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2019 Minerals Yearbook

MERCURY [ADVANCE RELEASE]

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Mercury

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In 2019, mercury was produced in the United States as a byproduct of processing gold-silver ores, mainly in Nevada, and may have been produced as a byproduct of processing other metal ores. Secondary mercury was recovered from end-of-service automobile convenience switches, dental amalgam, electronic waste, fluorescent lamps and compact fluorescent lamps (CFLs), laboratory and medical measuring devices, mercury-contaminated waste, and thermostats. About 8,970 kilograms (kg) of mercury was imported in 2019, 51% more than imports in 2018 (tables 1, 2).

The global use of mercury continued to decline in 2019 owing to environmental and health concerns. Unable to sell mercury to an oversupplied domestic market and precluded from exporting it, mining and recycling companies placed additional byproduct mercury into permanent storage. However, the use of mercury in artisanal and small-scale gold mining (ASGM) operations and in the production of vinyl chloride monomer (VCM) in China continued to be substantial. Globally, ASGM accounted for about one third of mercury consumption, VCM production accounted for about a quarter, and the rest was used in mercury containing products (batteries, dental amalgam, switches, and other formulated products) or as catalysts or cathodes in the chlorine-caustic soda (chloralkali) process.

Legislation and Government Programs

On December 3, the U.S. Department of Energy (DOE) signed a Record of Decision for the long-term management and storage of up to 6,800 t of elemental mercury in the existing building at the Waste Control Specialist LLC site near Andrews, TX. The long-term management and storage of domestically generated elemental mercury was a requirement of the Mercury Export Ban Act of 2008 (U.S. Department of Energy, 2020).

Production

Mercury was last produced as a principal product in the United States in 1992 when the McDermitt Mine in northern Nevada closed. Since then, mercury has been recovered chiefly as a byproduct of processing gold-silver ores, mainly in Nevada.

Mercury was reclaimed from end-of-service automobile convenience switches, dental amalgam, electronic waste, fluorescent lamps and CFLs, laboratory and medical measuring devices, mercury-contaminated waste, and thermostats. Reclaimed mercury either was sold to domestic customers or placed in permanent storage.

The U.S. Environmental Protection Agency (EPA) reported that domestic byproduct and secondary mercury production was 33 t in 2018 (the last year for which data were available), and about 70 t of mercury was stored by manufacturers or producers (U.S. Environmental Protection Agency, 2020, p. 13).

Consumption

The EPA reported domestic consumption of mercury and mercury in compounds in products was 9 t in 2018 (the last year for which data were available). The leading domestic end uses of mercury were dental amalgam (47%); relays, sensors, switches, and valves (45%); formulated products (buffers, catalysts, fixatives, and vaccination uses) (9%); bulbs, lamps, and lighting (8%); and batteries (1%) (U.S. Environmental Protection Agency, 2020, p. 13–20). In 2019, domestic consumption of mercury was estimated to be less than 9 t. Consumption continued to decrease as mercury was eliminated from more consumer and industrial products.

About 245 t of mercury was used domestically in manufacturing processes such as catalysts or as cathodes in the chlorine-caustic soda (chloralkali) process. Much of the mercury used in manufacturing processes was in mercury cell chloralkali plants. Almost all of the mercury used in manufacturing processes was recycled internally, and therefore, there was almost no new demand for mercury (U.S. Environmental Protection Agency, 2020, p. 26–28). The chloralkali industry continued to shift away from using mercury cell technology and so only two mercury cell plants remained in the United States in 2019—the ASHTA Chemicals Inc. (Ashtabula, OH) plant and the Westlake Chemical Corp. (New Martinsville, WV) plant. In 2014, ASHTA announced that the Ashtabula plant would be phasing out mercury cell technology and began construction of a modernization project that would eliminate the use of mercury in 2017. The project was expected to be completed in the summer of 2020 (United Nations Environment Programme, 2017, p. 14; Terry, 2020).

