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2016 Minerals Yearbook

ASBESTOS [ADVANCE RELEASE]

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Asbestos

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The last company that mined asbestos in the United States ceased operations in 2002; domestic consumers have since been wholly dependent on imports to meet manufacturing needs. In 2016, U.S. apparent consumption of unmanufactured asbestos increased for the first time since 2011 to 702 metric tons (t), less than 0.1% of peak consumption in the early 1970s (fig. 1), but actual consumption may have been lower owing to stockpiling by companies. Global asbestos production was 1.28 million metric tons (Mt), slightly less than revised 1.31 Mt in 2015 (table 1).

Asbestos, an industry term rather than a mineralogical term, is the generic name applied to a subset of silicate minerals that consist of bundles of separable fibers with high length-to-width ratios. The six asbestos types with a history of use in commercial products are the amphibole minerals actinolite, amosite, anthophyllite, crocidolite, and tremolite, as well as chrysotile, the asbestiform variety of serpentine. Chrysotile accounted for more than 93%, by weight, of global asbestos production from 1900 to 2000, followed by crocidolite, amosite, and anthophyllite. Actinolite and tremolite have never been widely produced or used. Other forms of amphibole asbestos also occur in nature but have no commercial applications (Virta, 2006, p. 195, 197).

U.S. consumption of asbestos was minimal during the late 1800s, when primary uses were fireproof garments, insulation and packing for steam locomotive and other boiler systems, and paper and millboard for fireproofing and heat insulation (Bowles, 1937, p. 8–10). Expansion of the automotive and construction industries during the early 20th century provided ready markets for asbestos, and demand for asbestos-containing items such as brake shoes and clutches, cement, flooring, packings and gaskets, and thermal and electrical insulation grew rapidly. Apparent consumption of asbestos in the United States increased from 20,400 t in 1900 (estimated) to 153,000 t in 1920 and 660,000 t in 1950 (fig. 1). Consumption continued to increase with the expansion of the U.S. economy following World War II and reached an alltime high of 803,000 t in 1973 (Virta, 2003, p. 3, 28–30). Asbestos was widely used in a variety of products because it is relatively inexpensive; resists corrosion, fire, and wear; has high mechanical strength; serves as a thermal and electrical insulator; and is flexible enough to be spun and woven. The United States dominated global consumption of asbestos for most of the 20th century, accounting for as much as 83% of the worldwide total in 1920 and averaging 48% from 1920 through 1960. The Soviet Union surpassed the United States as the leading global asbestos consumer in 1970, and the United States remained one of the top five worldwide consumers until the late 1980s (Virta, 2003, p. 36–56).

Domestic and overseas markets began to contract during the early 1970s, when the first of numerous bans on asbestos products in the United States and abroad went into effect in response to health and liability issues associated with asbestos use. By 2000, domestic consumption decreased to 14,600 t, similar to late-19th-century levels (Virta, 2003, p. 30). Most U.S. manufacturers had halted production of asbestos-containing products, begun using asbestos substitutes, and (or) replaced asbestos-containing products with ones that did not contain asbestos.

Legislation and Government Programs

The Frank R. Lautenberg Chemical Safety for the 21st Century Act, which amended the Toxic Substances Control Act of 1976, was signed into law during 2016. The legislation granted the U.S. Environmental Protection Agency (EPA) greater authority to evaluate the risks to human health and the environment posed by new chemicals as well as those already in the marketplace. In November, the EPA announced that asbestos would be one of the first chemicals reviewed with an evaluation that must be completed within 3 years of initiation. If the EPA determines that asbestos presents an unreasonable risk, it will be required to take mitigating actions (U.S. Environmental Protection Agency, 2016).

