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MERCURY [ADVANCE RELEASE]

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Mercury

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In 2018, 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 5,960 kilograms (kg) of mercury was imported in 2018, 71% less than in 2017 and the fourth consecutive year of decline (tables 1, 2).

The global use of mercury continued to decline in 2018 owing to environmental and health concerns. Unable to sell all of the elemental 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 37% of mercury consumption, VCM production accounted for about 25%, and the rest was used in mercury-containing products or in the chloralkali production (United Nations Environment Programme, 2017, p. 62).

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. Since 1998, data on the amount of primary and secondary mercury produced in the United States have not been available.

Consumption

On the basis of industry trends and data in trade literature, domestic consumption of mercury was estimated to be less than 25,000 kg in 2018. Consumption continued to decrease as mercury was eliminated from more consumer and industrial products. Some of the domestic uses were in batteries, dental amalgam, lighting, measuring devices, switches and relays, and thermostats (Interstate Mercury Education and Reduction Clearinghouse, 2015).

Mercury was used as a cathode in chloralkali production; however, most of the mercury was recycled internally and only a small quantity of additional or make-up mercury was required. The chloralkali industry continued to shift away from using mercury cell technology with only two mercury cell plants remaining in the United States in 2018, the ASHTA Chemicals Inc. (Ashtabula, OH) and Westlake Chemical Corp. (New Martinsville, WV) plants (United Nations Environment Programme, 2017, p. 14). In 2014, ASHTA announced that the Ashtabula plant would be modernized and expanded to phase out the mercury cell technology and began project construction in 2017. The project was expected to be completed in the summer of 2020 (Terry, 2020).

Prices

On May 1, Argus Media group—Argus Metals International discontinued its assessment for European Union price, minimum 99.99% mercury, because of a decline in spot liquidity (Argus Metals International, 2018). The 2018 annual average of the Fastmarkets Metal Bulletin price for mercury in United States warehouse was $2,790 per flask in 2018. The price range started the year at $1,700 to $2,000 per flask and increased to $3,000 to $3,450 per flask in April before decreasing to $2,400 to $2,700 per flask at yearend. 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 as a result of export bans and reduced consumption (United Nations Environment Programme, 2017, p. VIII). One flask of mercury weighs 34.5 kg, and 1 metric ton (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 when the following criteria are met: there are no alternatives to mercury use for a specified application, mercury is not available from other sources in the destination country, the destination country supports the export ban exemption, the exported mercury will be used at a specific facility, and the mercury will be handled in a manner to protect human health and the environment. In 2013, 90 kg of mercury was exported to South Africa under this exemption, and in 2015, 30 kg of mercury was exported to Mexico. There were no exports from the United States in 2016, 2017, and 2018.

In 2018, mercury imports were 5,960 kg valued at $43,000 compared with 20,300 kg valued at $284,000 in 2017. Almost all of the mercury was imported from China with small amounts from Canada and the United Kingdom (table 2).

In 2018, 38,000 kg of amalgam valued at $127 million was imported into the United States, which was 64% more than the quantity imported in 2017 and almost double the value. 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 Germany (24%), Italy (17%), South Africa (15%), the United Kingdom (9%), India (8%), and Canada and Japan (5% each) (table 3). In 2018, 151,000 kg of amalgam valued at $634 million was exported from the United States, 35% more than the quantity exported in 2017. Principal destinations

for these exports were Belgium (20%), Mexico (16%), the Netherlands (10%), India (9%), and Canada (7%) (table 3).

World Review

In 2018, world mercury mine production was estimated to be 4,060 t (table 4). China (3,600 t) was the world's leading producer of mercury, and Mexico was a leading exporter of mercury, most of which was produced in Mexico. 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, including China and Mexico, that produced mercury recovered it as a byproduct of other metal mining. Relatively high gold prices and ongoing demand (especially for ASGM and VCM production) combined with uncertain supply in recent years have contributed to increases and volatility in the free market price of mercury, which in turn have encouraged new mercury mining in Indonesia and Mexico (United Nations Environment Programme, 2017, p. 5, 7, 9–10). Quantities may appear erratic from year to year because production may not be reported until it is shipped, and stockpiling may take place prior to shipment (table 4).

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 2018, 128 countries had signed, and 101 countries had ratified the convention (Minamata Convention on Mercury, 2019).

ASGM operations accounted for about 12% to 15% of the world's gold production and employed about 15 million people in remote and rural regions. This type of mining relies 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 tends to be even more attractive when the world gold price is elevated. Most of the mercury used in ASGM was not recycled and was released into the environment. The ASGM sector accounted for an estimated 37% 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. The majority of China's VCM facilities used a coal-based process that required the use of mercury. China represented about 99% of the mercury used by the VCM industry, with the reminder used in India and Russia. It was estimated that the VCM industry accounted for about 25% of global mercury consumption (U.S. Environmental Protection Agency, 2016, p. 3-2; United Nations Environment Programme, 2017, p. 51, 62, 81).

