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] Excludes direct sales of run-of-mine material, in metric tons, as follows: 1985—887; 1986—2,060; 1987—2,000 (estimated); 1988—2,000 (estimated); and 1989—2,000 (estimated).

[4] Revised to zero.

[5] Reported figure.

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