Consumption

Consumption of unmanufactured asbestos fiber has generally decreased in each year since 1974 but, in 2016, consumption increased to 702 t—less than 0.1% of peak consumption in 1973—from 386 t in 2015. The chloralkali industry, which uses asbestos to manufacture semipermeable diaphragms that separate chlorine generated in electrolytic cells from the starting brine, accounted for an estimated 667 t (95%) of domestic asbestos consumption (table 2). Nearly 25% of U.S. asbestos imports in 2016 were shipped in December after the EPA announced that asbestos would be one of the first chemicals reviewed under the Frank R. Lautenberg Chemical Safety for the 21st Century Act, suggesting that chloralkali companies may be stockpiling asbestos in anticipation of future restrictions on its use. As a result, actual consumption in 2016 may have been lower than 702 t, but information regarding industry stocks was unavailable. The proportion of asbestos used by the chloralkali industry increased over the past several years, rising from an estimated 35% of consumption in 2010 as other end uses declined (Virta, 2011, 2014; Flanagan, 2016). Insufficient data were available to reliably identify other markets for asbestos fiber in 2016, but many industrial applications in the United States have ceased since the first domestic ban on asbestos-containing products was implemented in 1973. In 2000, U.S. asbestos was principally sold for roofing products (62% of the market), gaskets (21%), and friction products (12%), whereas near peak consumption in 1972, the major uses were vinyl asbestos tile and sheet flooring (31%), asbestos-cement pipe (27%), roofing (10%), packing and gaskets (9%), friction products (brakes and clutches) (8%), and insulation (6%) (Clifton, 1975; Virta, 2002).

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Prices

The average U.S. customs unit value for all grades of imported asbestos fiber decreased slightly to $2,040 per metric ton in 2016 from $2,090 per metric ton in 2015. Unit values of individual fiber grades were as follows: grade 3, $2,010 per metric ton; grades 4 and 5, $2,040 per metric ton; and unspecified fiber grades, $2,730 per metric ton (table 5). From grade 1 through grade 7, the length of asbestos fibers decreases, and the degree of processing increases.

Foreign Trade

In 2016, the United States imported 702 t of chrysotile valued at $1.43 million compared with 386 t valued at $808,000 in 2015 (table 5). Additional imports were reported in each year by the U.S. Census Bureau, but information from a commercial trade database suggests that some of the shipments were misclassified (IHS Inc., 2017). All asbestos mineral imports originated from Brazil (98%) and Russia (2%). The United States also imported an unknown quantity of asbestos within manufactured products; the total value of these items was $7.66 million, an increase of 65% from $4.64 million of asbestos product imports in 2015 (tables 1, 6). Some nonasbestos articles likely were imported under the Harmonized Tariff Schedule of the United States codes for products that contain asbestos based on reported imports from countries that have banned asbestos use.

Reported exports of unmanufactured asbestos fiber totaled 587 t with a free alongside ship value of $116,000 in 2016 compared with 517 t valued at $116,000 during 2015 (table 4). However, these shipments were likely waste material or improperly classified as asbestos because asbestos has not been mined domestically since 2002. The United States exported and reexported $35.4 million of manufactured asbestos products in 2016, a 36% increase from $26.1 million (table 3). Many reported export destinations have banned the use of asbestos and asbestos products, indicating that shipments to these countries likely were misclassified.

Friction products (including brake linings, clutch linings, and disk pads) accounted for 23% of the value of manufactured asbestos-containing products exported from the United States in 2016, followed by gaskets, packing, and seals with 17% (table 4). Little or no asbestos board, asbestos friction components, asbestos gaskets and packings, asbestos insulating paper, and asbestos-cement products have been produced in the United States for many years. Shipments reported under these categories may have been reexports and (or) exports of products that were similar but did not contain asbestos.

World Review

Estimates of global unmanufactured asbestos consumption are presented in table 7. The estimates for 2016 are preliminary because data for many countries were either unavailable or based on incomplete information at the time of compilation. Apparent consumption was calculated as production plus imports minus exports; data regarding changes in industry and Government stocks were not available and thus were not considered. In 2015, apparent world consumption of asbestos declined by 12% to 1.35 Mt from 1.54 Mt in 2014. Decreases in consumption of more than 10,000 t took place in China, Kazakhstan, Russia, and Uzbekistan, whereas consumption in Indonesia increased by more than 10,000 t. India was the leading consumer of asbestos, followed by China, Brazil, Russia, Indonesia, Vietnam, Uzbekistan, Thailand, Sri Lanka, and Mexico; these 10 countries collectively accounted for 94% of the estimated worldwide asbestos consumption. Based on preliminary data, global apparent consumption in 2016 was 1.37 Mt.