Prices

The Fastmarkets Metal Bulletin price for mercury in U.S. warehouses was discontinued on December 1, 2019. The 2019 partial annual average was $2,550 per flask. The price started the year at $2,400 to $2,700 per flask and was unchanged through November. Prices of mercury in the European Union and the United States were generally lower than those in other regions because a surplus of mercury existed resulting from export bans and reduced consumption (United Nations Environment Programme, 2017, p. VIII). One flask of mercury weighs 34.5 kg and 1 t of mercury is equivalent to approximately 29 flasks.

Foreign Trade

Beginning on January 1, 2013, U.S. exports of elemental mercury were banned, except under the following criteria: (1) there were no alternatives to mercury use for a specified

application, (2) mercury was not available from other sources in the destination country, (3) the destination country supported the export ban exemption, (4) the exported mercury would be used at a specific facility, and (5) the mercury would be handled in a manner that protected human health and the environment. Exports of mercury compounds (mercury chloride, mercury oxide, mercury nitrate, mercury sulfate, and mercury sulfide) would be banned effective January 1, 2020 (19 U.S.C. 2611). In 2015, 30 kg of elemental mercury was exported to Mexico, and there were no elemental mercury exports from the United States in 2016–19.

In 2019, mercury imports equaled 8,970 kg valued at $207,000 compared with 5,960 kg valued at $42,600 in 2018. All mercury was imported from Canada in 2019 (table 2). This was the first increase in imports since 2014.

In 2019, 39,400 kg of amalgam valued at $74 million was imported into the United States, which was 19% more than the revised quantity imported in 2018 and 22% less than value of 2018. Amalgam is defined as mercury alloyed with one or more metals, but amalgam imports may include mercury-containing chlorine-caustic soda waste. Principal amalgam source countries were India (22%), Germany (19%), China (12%), the United Kingdom (10%), Japan and South Africa (7% each), and Belgium and Italy (5% each). In 2019, 216,000 kg of amalgam valued at $980 million was exported from the United States, which was 49% more than the quantity exported in 2018 and 55% more by value. Principal destinations for these exports were Mexico (14%), Belgium (13%), Canada and Suriname (9% each), India (8%), the Netherlands and South Africa (7% each), and Germany (6%) (table 3).

World Review

In 2019, world mercury mine production, excluding the United States, was estimated to be 3,900 t (table 4), 4% less than revised 2018 production. China (3,600 t) was the world's leading producer of mercury. World mercury production estimates have a high degree of uncertainty because most companies and countries do not report principal mine, byproduct mine, or recycling data for mercury. Only four countries have primary mercury mines—China, Indonesia, Kyrgyzstan, and Mexico. Other countries that produced mercury, including China and Mexico, recovered it as a byproduct of other metal mining. Relatively high gold prices, ongoing demand (especially for ASGM and VCM production), and uncertain supply in recent years have contributed to increases and volatility in the illegal and black-market price of mercury and may encourage new mercury mining.

In October 2013, representatives of 92 countries signed the terms of the Minamata Convention, a global treaty that addresses releases of mercury into the environment. The convention, when ratified, will require participating countries to develop strategies to reduce and, if possible, eliminate the use of mercury. Among the convention's conditions are the phasing out of primary mercury mining; ceasing the manufacture, import, and export of many mercury-containing products by 2020; reducing or eliminating the use of mercury in ASGM; reducing mercury emissions by industrial plants; and planning for safe storage of waste mercury (United Nations Environment Programme, 2013, p. 1–6). In November 2013, the United States became the first country to ratify the convention. By yearend 2019, there were 128 signatory countries, of which 116 countries had acceded, accepted, approved, or ratified the convention (Minamata Convention on Mercury, 2020).

ASGM operations accounted for 12% to 15% of the world's gold production and employed about 15 million people in remote and rural regions. This type of mining relied on rudimentary methods and technologies and was typically performed by miners with limited economic capital, who often operated in the informal economic sector, sometimes illegally. Countries where ASGM activities were observed were typically in regions where few economic alternatives were available for workers. ASGM tended to be more attractive when world gold price is high. Most of the mercury used in ASGM was not recycled and was released into the environment. The ASGM sector accounted for an estimated one-third of global mercury consumption (United Nations Environment Programme, 2017, p. 49–50, 81).

