

## SULFUR

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

**Domestic Production and Use:** In 1997, elemental sulfur and byproduct sulfuric acid were produced at 152 operations in 30 States, Puerto Rico, and the U.S. Virgin Islands. Total shipments were valued at about \$450 million. Elemental sulfur production was 10.5 million metric tons; Texas and Louisiana accounted for about 50% of domestic production. Elemental sulfur was recovered at petroleum refineries, natural gas processing plants, and coking plants by 58 companies at 137 plants in 26 States, Puerto Rico, and the U.S. Virgin Islands. Elemental sulfur was produced by one company at two mines in two States, using the Frasch method of mining. Byproduct sulfuric acid, representing 12% of sulfur in all forms, was recovered at 14 nonferrous smelters in 8 States by 10 companies. Domestic elemental sulfur provided 73% of domestic consumption and byproduct acid 10%. The remaining 17% of sulfur consumed was imported sulfur and sulfuric acid. About 90% of sulfur was consumed in the form of sulfuric acid. Agricultural chemicals (primarily fertilizers) comprised 70% of sulfur demand; petroleum refining, 11%; chemicals, organic and inorganic, 7%; and metal mining, 6%. Other uses, accounting for 6% of demand, were widespread because a multitude of industrial products require sulfur in one form or another during some stage in their manufacture.

<b>Salient Statistics—United States:</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997<sup>e</sup></b>
Production: Frasch	<sup>1</sup> 1,900	<sup>e</sup> 2,960	<sup>e</sup> 3,150	<sup>e</sup> 2,900	2,900
Recovered elemental	<sup>2</sup> 7,720	7,160	7,250	7,470	7,600
Other forms	<u>1,430</u>	<u>1,380</u>	<u>1,400</u>	<u>1,430</u>	<u>1,400</u>
Total	11,100	11,500	11,800	11,800	11,900
Shipments, all forms	10,500	11,700	12,100	11,800	12,000
Imports for consumption:					
Recovered, elemental	2,040	1,650	2,510	1,620	1,610
Sulfuric acid, sulfur content	797	696	628	678	620
Exports:					
Frasch and recovered elemental	656	899	906	855	690
Sulfuric acid, sulfur content	46	46	56	38	40
Consumption, apparent, all forms	12,600	13,100	14,300	13,200	13,500
Price, reported average value, dollars per ton of elemental sulfur, f.o.b., mine and/or plant	31.86	28.60	43.74	34.48	38.00
Stocks, producer, yearend	1,380	1,160	583	639	600
Employment, mine and/or plant, number	3,100	3,100	3,100	3,100	3,100
Net import reliance <sup>3</sup> as a percent of apparent consumption	12	12	21	10	11

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

**Import Sources (1993-96):** Frasch and recovered: Canada, 68%; Mexico, 31%; and other, 1%. Sulfuric acid: Canada, 71%; Germany, 10%; Japan, 5%; Mexico, 5%; and other, 9%. Total sulfur imports: Canada, 70%; Mexico, 18%; Germany, 5%; Japan, 3%; and other, 4%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Most favored nation (MFN) 12/31/97</b>	<b>Non-MFN<sup>4</sup> 12/31/97</b>
Sulfur, crude or unrefined	2503.00.0010	Free	Free.
Sulfur, all kinds, other	2503.00.0090	Free	Free.
Sulfur, sublimed or precipitated	2802.00.0000	Free	Free.
Sulfuric acid	2807.00.0000	Free	Free.

**Depletion Allowance:** 22% (Domestic), 22% (Foreign).

**Government Stockpile:** None.

## SULFUR

**Events, Trends, and Issues:** Domestic sulfur demand was reasonably strong and prices increased slightly over the year. Operating rates at domestic Frasch operations continued below capacity. The parent company of the remaining U.S. Frasch sulfur producer expected to merge with a major fertilizer producer. The two companies participated in joint venture projects in the past. The sulfur mining, marketing, transportation, and the oil and gas portions of the parent were to be spun off as a debt-free independent entity. Regulatory, board of directors, and shareholder approvals were expected by yearend.

The merger of two U.S. railroad companies resulted in logistical problems that effected sulfur availability. Delays in the movement of railcars to oil refineries because engines were unavailable prompted sulfur deliveries by truck, rather than rail, to move sulfur from refineries with no storage facilities. Truck deliveries were not capable of completely remedying the problem. By the end of the third quarter, some refineries were considering temporary shutdowns because the transportation problems were so severe.

Elemental sulfur imports from Canada remained at low levels because some Canadian producers withheld product from the United States market rather than face the possibility of antidumping penalties. The U.S. Department of Commerce (DOC) once again levied antidumping duties against several Canadian sulfur producers for shipments made in 1994 and 1995. Significant in this decision was that DOC established that the cost of sulfur production should be determined at the point where sulfur is separated from hydrogen, not at the wellhead or when the raw material reaches the processing plant.

Discrepancies between trade data published by the Bureau of the Census and information provided by sulfur consumers in the United States and sulfur producers in Canada have raised questions concerning the quantity of elemental sulfur imported by the United States in 1996 and 1997. Solutions to the data problem were being sought.

Domestic sulfur production is expected to increase slightly for the next few years, with Frasch production remaining relatively stable at reduced levels as long as both mines continue to operate. Recovered production should continue its consistent growth. Apparent consumption of sulfur is projected to be 13.8 million tons in 1998.

### **World Production, Reserves, and Reserve Base:**

	Production—All forms		Reserves <sup>5</sup>	Reserve base <sup>5</sup>
	1996	1997 <sup>e</sup>		
United States	11,800	11,900	140,000	230,000
Canada	9,010	9,200	160,000	330,000
China	5,470	5,200	100,000	250,000
France	1,200	1,100	10,000	20,000
Iraq	475	475	130,000	500,000
Japan	2,802	2,800	5,000	15,000
Mexico	2,890	2,900	75,000	120,000
Poland	1,769	1,700	130,000	300,000
Russia	4,000	4,000	NA	NA
Saudi Arabia	2,000	2,000	100,000	130,000
Spain	752	700	50,000	300,000
Other countries	<u>10,200</u>	<u>12,000</u>	<u>500,000</u>	<u>1,300,000</u>
World total (may be rounded)	52,400	54,000	1,400,000	3,500,000

**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 are 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.

**Substitutes:** There are no adequate substitutes for sulfur at present or anticipated price levels; some acids, in certain applications, may be substituted for sulfuric acid.

<sup>e</sup>Estimated. NA Not available.

<sup>1</sup>Includes 10 months of Frasch sulfur data. Two remaining months of Frasch data included with recovered sulfur data to conform with proprietary data requirements.

<sup>2</sup>Includes corresponding Frasch sulfur data for November and December.

<sup>3</sup>Defined as imports - exports + adjustments for Government and industry stock changes.

<sup>4</sup>See Appendix B.

<sup>5</sup>See Appendix D for definitions.