World production of asbestos fiber in 2016 totaled 1.28 Mt, slightly less than that in 2015. Russia was the leading producer and accounted for greater than 50% of global output; Brazil, China, and Kazakhstan each produced about 16% of the global total. Production of asbestos in Russia from 2013 to 2015 was revised significantly downward based on information from an industry market research report (Sitdikova, 2016) and new data reported to the U.S. Geological Survey. From 2012 through 2016, output from Russia decreased by 344,000 t, or 33% (table 8).

Several countries announced asbestos bans in 2016 that will take effect over the next several years. Canada will ban the manufacture, import, and export of asbestos by 2018 (Goffin, 2016); the European Union will phase out use of asbestos in electrolysis diaphragms by 2025 (TÜV SÜD, 2016); and Sri Lanka will prohibit the import of asbestos in 2018 and the manufacture of asbestos-containing products in 2024 (Colombo Gazette, 2016). However, the bans are unlikely to significantly affect global consumption of mineral asbestos because these countries represented only 3% of worldwide consumption in 2015 (table 7).

Outlook

Domestic use of unmanufactured asbestos fiber has steadily decreased since the 1970s and will likely continue to decrease as alternative materials and new technologies displace it from the few remaining markets. Chloralkali production accounts for nearly all of the U.S. consumption, and imports of asbestos by this industry likely will decline over the long term as companies adopt asbestos-free cell membrane technology. Globally, asbestos-cement products (primarily corrugated sheets for roofing) are expected to continue as the leading market for asbestos. World production and consumption may decline slightly in coming years as additional asbestos bans are enacted.

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TABLE 1
SALIENT ASBESTOS STATISTICS[1]

		2012	2013	2014	2015	2016
United States:						
Exports and reexports:						
Unmanufactured:[2]						
Quantity	metric tons	47	27	279	517	587
Value[3]	thousands	$69	$48	$54	$116	$116
Asbestos products, value[3, 4]	do.	$26,400	$33,300	$29,800	$26,100 r	$35,400
Imports for consumption:						
Unmanufactured:[5]						
Quantity	metric tons	1,610	772	406	386 r	702
Value[6]	thousands	$2,520	$1,160	$741	$808 r	$1,430
Asbestos products, value[4, 6]	do.	$6,090	$4,940	$5,630	$4,640	$7,660
Consumption, apparent[7]	metric tons	1,020	772	406	386 r	702
World, production	do.	1,900,000 r	1,630,000 r	1,510,000 r	1,310,000 r	1,280,000

rRevised. do. Ditto.
[1]Includes data available through May 17, 2017. Data are rounded to no more than three significant digits.
[2]May include nonasbestos materials and (or) exports of crudes, fibers, stucco, sand, and refuse. Asbestos is no longer mined in the United States.
[3]Free alongside ship value.
[4]May include nonasbestos products.
[5]Additional imports were reported by the U.S. Census Bureau for some years, but bill of lading information from a commercial trade database suggests that some of the shipments were misclassified.
[6]U.S. customs declared value.
[7]Consumption assumed to equal imports, except in 2012, when an estimated 590 metric tons of asbestos was put into company stockpiles for future use. A significant quantity of asbestos may have been added to company stockpiles in 2016, but information to make a reliable estimate was unavailable.

TABLE 2
U.S. ASBESTOS CONSUMPTION BY END USE, GRADE, AND TYPE[1, 2, 3]

(Metric tons)

	Chrysotile			
End use	Grade 3	Grades 4, 5	Unspecified grade	Total
2015:				
Chloralkali industry	286	85	--	386
Other	--	--	--	--
Total	286	85	--	386
2016:				
Chloralkali industry	281	375	11	667
Other	--	35	--	35
Total	281	410	46	702

-- Zero.
[1]Includes data available through May 17, 2017. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Estimated end-use distribution based on import data and industry trends.
[3]Consumption assumed to equal imports. A significant quantity of asbestos may have been added to company stockpiles in 2016, but information to make a reliable estimate was unavailable.