The number of chloralkali plants that used mercury cell technology decreased worldwide to 12 plants in 2018 from 30 plants in 2017 because 18 plants in Europe closed or were closed by the second quarter of 2018. Mercury emissions from chloralkali plants decreased to 2.98 metric tons per year (t/yr) in 2018 from 4.47 t/yr in 2017 (Scott, 2017; World Chlorine Council, 2019). It was estimated that the chloralkali industry used about 6% of the mercury consumed globally (United Nations Environment Programme, 2017, p. 81).

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 was also 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 consumption (United Nations Environment Programme, 2017, p. 59, 81).

Outlook

Global mercury use is expected to continue to decline as more countries enact restrictions or bans on the use and trade of mercury. If the Minamata Convention is ratified by more of the 128 signatories, global mercury trade and use are expected to be further reduced, most significantly in countries where mercury is 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 is also 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 storage.

Recycled mercury recovered from mercury cell chloralkali plants and commercial products, and byproduct mercury recovered from domestic and foreign precious metals operations, are expected to exceed domestic needs.

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TABLE 1
SALIENT MERCURY STATISTICS[1]

(Kilograms unless otherwise specified)

		2014	2015	2016	2017	2018
United States:						
Imports for consumption		49,500	25,800	24,300	20,300	5,960
Exports		--	30	--	--	--
Price, average	dollars per flask	3,037 [2]	1,954 [2]	1,402 [2]	1,041 [2]	1,100 [3]
World, mine production	metric tons	2,770	3,300	3,890 [r]	4,070 [r]	4,060

[r]Revised. -- Zero.
[1]Table includes data available through April 23, 2020. Data are rounded to no more than three significant digits, except prices.
[2]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 are not available.

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

	2017		2018	
Country or locality	Quantity, gross weight (kilograms)	Value (thousands)	Quantity, gross weight (kilograms)	Value (thousands)
Imports:				
Canada	7,530	$112	10	$2
China	--	--	5,940	38
Colombia	10	3	--	--
France	10,100	74	--	--
India	700	56	--	--
Japan	3	4	--	--
Switzerland	2,000	33	--	--
United Kingdom	2	2	2	2
Total	20,300	284	5,960	43
Exports	--	--	--	--

-- Zero.
[1]Table includes data available through April 23, 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]

	2017		2018	
Country or locality	Quantity, gross weight (kilograms)	Value (thousands)	Quantity, gross weight (kilograms)	Value (thousands)
Imports:				
Argentina	1,200	$8,840	1,280	$9,180
Canada	329	577	1,840	558
Colombia	979	122	1,410	796
Germany	9,330 r	7,640 r	9,050	7,340
India	1,580	569	3,200	1,330
Italy	2,170 r	542 r	6,480	32,300
Japan	1,540 r	14,300 r	1,760	10,800
Mexico	45	684	15	171
South Africa	3,990 r	32,800 r	5,740	55,400
United Kingdom	498	1,540	3,600	7,560
Other	1,450	1,080	3,590	1,650
Total	23,100 r	68,700 r	38,000	127,000
Exports:				
Australia	137	30	7	19
Austria	11	39	34	168
Belgium	229	771	30,200	1,370
Brazil	59	289	42	248
Canada	13,500	14,900	11,100	12,000
China	22,000	36,800 r	5,670	33,200
France	419 r	339	669	391
Germany	8,460	6,660	9,390	10,100
Hong Kong	17	29	13	447
India	13,000	68,600	13,100	85,600
Italy	2,870	15,300	5	26
Japan	1,200	12,900	622	10,100
Korea, Republic of	6,650	6,730	7,520	6,520
Mexico	16,200	258,000	23,800	397,000
Netherlands	9,090	13,400	15,600	21,800
Peru	10	15	48	42
Saudi Arabia	274	3,980	211	6,530
Singapore	2,750	4,360	3,930	7,140
Taiwan	1,860	10,400	1,180	7,440
Thailand	1,640	8,410	513	3,250
United Kingdom	6,260	14,600	5,010	27,200
Other	5,200	2,400	22,400	3,320
Total	112,000	479,000	151,000	634,000

rRevised.
[1]An alloy of mercury with one or more other metals.
[2]Table includes data available through April 23, 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]	2014	2015	2016	2017	2018
Argentina[e]	25	25	25	25	25
Chile[e, 3]	18	14	2	11 [r]	10
China	2,259	2,801	3,482 [r]	3,620 [r]	3,600 [e]
Iran	12	14	3 [r]	--	-- [e]
Kyrgyzstan	48	46	20 [r, e]	20 [e]	20 [e]
Mexico[e, 4]	301	306	262	225 [r]	234
Morocco[e]	8	5	5	10	10
Norway[e]	25	20	20	20	20
Peru[e, 3]	40	35	40	40	40
Tajikistan[e]	35	30	30	100	100
United States[3]	NA	NA	NA	NA	NA
Total	2,770	3,300	3,890 [r]	4,070 [r]	4,060

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

[1]Table includes data available through May 1, 2019. 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, Indonesia has primary mercury mine production and Canada, Germany, India, Japan, the Netherlands, Russia, Spain, and Ukraine 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.