

SULFUR

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

Domestic Production and Use: In 2008, elemental sulfur and byproduct sulfuric acid were produced at 114 operations in 29 States and the U.S. Virgin Islands. As a result of dramatically increased prices during the year, total shipments were valued at nearly \$1 billion. Elemental sulfur production was 8.4 million tons; Louisiana and Texas accounted for about 45% of domestic production. Elemental sulfur was recovered, in descending order of tonnage, at petroleum refineries, natural-gas-processing plants, and coking plants by 40 companies at 107 plants in 26 States and the U.S. Virgin Islands. Byproduct sulfuric acid, representing about 8% of production of sulfur in all forms, was recovered at seven nonferrous smelters in five States by six companies. Domestic elemental sulfur provided 60% of domestic consumption, and byproduct acid accounted for 6%. The remaining 34% 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 about 60% of reported sulfur demand; petroleum refining, 25%; and metal mining, 3%. Other uses, accounting for 12% 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:	2004	2005	2006	2007	2008^e
Production:					
Recovered elemental	9,380	8,790	8,390	8,280	8,400
Other forms	739	711	674	803	800
Total (may be rounded)	10,100	9,500	9,050	9,090	9,200
Shipments, all forms	10,100	9,480	8,960	9,120	9,200
Imports for consumption:					
Recovered, elemental ^e	2,850	2,820	2,950	2,930	3,400
Sulfuric acid, sulfur content	784	877	793	851	1,000
Exports:					
Recovered, elemental	949	684	635	922	740
Sulfuric acid, sulfur content	67	110	79	110	80
Consumption, apparent, all forms	12,800	12,400	12,000	11,900	12,800
Price, reported average value, dollars per ton of elemental sulfur, f.o.b., mine and/or plant	32.62	30.88	32.85	36.29	100.00
Stocks, producer, yearend	185	160	221	187	200
Employment, mine and/or plant, number	2,700	2,700	2,600	2,600	2,600
Net import reliance ¹ as a percentage of apparent consumption	21	24	25	23	28

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

Import Sources (2004-07): Elemental: Canada, 71%; Mexico, 16%; Venezuela, 11%; and other, 2%. Sulfuric acid: Canada, 83%; Mexico, 11%; and other, 6%. Total sulfur imports: Canada, 73%; Mexico, 15%; Venezuela, 8%; and other, 4%.

Tariff: Item	Number	Normal Trade Relations 12-31-08
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 and shipments increased slightly compared with those of 2007. Increased domestic production of elemental sulfur from petroleum refineries offset a decline in recovery from natural gas operations. Sulfur recovery from refineries is expected to continue on an upward trend. Recovered sulfur from domestic natural gas processing is expected to continue to decline. Byproduct sulfuric acid production is expected to remain relatively stable, unless one or more of the remaining nonferrous smelters closes. World sulfur production increased slightly and is likely to steadily increase for the foreseeable future. Significantly increased production is expected from sulfur recovery at liquefied natural gas operations in the Middle East and expanded oil sands operations in Canada, unless a downturn in the world economy limits investments in those arenas.

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Elemental sulfur prices reached record highs during the year, skyrocketing to more than 10 times what they had been during much of 2007. High prices were driven by tight supplies that resulted from lower than expected production in the United States, owing to the processing of more lower sulfur crude oil than normal and unplanned outages at refineries. In other parts of the world, slow progress at new petroleum and natural gas developments and increased consumption at phosphate fertilizer operations, because of the increased emphasis placed on agriculture for biofuels production, contributed to high prices. Prices, however, peaked in August and began to decline in October; the downturn was expected to be steeper than the increases. In August, the Tampa, FL, sulfur price reached about \$600 per ton and remained at that level throughout September. By the end of November, spot prices in Tampa had declined to about \$70 per ton, and further decreases were likely.

Domestic phosphate rock consumption was slightly higher in 2008 than in 2007, which resulted in increased demand for sulfur to process the phosphate rock into phosphate fertilizers; however, demand for sulfur for fertilizers in the rest of the world was higher than that in the United States. High sulfur demand continued in China and India, but decreased sharply in the third quarter, precipitating the price crash. Some Canadian sulfur stocks were remelted to meet increased demand for overseas trade, and high prices made it possible for material in remote areas to be marketed successfully until the market collapsed.

World Production, Reserves, and Reserve Base:

	Production—All forms		Reserves and reserve base²
	2007	2008^e	
United States	9,090	9,200	Previously published reserves 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 from Saudi Arabian oil actually may be recovered at refineries in the United States.
Australia	950	950	
Canada	8,967	8,800	
Chile	1,573	1,600	
China	8,460	8,500	
Finland	615	615	
France	1,306	1,300	
Germany	2,300	2,500	
India	1,152	1,200	
Iran	1,570	1,600	
Italy	740	740	
Japan	3,200	3,200	
Kazakhstan	2,600	2,600	
Korea, Republic of	1,690	1,700	
Kuwait	700	700	
Mexico	1,770	1,800	
Netherlands	530	530	
Poland	1,324	1,300	
Russia	7,050	7,100	
Saudi Arabia	3,100	3,200	
South Africa	641	650	
Spain	601	600	
United Arab Emirates	1,950	2,000	
Uzbekistan	520	520	
Venezuela	800	800	
Other countries	<u>5,230</u>	<u>5,200</u>	
World total (rounded)	68,400	69,000	

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 of sulfur 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 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.

^eEstimated.

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

²See Appendix C for definitions.