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TABLE 3
VALUE OF U.S. EXPORTS AND REEXPORTS OF UNMANUFACTURED ASBESTOS FIBERS AND ASBESTOS-BASED PRODUCTS, BY COUNTRY[1, 2]

(Thousand dollars)

	2015			2016		
Country	Unmanufactured fiber[3]	Manufactured products	Total	Unmanufactured fiber[3]	Manufactured products	Total
Australia[4]	3	40	43	4	97	101
Brazil	--	86	86	--	325	325
Canada	4	2,610 r	2,620 r	--	2,100	2,100
China[5]	--	981 r	981 r	--	3,260	3,260
Colombia	--	345	345	--	642	642
Dominican Republic	--	369	369	--	2,520	2,520
El Salvador	--	848	848	--	1,940	1,940
France[4]	--	--	--	--	46	46
Germany[4]	--	111	111	--	31	31
Guatemala	--	401	401	--	704	704
Italy[4]	--	83	83	--	74	74
Japan[4]	--	258	258	--	540	540
Korea, Republic of[4]	--	3,920	3,920	--	1,680	1,680
Mexico	14	4,370	4,380 r	84	5,390	5,480
Netherlands[4]	--	61	61	--	52	52
Philippines	--	4,190	4,190	--	10	10
Sierra Leone	--	733	733	--	473	473
United Arab Emirates	--	294	294	--	1,730	1,730
United Kingdom[4]	4	1,620	1,630	--	8,850	8,850
Venezuela	88	999	1,090	--	89	89
Other[4]	4	3,750 r	3,760 r	29	4,850	4,880
Total	116	26,100 r	26,200 r	116	35,400	35,500

rRevised. -- Zero.
[1]Includes data available through May 17, 2017. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Free alongside ship value.
[3]May include nonasbestos materials and (or) exports of crudes, fibers, stucco, sand, and refuse. Asbestos is no longer mined in the United States.
[4]Destination country has banned the use of asbestos. Data may include some nonasbestos products.
[5]Includes Hong Kong.

Source: U.S. Census Bureau.

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TABLE 4
U.S. EXPORTS AND REEXPORTS OF UNMANUFACTURED ASBESTOS FIBERS AND ASBESTOS-BASED PRODUCTS, BY PRODUCT[1]

Product	2015 Quantity[2] (metric tons)	2015 Value[3] (thousands)	2016 Quantity[2] (metric tons)	2016 Value[3] (thousands)
Unmanufactured, asbestos[4]	517	$116	587	$116
Manufactured:				
Cement products[5]	70	219	66	294
Friction products[6]	NA	8,480 r	NA	8,180
Gaskets, packing, and seals	149	4,020	559	5,940
Paper and millboard	NA	339	NA	1,990
Other articles[7]	1,500	13,000	2,080	19,000
Total	1,720	26,100 r	2,710	35,400

rRevised. NA Not available.
[1]Includes data available through May 17, 2017. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]For manufactured products, the quantity is the gross weight and represents the minimum quantity because data for some countries are not available.
[3]Free alongside ship value.
[4]May include nonasbestos materials and (or) exports of crudes, fibers, stucco, sand, and refuse. Asbestos is no longer mined in the United States.
[5]May include cellulose fiber panel, sheet, tile, and tube-cement products because asbestos-cement products are not manufactured in the United States.
[6]May include some nonasbestos brake and clutch shipments.
[7]May include some nonasbestos materials.

Source: U.S. Census Bureau.

