

## IODINE

(Data in metric tons of elemental iodine unless otherwise noted)

**Domestic Production and Use:** Iodine was produced from brines in 2018 by three companies operating in Oklahoma. U.S. iodine production in 2018 was withheld to avoid disclosing company proprietary data. The average cost, insurance, and freight value of iodine imports in 2018 was estimated to be \$22 per kilogram, a 13% increase from that of 2017.

Because domestic and imported iodine was used by downstream manufacturers to produce many intermediate iodine compounds, it was difficult to establish an accurate end-use pattern. Organic iodine compounds, which included ethyl and methyl iodide, ethylenediamine dihydroiodide, and povidone iodine were thought to account for more than 50% of domestic iodine consumption in 2018. Worldwide, the leading uses of iodine and its compounds were x-ray contrast media, pharmaceuticals, and liquid-crystal-display (LCD) screens, in descending order of production quantity.

| <b>Salient Statistics—United States:</b>   | <b><u>2014</u></b> | <b><u>2015</u></b> | <b><u>2016</u></b> | <b><u>2017</u></b> | <b><u>2018<sup>e</sup></u></b> |
|--|--------------------|--------------------|--------------------|--------------------|--------------------------------|
| Production   | W                  | W                  | W                  | W                  | W                              |
| Imports for consumption  | 5,360              | 5,630              | 4,320              | 4,180              | 4,800                          |
| Exports  | 1,240              | 1,210              | 1,050              | 1,230              | 1,000                          |
| Consumption:   |                    |                    |                    |                    |                                |
| Apparent <sup>1</sup>  | W                  | W                  | W                  | W                  | W                              |
| Reported   | 3,910              | 3,800              | 4,610              | 4,500              | 4,600                          |
| Price, average value of imports,<br>cost, insurance, and freight, dollars per kilogram | 37.04              | 27.74              | 22.71              | 19.55              | 22                             |
| Employment, number <sup>e</sup>  | 60                 | 60                 | 60                 | 60                 | 60                             |
| Net import reliance <sup>2</sup> as a percentage<br>of reported consumption            | >50                | >50                | >50                | >50                | >50                            |

**Recycling:** Small amounts of iodine were recycled.

**Import Sources (2014–17):** Chile, 88%; Japan, 11%; and other, 1%.

| <b>Tariff:</b> | <b>Item</b>   | <b>Number</b> | <b>Normal Trade Relations</b>   |
|----------------|---------------|---------------|---------------------------------|
|                | Iodine, crude | 2801.20.0000  | <b><u>12–31–18</u></b><br>Free. |

**Depletion Allowance:** 14% (Domestic and foreign).

**Government Stockpile:** None.

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**Events, Trends, and Issues:** According to trade publications, spot prices for iodine crystal averaged about \$25 per kilogram during the first half of 2018. Although this was an increase from the 2017 annual average of \$21 per kilogram, prices were still considerably less than the historically high levels of \$65 to \$85 per kilogram in late 2012 and early 2013. The increase in the average spot price was attributed to an undersupply in the market, with consumption being greater than current production levels. In recent years, iodine producers decreased production in response to falling prices. One U.S. company opened a new plant in early 2018. The new plant was expected to increase the company's iodine production and reduce the unit cost of production.

As in recent years, Chile was the world's leading producer of iodine, followed by Japan and the United States. Excluding production in the United States, Chile accounted for about 62% of world production in 2018. Most of the world's iodine supply comes from three areas: the Chilean desert nitrate mines, the oil and gas fields in Japan, and iodine-rich brine wells in northwestern Oklahoma.

**World Mine Production and Reserves:** China also produces crude iodine, but output is not officially reported. Reserves for Chile were revised based on company and Government reports.

|                       | Mine production |                         | Reserves <sup>3</sup> |
|-----------------------|-----------------|-------------------------|-----------------------|
|                       | <u>2017</u>     | <u>2018<sup>e</sup></u> |                       |
| United States         | W               | W                       | 250,000               |
| Azerbaijan            | 199             | 200                     | 170,000               |
| Chile                 | 18,400          | 18,000                  | 610,000               |
| Indonesia             | 39              | 40                      | 100,000               |
| Japan                 | 10,000          | 10,000                  | 5,000,000             |
| Russia                | —               | 10                      | 120,000               |
| Turkmenistan          | <u>544</u>      | <u>540</u>              | <u>70,000</u>         |
| World total (rounded) | <u>429,200</u>  | <u>429,000</u>          | <u>6,300,000</u>      |

**World Resources:** In addition to the reserves shown above, seawater contains 0.06 parts per million iodine, and the oceans are estimated to contain approximately 90 billion tons of iodine. Seaweeds of the Laminaria family are able to extract and accumulate up to 0.45% iodine on a dry basis. Although not as economical as the production of iodine as a byproduct of gas, nitrates, and oil, the seaweed industry represented a major source of iodine prior to 1959 and remains a large resource.

**Substitutes:** No comparable substitutes exist for iodine in many of its principal applications, such as in animal feed, catalytic, nutritional, pharmaceutical, and photographic uses. Bromine and chlorine could be substituted for iodine in biocide, colorant, and ink, although they are usually considered less desirable than iodine. Antibiotics can be used as a substitute for iodine biocides.

<sup>e</sup>Estimated. W Withheld to avoid disclosing company proprietary data. — Zero.

<sup>1</sup>Defined as production + imports – exports.

<sup>2</sup>Defined as imports – exports.

<sup>3</sup>See Appendix C for resource and reserve definitions and information concerning data sources.

<sup>4</sup>Excludes U.S. production.