

## SULFUR

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

**Domestic Production and Use:** In 2016, recovered elemental sulfur and byproduct sulfuric acid were produced at 101 operations in 27 States. Total shipments were valued at about \$765 million. Elemental sulfur production was 9.11 million tons; Louisiana and Texas accounted for about 52% of domestic production. Elemental sulfur was recovered, in descending order of tonnage, at petroleum refineries, natural-gas-processing plants, and coking plants by 38 companies at 95 plants in 26 States. Byproduct sulfuric acid, representing about 7% of production of sulfur in all forms, was recovered at six nonferrous smelters in five States by four companies. Domestic elemental sulfur provided 66% of domestic consumption, and byproduct acid accounted for about 6%. The remaining 28% of sulfur consumed was provided by imported sulfur and sulfuric acid. About 90% of sulfur consumed was in the form of sulfuric acid.

<b><u>Salient Statistics—United States:</u></b>	<b><u>2012</u></b>	<b><u>2013</u></b>	<b><u>2014</u></b>	<b><u>2015</u></b>	<b><u>2016<sup>e</sup></u></b>
Production:					
Recovered elemental	8,410	8,590	9,050	8,890	9,110
Other forms	<u>586</u>	<u>616</u>	<u>587</u>	<u>646</u>	<u>670</u>
Total (rounded)	9,000	9,210	9,630	9,540	9,780
Shipments, all forms	9,030	9,200	9,670	9,560	9,810
Imports for consumption:					
Recovered, elemental <sup>e</sup>	2,930	2,990	2,370	2,240	1,960
Sulfuric acid, sulfur content	933	972	1,000	1,160	1,070
Exports:					
Recovered, elemental	1,860	1,770	2,010	1,850	2,040
Sulfuric acid, sulfur content	53	54	52	56	52
Consumption, apparent, all forms	11,000	11,300	11,000	11,100	10,700
Price, reported average value, dollars per ton of elemental sulfur, f.o.b., mine and (or) plant	123.54	68.71	80.07	87.62	78.00
Stocks, producer, yearend	132	160	141	138	135
Employment, mine and/or plant, number	2,600	2,600	2,600	2,600	2,500
Net import reliance <sup>1</sup> as a percentage of apparent consumption	18	19	12	14	9

**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 (2012–15):** Elemental: Canada, 82%; Mexico, 13%; Venezuela, 3%; and other, 2%. Sulfuric acid: Canada, 64%; Mexico, 20%; and other, 16%. Total sulfur imports: Canada, 77%; Mexico 15%; Venezuela, 2%; and other, 6%.

<b><u>Tariff: Item</u></b>	<b><u>Number</u></b>	<b><u>Normal Trade Relations</u></b>
		<b><u>12–31–16</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.

**Events, Trends, and Issues:** Total U.S. sulfur production and shipments each increased by about 3% compared with those of 2015. Domestic production of elemental sulfur from petroleum refineries and recovery from natural gas operations increased slightly. Domestically, refinery sulfur production is expected to remain relatively constant as well as byproduct sulfuric acid, unless one or more of the remaining nonferrous-metal smelters close.

Domestic phosphate rock consumption was lower in 2016 than in 2015, which resulted in decreased demand for sulfur to process the phosphate rock into phosphate fertilizers.

## SULFUR

World sulfur production decreased slightly; however, it is likely to steadily increase for the foreseeable future. The largest increases in sulfur production during the next 5 years are expected to take place in Iran, Kazakhstan, Qatar, Russia, Saudi Arabia, Turkmenistan, and the United Arab Emirates. During May 2016, wildfires in northeastern Alberta, Canada, had a negative effect on oil sand operations and sulfur production. Most of these operations were offline for the entire month. New sulfur demand associated with phosphate/fertilizer projects is expected in Algeria, Brazil, Egypt, Morocco, and Saudi Arabia.

Contract sulfur prices in Tampa, FL, began 2016 at around \$110 per ton. The price decreased to \$65 per ton at the end of July but increased to about \$69 in mid-October. Export prices were higher than domestic prices. In the past few years, sulfur prices have been variable, a result of the volatility of the demand for sulfur. The slight price increase seen in the fourth quarter of 2016 was a result of tightness in sulfur supply.

### World Production and Reserves:

	Production—All forms		Reserves <sup>2</sup>
	2015	2016 <sup>e</sup>	
United States	9,540	9,780	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, 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	
Brazil	530	530	
Canada	5,780	5,500	
Chile	1,700	1,700	
China	8,800	8,800	
Finland	740	740	
Germany	3,800	3,800	
India	2,730	2,700	
Iran	2,200	2,200	
Italy	740	740	
Japan	3,250	3,300	
Kazakhstan	2,820	2,800	
Korea, Republic of	1,400	1,400	
Kuwait	850	850	
Mexico	1,410	1,400	
Netherlands	515	510	
Poland	1,130	980	
Qatar	850	850	
Russia	6,720	6,700	
Saudi Arabia	4,900	4,900	
United Arab Emirates	2,400	2,400	
Uzbekistan	540	540	
Venezuela	700	700	
Other countries	4,500	4,500	
World total (rounded)	69,400	69,300	

**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 600 billion tons of sulfur is contained in coal, oil shale, and shale 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.

<sup>e</sup>Estimated.

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

<sup>2</sup>See [Appendix C](#) for resource and reserve definitions and information concerning data sources.