TABLE 5
U.S. IMPORTS FOR CONSUMPTION OF ASBESTOS FIBERS, BY TYPE AND ORIGIN[1]

Type	Brazil Quantity (metric tons)	Brazil Value[2] (thousands)	Russia Quantity (metric tons)	Russia Value[2] (thousands)	Total Quantity (metric tons)	Total Value[2] (thousands)
2015:						
Chrysotile:						
Spinning fibers, grade 3	102	$139	--	--	102	$139
Milled, grades 4 and 5	266	633	--	--	266	633
All other	18	36	--	--	18	36
Total	386	808	--	--	386	808
2016:						
Chrysotile:						
Spinning fibers, grade 3	281	566	--	--	281	566
Milled, grades 4 and 5	410	835	--	--	410	835
All other	--	--	11	$30	11	30
Total	691	1,400	11	30	702	1,430

-- Zero.
[1]Includes data available through May 17, 2017. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]U.S. customs declared value.

Source: U.S. Census Bureau; data adjusted by the U.S. Geological Survey.

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TABLE 6
U.S. IMPORTS FOR CONSUMPTION OF MANUFACTURED PRODUCTS WITH BASIS OF ASBESTOS IN 2016[1]

HTS[2] code	Category	Quantity[3] (metric tons)	Value[4]	Major sources[5]	Percent of value[6]
6812.80.1000	Crocidolite footwear[7]	(8)	$2,750	Italy[9]	100%
6812.80.9000	Crocidolite products (except footwear)[7]	178	68,400	China	Do.
6812.91.9000	Clothing (except footwear)[7, 10]	(8)	15,000	Mexico	Do.
6812.92.0000	Paper, millboard, and felt[7, 10]	NA	69,300	Japan,[9] China	Do.
6812.93.0000	Compressed asbestos fiber jointing[7, 10]	NA	47,300	China, India	Do.
6812.99.0002	Yarn and thread[7, 10]	(8)	18,900	Spain,[9] India	Do.
6812.99.0003	Cords and string[7, 10]	(8)	12,000	China	Do.
6812.99.0004	Woven or knitted fabric[7, 10]	(8)	18,300	Italy,[9] United Kingdom[9]	Do.
6812.99.0010	Products for use in civil aircraft[7, 10]	NA	8,430	China, United Kingdom[9]	Do.
6812.99.0020	Gaskets, packing, and seals[7, 10]	16	246,000	Japan,[9] China, Israel[9]	69%
6812.99.0055	Asbestos articles not elsewhere specified[7, 10]	NA	87,700	Canada, Mexico	83%
6813.20.0010	Brake linings and pads, civil aircraft[11]	NA	143,000	France,[9] Mexico, Germany,[9] India	Do.
6813.20.0015	Brake linings and pads, other[11]	NA	1,620,000	China, Germany,[9] Spain[9]	54%
6813.20.0020	Other friction materials, civil aircraft[11]	NA	4,490,000	Japan[9]	99%
6813.20.0025	Other friction materials[11]	NA	820,000	China, Japan[9]	92%
Total		195	7,660,000		

Do. Ditto. NA Not available.
[1]Includes data available through May 17, 2017. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Harmonized Tariff Schedule of the United States.
[3]Gross weight of product; represents the minimum quantity because data for some countries are not available.
[4]U.S. customs declared value.
[5]Countries are listed in decreasing order of value. Includes all countries with a percentage contribution of 10% or more by value.
[6]Percentage contribution of total imports by major import sources.
[7]Articles of fabricated asbestos fibers or of mixtures with a basis of asbestos or with a basis of asbestos and magnesium carbonate.
[8]Less than ½ unit.
[9]Country has imposed a ban on asbestos. Material may have been misclassified as asbestos or transshiped.
[10]Excludes crocidolite products.
[11]Articles with a basis of asbestos, of other mineral substances, or of cellulose, whether or not combined with textile or other materials (containing asbestos).

Source: U.S. Census Bureau.