VCM production in China constituted 80% to 90% of world VCM production and was used to produce polyvinyl chloride (PVC), a widely used plastic. Most of China's VCM facilities used a coal-based process that required the use of mercury. China used about 99% of the mercury in the VCM industry, with the remainder used in India and Russia. It was estimated that the VCM industry accounted for about 25% of global mercury consumption (United Nations Environment Programme, 2017, p. 51, 62, 81).

The number of chloralkali plants that used mercury cell technology worldwide was unchanged at 12 plants in 2019, with plants in Argentina, Brazil, Canada, Mexico, Russia, the United States, and Uruguay. Mercury emissions from chloralkali plants increased to 3.88 metric tons per year (t/yr) in 2019 from 3.45 t/yr in 2018 (World Chlorine Council, 2020). It was estimated that the chloralkali industry used about 5% of the mercury consumed globally.

Other major applications for mercury were, in descending order of consumption, measuring and control devices (7% of estimated global consumption), dental applications (6%), batteries (5%), electrical and electronic devices (3%), and lamps (3%) (United Nations Environment Programme, 2017, p. 81).

Mercury also was used in mercury compounds and other minor applications, which included catalysts, chemical intermediates, cosmetics such as eye makeup and skin-lightening creams, cultural and ritual uses, fungicides, laboratory chemicals, novelty items, paints, pesticides, pharmaceuticals, porosimeters, pycnometers, and traditional medicine. These applications accounted for about 8% of global usage (United Nations Environment Programme, 2017, p. 59, 81).

Outlook

Global mercury use is expected to continue to decline as more countries enact restrictions and (or) bans on the use and trade of mercury. The Minamata Convention was approved on August 16, 2017, and the global mercury trade and use are expected to be reduced, most significantly in countries where mercury was used for artisanal gold mining. As a result of reduced consumption and restrictions on sales and trade, mining

and recycling companies are expected to place increasing quantities of byproduct mercury into permanent storage. Use of mercury in CFL and other fluorescent lighting may decrease owing to lower unit loading and increased sales of alternative light-emitting diode (LED) lighting. Mercury use in electronics and measuring devices also is expected to further decrease. Gallium alloys may provide nontoxic substitutes for mercury in a wide variety of applications that include electrical switches, liquid mirror telescopes, pumps, and sensors. Mercury-containing dental amalgam continues to decline in use, replaced by ceramic material with a more natural appearance. Closure of mercury cell chloralkali production facilities worldwide, owing to pressure from international environmental and health organizations, is expected to further reduce consumption and result in the release of large quantities of mercury for disposal, recycling, or long-term storage.

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TABLE 1
SALIENT MERCURY STATISTICS[1]

(Kilograms unless otherwise specified)

		2015	2016	2017	2018	2019
United States:						
Imports for consumption		25,800	24,300	20,300	5,960	8,970
Exports		30	--	--	--	--
Price, average	dollars per flask	1,954 [2]	1,402 [2]	1,041 [2]	1,100 [2]	1,100 [3]
World, mine production	metric tons	3,330 [r]	4,000 [r]	4,060 [r]	4,080 [r]	3,900 [e]

[e]Estimated. [r]Revised. -- Zero.

[1]Table includes data available through August 10, 2020. Data are rounded to no more than three significant digits, except prices.

[2]Source: European Union, 99.99% minimum mercury. Price discontinued on May 1, 2018. Source: Argus Media group – Argus Metals International.

[3]United States free market values in warehouse. Source: Fastmarkets Metal Bulletin.

Note: Industrial secondary production, stockpile, and consumption data were not available.

