

SULFUR

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

Domestic Production and Use: In 2002, elemental sulfur and byproduct sulfuric acid were produced at 124 operations in 30 States and the U.S. Virgin Islands. Total shipments were valued at about \$230 million. Elemental sulfur production was 8.3 million tons; Louisiana and Texas accounted for about 50% of domestic production. Elemental sulfur was recovered at petroleum refineries, natural-gas-processing plants, and coking plants by 44 companies at 114 plants in 26 States and the U.S. Virgin Islands. Mining of elemental sulfur using the Frasch method, ended in 2000. Byproduct sulfuric acid, representing almost 11% of sulfur in all forms, was recovered at 10 nonferrous smelters in 7 States by 8 companies. Domestic elemental sulfur provided 71% of domestic consumption, and byproduct acid accounted for 9%. The remaining 20% of sulfur consumed was provided by imported sulfur and sulfuric acid. About 90% of sulfur was consumed in the form of sulfuric acid. Agricultural chemicals (primarily fertilizers) composed 60% of reported sulfur demand; petroleum refining, 18%; metal mining, 5%; and organic and inorganic chemicals, 3%. Other uses, accounting for 14% of demand, were widespread because a multitude of industrial products required sulfur in one form or another during some stage of their manufacture.

Salient Statistics—United States:	1998	1999	2000	2001	2002^e
Production:					
Frasch ^e	1,800	1,780	900	—	—
Recovered elemental	8,220	8,220	8,380	8,270	8,300
Other forms	<u>1,610</u>	<u>1,320</u>	<u>1,030</u>	<u>982</u>	<u>980</u>
Total ^e (may be rounded)	11,600	11,300	10,300	9,250	9,280
Shipments, all forms	12,100	11,100	10,500	9,240	9,280
Imports for consumption:					
Recovered, elemental	2,270	2,580	2,330	1,730	1,800
Sulfuric acid, sulfur content	668	447	463	462	350
Exports:					
Frasch and recovered elemental	889	685	762	675	500
Sulfuric acid, sulfur content	51	51	62	69	50
Consumption, apparent, all forms	14,100	13,400	12,500	10,700	10,900
Price, reported average value, dollars per ton of elemental sulfur, f.o.b., mine and/or plant	29.14	37.81	24.73	10.11	25.00
Stocks, producer, yearend	283	451	208	232	220
Employment, mine and/or plant, number	3,100	3,000	3,000	2,700	2,700
Net import reliance ¹ as a percentage of apparent consumption	18	16	18	13	15

Recycling: Between 3 million and 5 million tons of spent sulfuric acid was reclaimed from petroleum refining and chemical processes.

Import Sources (1998-2001): Elemental: Canada, 67%; Mexico, 22%; Venezuela, 9%; and other, 2%. Sulfuric acid: Canada, 60%; Mexico, 15%; Japan, 8%; Germany, 3%, and other, 14%. Total sulfur imports: Canada, 66%; Mexico, 21%; Venezuela, 7%; and other, 6%.

Tariff: Item	Number	Normal Trade Relations 12/31/02
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.

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Events, Trends, and Issues: Total sulfur production was virtually the same in 2002 as it was in 2001 because sulfur recovered at oil refineries increased and production at natural gas facilities decreased. Production of elemental sulfur from petroleum refineries will continue to grow steadily, supported by new facilities being installed to increase refining capacity and the capability of current operations to handle higher sulfur crude oil. Additional equipment will be installed at many refineries to reduce the sulfur in gasoline and diesel fuel to comply with the environmental regulations that were enacted in 2000 and 2001 and that will go into effect in 2006. Recovered sulfur from natural gas processing may continue to decline as a result of projects to reinject acid gas rather than produce recovered elemental sulfur. Byproduct sulfuric acid production continued at low rates because three copper smelters remained closed with little likelihood of reopening. Despite continued decreases in native sulfur and pyrites production because of environmental and cost considerations, total world sulfur production remained about the same as a result of expanded recovered production worldwide.

Domestic phosphate fertilizer production improved slightly in 2002, increasing demand for sulfur in that end use. Continued increases in phosphate fertilizer production could raise sulfur consumption to about 11.2 million tons in 2003. Increased demand drove prices higher, and improved prices made increased imports, especially from Canada, more likely. Additional facilities for importing formed sulfur were under consideration to increase the alternative sources available.

World Production, Reserves, and Reserve Base:

	Production—All forms		Reserves and reserve base ²
	2001	2002 ^e	
United States	9,250	9,280	Previously published reserve and reserve base data are outdated and inadequate for this tabulation because of changes in the world sulfur industry. For this reason, specific country data has been omitted from this report. 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 should be adequate for the foreseeable future. Because petroleum and sulfide ores can be processed long distances from where they are produced, actual sulfur production may not be in the country for which the reserves were attributed. For instance, sulfur reserves from Saudi Arabia actually may be recovered at oil refineries in the United States.
Australia	720	750	
Canada	9,360	9,400	
Chile	1,160	1,300	
China	5,380	5,500	
Finland	543	540	
France	1,100	1,100	
Germany	1,240	1,300	
India	941	940	
Iran	983	1,000	
Italy	743	800	
Japan	3,370	3,400	
Kazakhstan	1,700	1,800	
Korea, Republic of	1,270	1,300	
Kuwait	524	530	
Mexico	1,450	1,500	
Netherlands	510	500	
Poland	1,420	1,200	
Russia	6,250	6,250	
Saudi Arabia	2,350	2,400	
Spain	622	600	
United Arab Emirates	1,490	1,500	
Other countries	<u>5,070</u>	<u>5,100</u>	
World total (may be rounded)	57,300	58,000	

World Resources: Resources of elemental sulfur in evaporite and volcanic deposits and sulfur associated with natural gas, petroleum, tar sands, and metal sulfides amount to about 5 billion tons. The sulfur in gypsum and anhydrite is almost limitless, and some 600 billion tons is contained in coal, oil shale, and shale rich in organic matter, but low-cost methods have not been developed to recover sulfur from these sources. The domestic resource is about one-fifth of the world total. Elemental sulfur deposits have become marginal reserves even at deposits that are already developed. Sulfur from petroleum and metal sulfides may be recovered where it is refined, which may be in the country of origin or in an importing nation. The rate of sulfur recovery from refineries is dependent on the environmental regulations where refining is accomplished, most of which are becoming more stringent.

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

^eEstimated. — Zero.

¹Defined as imports - exports + adjustments for Government and industry stock changes.

²See Appendix C for definitions.