TABLE 7
ESTIMATED ASBESTOS CONSUMPTION, BY COUNTRY, 2012–16[1, 2, 3, 4]

(Metric tons)

Region	2012	2013	2014	2015	2016[p]
Africa:					
Angola	880	816 [r]	409	326	167
Ghana	1,420 [r]	2,040	451	--	--
Nigeria	1,640 [r]	349	--	35	--
South Africa	1,130 [r]	854	4	1,530	16
Zimbabwe	4,290 [r]	4,360	5,280	1,550	NA
Other	418 [r]	235 [r]	470 [r]	798	NA
Total	9,770 [r]	8,660 [r]	6,610 [r]	4,240	NA
Asia and the Middle East:					
Bangladesh	2,230	8,030	12,100	10,400	11,900
China	431,000 [r]	430,000 [r]	357,000 [r]	287,000	288,000
India	473,000	303,000 [r]	379,000	370,000	308,000
Indonesia	162,000	148,000	109,000	120,000	114,000
Kazakhstan	93,500 [r]	67,200	39,500	11,300	25,200
Korea, North	1,250	611	710	362	577
Kyrgyzstan	7,270 [r]	7,200	5,630	4,450	6,800
Malaysia	8,310 [r]	4,960	3,590 [r]	2,980	2,240
Pakistan	4,430 [r]	3,800	2,300	2,850	2,880
Philippines	1,970	2,650	2,670	1,780	3,110
Russia	319,000 [r]	209,000 [r]	156,000 [r]	124,000	234,000
Sri Lanka	44,300 [r]	34,900 [r]	42,100	34,500	47,400
Thailand	58,000	53,100	41,900	36,500	32,700
Turkmenistan	6,680	5,280	4,280	4,790	4,280
Uzbekistan	104,000	81,800	76,400	56,100	70,600
Vietnam	78,900	57,800	52,900	61,300	58,100
Other	-2,180 [r]	2,600 [r]	1,400 [r]	2,220	2,580
Total	1,790,000 [r]	1,420,000 [r]	1,290,000 [r]	1,130,000	1,210,000
Central America and North America:					
Cuba	10,300	4,770	2,890	4,100	3,080
Mexico	14,300 [r]	7,110	10,200	12,100	4,530
Other	2,300 [r]	1,560 [r]	1,530 [r]	930	1,010
Total	26,900 [r]	13,400 [r]	14,600 [r]	17,100	8,620
Europe:					
Belarus	13,100	10,600	6,210	7,180	5,530
Ukraine	42,000	35,200	24,700	10,400	18,600
Other	70 [r]	570 [r]	145 [r]	154	321
Total	55,200 [r]	46,400 [r]	31,100 [r]	17,700	24,400
Oceania	34	250	26	109	27
South America:					
Bolivia	5,360	4,420	6,260	4,170	4,740
Brazil	166,000 [r]	165,000	181,000	163,000	120,000
Colombia	24,300 [r]	16,000 [r]	8,940 [r]	5,960	197
Ecuador	4,720 [r]	4,160 [r]	4,470	4,100	3,090
Other	1,140 [r]	1,010 [r]	220	1,130	690
Total	201,000 [r]	191,000 [r]	201,000	179,000	129,000
Other areas (nonspecified)	-- [r]	--	--	--	--
Grand total	2,090,000 [r]	1,680,000 [r]	1,540,000 [r]	1,350,000	1,370,000

[p]Preliminary. [r]Revised. NA Not available. -- Zero.

[1]Includes data available through September 11, 2017. Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Calculated as country production plus imports minus exports. Changes in Government and industry stocks were not considered because data were unavailable. Production data were from table 8 and trade data were from the United Nations Comtrade Database.

[3]Owing to data limitations, the apparent consumption estimates are best used for identifying trends in asbestos consumption over time rather than absolute consumption for a particular country in a particular year.

[4]Negative values are net exports (exports greater than production plus imports).

