

## SULFUR

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

**Domestic Production and Use:** In 2003, elemental sulfur and byproduct sulfuric acid were produced at 120 operations in 30 States and the U.S. Virgin Islands. Total shipments were valued at about \$235 million. Elemental sulfur production was 8.8 million tons; Louisiana and Texas accounted for about 45% of domestic production. Elemental sulfur was recovered at petroleum refineries, natural-gas-processing plants, and coking plants by 39 companies at 110 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 8% of production of sulfur in all forms, was recovered at 9 nonferrous smelters in 7 States by 8 companies. Domestic elemental sulfur provided 69% of domestic consumption, and byproduct acid accounted for 6%. The remaining 25% 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 70% of reported sulfur demand; petroleum refining, 20%; and metal mining, 5%. Other uses, accounting for 5% of demand, were widespread because a multitude of industrial products required sulfur in one form or another during some stage of their manufacture.

<b><u>Salient Statistics—United States:</u></b>	<b><u>1999</u></b>	<b><u>2000</u></b>	<b><u>2001</u></b>	<b><u>2002</u></b>	<b><u>2003<sup>e</sup></u></b>
Production:					
Frasch <sup>e</sup>	1,780	900	—	—	—
Recovered elemental	8,360	8,590	8,490	8,500	8,800
Other forms	<u>1,320</u>	<u>1,030</u>	<u>982</u>	<u>772</u>	<u>750</u>
Total <sup>e</sup> (may be rounded)	11,500	10,500	9,470	9,270	9,550
Shipments, all forms	11,300	10,700	9,450	9,260	9,500
Imports for consumption:					
Recovered, elemental	2,580	2,330	1,730	2,560	2,900
Sulfuric acid, sulfur content	447	463	462	346	410
Exports:					
Frasch and recovered elemental	685	762	675	687	680
Sulfuric acid, sulfur content	51	62	69	48	210
Consumption, apparent, all forms	13,800	12,700	10,900	11,400	11,900
Price, reported average value, dollars per ton of elemental sulfur, f.o.b., mine and/or plant	37.81	24.73	10.01	11.84	25.00
Stocks, producer, yearend	451	208	232	181	200
Employment, mine and/or plant, number	3,000	3,000	2,700	2,700	2,700
Net import reliance <sup>1</sup> as a percentage of apparent consumption	16	18	13	19	20

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

**Import Sources (1999-2002):** Elemental: Canada, 71%; Mexico, 20%; Venezuela, 7%; and other, 2%. Sulfuric acid: Canada, 53%; Mexico, 19%; Japan, 6%; Germany, 4%, and other, 18%. Total sulfur imports: Canada, 68%; Mexico, 20%; Venezuela, 6%; and other, 6%.

<b><u>Tariff: Item</u></b>	<b><u>Number</u></b>	<b><u>Normal Trade Relations</u></b> <b><u>12/31/03</u></b>
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 U.S. sulfur production was slightly higher in 2003 than it was in 2002 because sulfur recovered at oil refineries increased, but 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 domestic natural gas processing may continue to decline as a result of the natural depletion of some large natural gas deposits and projects to reinject acid gas rather than produce recovered elemental sulfur. Byproduct sulfuric acid production continued at low rates because four U.S. 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.

Domestic phosphate fertilizer production was about the same in 2002 as in 2003, with no change in demand for sulfur in that end use. Increased worldwide sulfur demand drove prices higher, which 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 <sup>2</sup>
	2002	2003 <sup>e</sup>	
United States	9,270	9,550	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 have 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	959	970	
Canada	8,538	9,000	
Chile	1,275	1,300	
China	5,730	5,800	
Finland	690	700	
France	1,000	1,000	
Germany	1,240	1,250	
India	945	950	
Iran	1,000	1,100	
Italy	702	700	
Japan	3,200	3,200	
Kazakhstan	2,100	2,200	
Korea, Republic of	1,280	1,300	
Kuwait	634	600	
Mexico	1,450	1,500	
Netherlands	497	500	
Poland	1,220	1,000	
Russia	6,350	6,500	
Saudi Arabia	2,230	2,300	
Spain	685	700	
United Arab Emirates	1,900	2,000	
Other countries	4,800	5,000	
World total (rounded)	57,700	59,000	

**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.

<sup>e</sup>Estimated. — Zero.

<sup>1</sup>Defined as imports – exports + adjustments for Government and industry stock changes.

<sup>2</sup>See Appendix C for definitions.