TABLE 2
U.S. IMPORTS AND EXPORTS OF MERCURY, BY COUNTRY OR LOCALITY[1]

	2018		2019	
Country or locality	Quantity, gross weight (kilograms)	Value (thousands)	Quantity, gross weight (kilograms)	Value (thousands)
Imports:				
Canada	10	$2	8,970	$207
China	5,940	38	--	--
United Kingdom	2	2	--	--
Total	5,960	43	8,970	207
Exports	--	--	--	--

-- Zero.

[1]Table includes data available through July 21, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 3
U.S. IMPORTS AND EXPORTS OF AMALGAMS[1] OF PRECIOUS METALS, WHETHER OR NOT CHEMICALLY DEFINED, BY COUNTRY OR LOCALITY[2]

	2018		2019	
Country or locality	Quantity, gross weight (kilograms)	Value (thousands)	Quantity, gross weight (kilograms)	Value (thousands)
Imports:				
Argentina	1,280	$9,180	1,520	$10,300
Belgium	30	5	1,820	111
Canada	1,840	558	784	1,650
China	2,110	1,040	4,730	1,510
Colombia	1,410	796	1,380	24
France	465	71	1,080	230
Germany	9,120 r	7,450 r	7,450	5,240
India	3,200	1,330	8,760	1,690
Italy	1,760 r	351 r	2,050	326
Japan	1,720 r	10,800	2,670	21,100
South Africa	5,740	55,400	2,880	26,300
United Kingdom	3,600	7,560	3,940	5,150
Other	747 r	493 r	347	397
Total	33,000 r	95,000 r	39,400	74,000
Exports:				
Australia	7	19	20	105
Austria	34	168	28	335
Belgium	30,200	1,370	27,500	7,220
Brazil	42	248	26	116
Canada	11,100	12,000	19,300	11,700
China	5,670	33,200	5,010	131,000
Colombia	174	3	8,200	10
Dominican Republic	13,600	863	9,550	295
El Salvador	1,420	93	2,310	59
France	669	391	387	475
Germany	2,760 r	10,000 r	13,400	27,600
Hong Kong	13	447	13	20
India	13,100	85,600	17,700	155,000
Italy	5	26	2,670	6,490
Japan	622	10,100	490	13,000
Korea, Republic of	7,520	6,520	7,480	16,400
Mexico	23,800	397,000	30,500	494,000
Netherlands	15,600	21,800	15,100	21,000
Saudi Arabia	211	6,530	318	10,500
Singapore	3,930	7,140	2,210	5,910
South Africa	--	--	14,600	12,700
Suriname	--	--	18,500	328
Taiwan	1,180	7,440	1,320	13,100
Thailand	513	3,250	2,240	22,000
United Kingdom	5,010	27,200	3,870	25,000
Other	7,270 r	2,410 r	13,200	5,670
Total	144,000 r	634,000	216,000	980,000

rRevised. -- Zero.

[1]An alloy of mercury with one or more other metals.

[2]Table includes data available through July 21, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 4
MERCURY: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY[1]

(Metric tons)

Country or locality[2]	2015	2016	2017	2018	2019
Argentina	59 r	135 r	54 r	50 r, e	50 e
Chile[e, 3]	14	2	11 [4]	10 [4]	10 [4]
China	2,801	3,482	3,573 r	3,600 e	3,600 e
Iran	14	3	--	-- e	-- e
Kyrgyzstan	46	20 e	20 e	20 e	15 e
Mexico[4]	306 e	262 e	225 e	234 e	63 e
Morocco	5 e	5 e	14 r	3 r	2
Norway[e]	20	20	20	20	20
Peru[e, 3]	35	40	40	40	40
Tajikistan[e]	30	30	100	100	100
United States[3]	NA	NA	NA	NA	NA
Total	3,330 r	4,000 r	4,060 r	4,080 r	3,900 e

[e]Estimated. [r]Revised. NA Not available. -- Zero.

[1]Table includes data available through July 17, 2020. All data are reported unless otherwise noted. Totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]In addition to the countries and (or) localities listed, Canada, Indonesia, and Spain may have produced byproduct mercury, but available information was inadequate to make reliable estimates of output.

[3]Byproduct mercury.

[4]Data based on net exports.