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TABLE 8
ASBESTOS: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country[3]	2012	2013	2014	2015	2016
Argentina[4]	102	101	-- [r]	--	--
Brazil	304,569 [r]	290,825 [r]	311,230 [r]	270,000 [r, e]	200,000 [e]
China[e]	320,000 [r]	280,000 [r]	250,000 [r]	210,000 [r]	200,000
India	359	267	227	-- [r]	--
Kazakhstan	241,200 [r]	243,400 [r]	213,100 [r]	179,700 [r]	192,600
Russia	1,035,975 [r]	810,352 [r]	733,067 [r]	647,690 [r]	692,000
Zimbabwe	30	377	--	--	--
Total	1,900,000 [r]	1,630,000 [r]	1,510,000 [r]	1,310,000 [r]	1,280,000

[e]Estimated. [r]Revised. -- Zero.

[1]Includes data available through September 11, 2017. All data are reported unless otherwise noted. Totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Marketable fiber production.

[3]In addition to the countries listed, Afghanistan, North Korea, Romania, and Slovakia may have produced asbestos, but available information was inadequate to make reliable estimates of output.

[4]Most uses of asbestos have been banned since 2001. An exception allowing the use of asbestos-containing diaphragms in the chloralkali process expired in 2014.

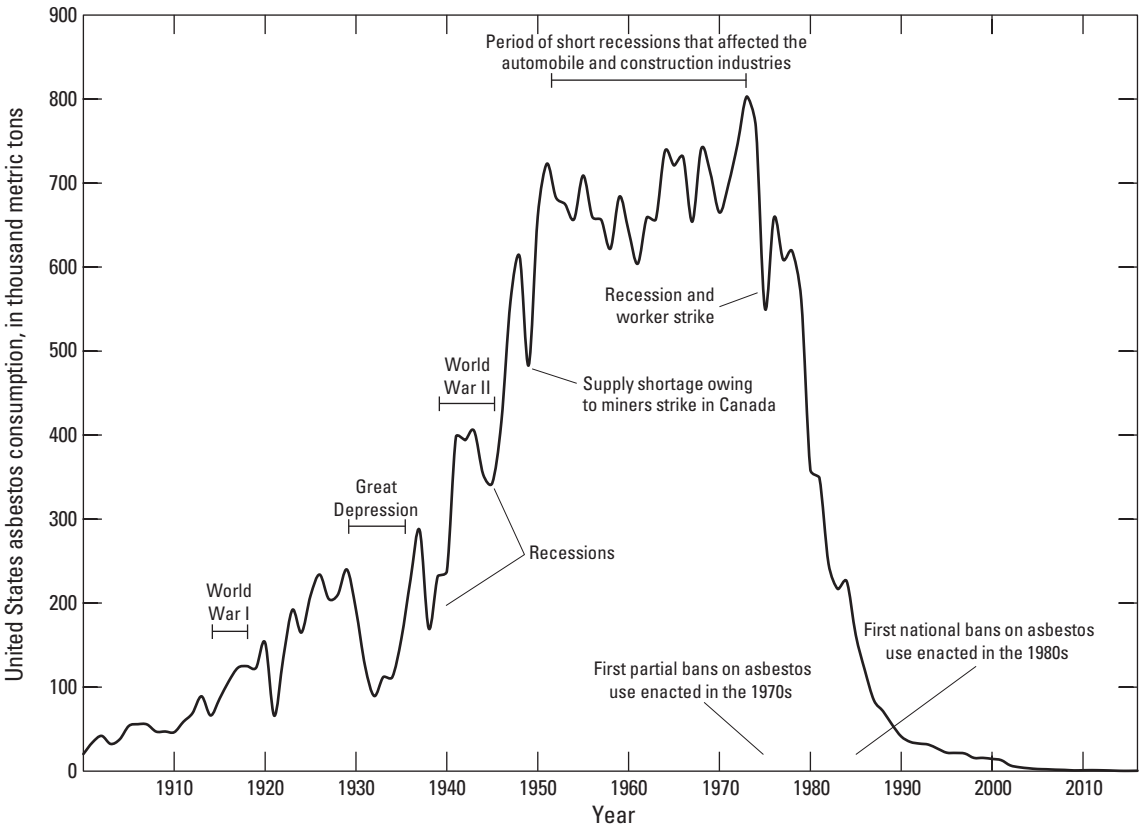


Figure 1. United States asbestos consumption from 1900 to 2016.

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