

SULFUR

(Data in thousand metric tons of contained sulfur unless otherwise noted)

Domestic Production and Use: In 2022, recovered elemental sulfur and byproduct sulfuric acid were produced at 93 operations in 27 States. Total shipments were valued at about \$1.3 billion. Elemental sulfur production was estimated to be 8.0 million tons; Louisiana and Texas accounted for about 46% of domestic production. Elemental sulfur was recovered, in descending order of tonnage, at petroleum refineries, natural-gas-processing plants, and coking plants by 34 companies at 88 plants in 26 States. Byproduct sulfuric acid, representing about 7% of production of sulfur in all forms, was recovered at five nonferrous-metal smelters in four States by four companies. Domestic elemental sulfur accounted for 65% of domestic consumption, and byproduct sulfuric acid accounted for about 5%. The remaining 30% of sulfur consumed was provided by imported sulfur and sulfuric acid. About 90% of sulfur consumed was in the form of sulfuric acid.

<u>Salient Statistics—United States:</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022^e</u>
Production:					
Recovered elemental	9,000	8,110	7,310	7,470	8,000
Other forms	<u>672</u>	<u>596</u>	<u>581</u>	<u>600</u>	<u>600</u>
Total (rounded)	9,670	8,710	7,890	8,070	8,600
Shipments, all forms	9,690	8,700	7,900	8,060	8,500
Imports for consumption:					
Recovered elemental ^e	2,230	1,840	2,230	2,370	1,900
Sulfuric acid	996	971	1,190	1,070	1,100
Exports:					
Recovered elemental	2,390	2,200	1,310	1,900	1,600
Sulfuric acid	112	72	64	129	100
Consumption, apparent, all forms ¹	10,400	9,240	9,950	9,470	9,800
Price, average unit value, free on board, mine and (or) plant, dollars per metric ton of elemental sulfur	81.20	51.10	24.60	92.30	150
Stocks, producer, yearend	118	124	109	113	120
Employment, mine and (or) plant, number	2,400	2,400	2,400	2,400	2,400
Net import reliance ² as a percentage of apparent consumption	7	6	21	15	13

Recycling: Typically, between 2.5 million and 5 million tons of spent sulfuric acid is reclaimed from petroleum refining and chemical processes during any given year.

Import Sources (2018–21): Elemental: Canada, 72%; Russia, 15%; Kazakhstan, 10%; and other, 3%. Sulfuric acid: Canada, 59%; Mexico, 19%; Spain, 7%; Germany, 4%; and other, 11%. Total sulfur imports: Canada, 68%; Russia, 10%; Kazakhstan, 7%; Mexico, 6%; and other, 9%.

<u>Tariff:</u>	<u>Item</u>	<u>Number</u>	<u>Normal Trade Relations</u>
			<u>12–31–22</u>
	Sulfur, crude or unrefined	2503.00.0010	Free.
	Sulfur, all kinds, other	2503.00.0090	Free.
	Sulfur, sublimed or precipitated	2802.00.0000	Free.
	Sulfuric acid	2807.00.0000	Free.

Depletion Allowance: 22% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Total U.S. sulfur production in 2022 was estimated to have increased by 7% from that in 2021, and shipments increased by 5% from those in 2021. Domestic production of elemental sulfur from petroleum refineries and recovery from natural gas operations increased by 7%. Domestically, refinery sulfur production is expected to remain about the same as refining utilization remains high. Domestic byproduct sulfuric acid is expected to remain relatively constant, unless one or more of the remaining nonferrous-metal smelters close.

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Domestic phosphate rock consumption in 2022 was estimated to have decreased from that in 2021, which resulted in the lower consumption of sulfur to process the phosphate rock into phosphate fertilizers. New sulfur demand associated with phosphate fertilizer projects is expected mostly in Africa and east Asia.

World sulfur production was unchanged compared with that in 2021. In 2022, world sulfur supplies were hampered by a decrease in the sulfur trade in part related to sanctions on Russia. However, sulfur production from the Middle East will increase sulfur availability. Also, an increase in nickel production to produce battery materials will increase sulfur demand.

Contract sulfur prices in Tampa, FL, began 2022 at around \$282 per long ton. The sulfur price increased to \$481 per long ton in early April, and then decreased to \$352 per long ton in mid-July. Fourth-quarter 2022 prices were \$90 per long ton. In the past few years, sulfur prices have been variable, a result of the volatility in the demand for sulfur. High sulfur prices in 2022 were a result of supply issues.

World Production and Reserves:

	Production, all forms		Reserves ³
	2021	2022 ^e	
United States	8,070	8,600	Reserves of sulfur in crude oil, natural gas, and sulfide ores are large. Because most sulfur production is a result of the processing of fossil fuels, supplies are expected to be adequate for the foreseeable future. Because petroleum and sulfide ores can be processed long distances from where they are produced, sulfur production may not be in the country to which the reserves were attributed. For instance, sulfur from Saudi Arabian oil may be recovered at refineries in the United States.
Australia	900	900	
Canada	4,880	4,900	
Chile	1,500	1,500	
China ⁴	18,800	18,000	
Finland	712	710	
Germany	592	600	
India	3,540	3,500	
Iran	2,200	2,200	
Japan	3,150	3,200	
Kazakhstan	4,600	4,600	
Korea, Republic of	3,080	3,100	
Kuwait	620	600	
Poland	995	1,000	
Qatar	1,700	2,000	
Russia	7,530	7,300	
Saudi Arabia	7,000	7,000	
Turkmenistan	700	700	
United Arab Emirates	5,200	6,000	
Other countries	<u>5,600</u>	<u>5,600</u>	
World total (rounded)	81,400	82,000	

World Resources:³ Resources of elemental sulfur in evaporite and volcanic deposits, and sulfur associated with natural gas, petroleum, tar sands, and metal sulfides, total about 5 billion tons. The sulfur in gypsum and anhydrite is almost limitless, and 600 billion tons of sulfur is contained in coal, oil shale, and shale that is rich in organic matter. Production from these sources would require development of low-cost methods of extraction. The domestic sulfur resource is about one-fifth of the world total.

Substitutes: Substitutes for sulfur at present or anticipated price levels are not satisfactory; some acids, in certain applications, may be substituted for sulfuric acid, but usually at a higher cost.

^eEstimated.

¹Defined as shipments + imports – exports ± adjustments for industry stock changes.

²Defined as imports – exports ± adjustments for industry stock changes.

³See Appendix C for resource and reserve definitions and information concerning data sources.

⁴Sulfur production in China includes byproduct elemental sulfur recovered from natural gas and petroleum, the estimated sulfur content of byproduct sulfuric acid from metallurgy, and the sulfur content of sulfuric acid from pyrite.