

MERCURY

By Stephen M. Jasinski

Mercury was produced in the United States only as a byproduct of gold mining. Domestic production data were withheld to protect company proprietary information. The last domestic mercury mine closed in 1990. Domestic consumption continued the downward trend of the past 5 years, falling to 483 metric tons, as many uses of mercury continue to be eliminated each year in favor of less toxic substances. The three largest uses were: the manufacturing of chlorine and caustic soda, which made up 28% of domestic consumption; wiring devices and switches, which accounted for 16%; and measuring and control instruments, which used 11%. Imports of mercury increased in 1994 owing to the suspension of sales in July from the National Defense Stockpile (NDS), which was the major supplier of mercury to the domestic market in 1993. Exports also dropped as less mercury was available. Secondary production increased as more mercury-containing materials were banned from landfill disposal.

The domestic dealer price increased in response to the tighter market situation. The average was \$194 per flask. World production decreased in 1994 because of reduced output from Spain and the former USSR. World reserves and reserve base were 130,000 and 240,000 tons, respectively.

Domestic Data Coverage

For consumption and stock data, 37 companies were canvassed and 76% responded. The respondents accounted for an estimated 88% of consumption.

Legislation and Government Programs

The Defense Logistics Agency (DLA) sold 86 tons of mercury from the National Defense Stockpile in 1994. Sales were suspended in July after the U.S. Environmental Protection Agency (EPA) had questions about potential environmental problems associated with the release of mercury. Also, there were concerns about NDS mercury being exported for uses eliminated or reduced in the United States. Sales were not to resume until the EPA and DLA determine how to dispose of the NDS mercury in an environmentally responsible manner. The DLA was authorized to sell 690

tons of mercury in FY 1995 and proposes to sell 690 tons in FY 1996. The NDS inventory on December 31 was 4,408 tons. No mercury was sold from the 167 tons held by the Department of Energy at Oak Ridge, TN.

Several States, primarily in the Northeast, issued warnings in 1994 against eating freshwater fish because of elevated levels of mercury. The U.S. Food and Drug Administration has set a level of 1 part per million mercury in fish as the safe maximum limit for human consumption. Most States limits, however, are 0.5 part per million. In New Jersey, fish in several lakes in the Pine Barrens have shown limits above 0.5 part per million and 70% had levels above 1 part per million. This prompted warnings against eating the fish in this area of the State. In Maine, which has a limit of 0.43 part per million, pregnant women and children under 8 years of age were advised not to eat any fish from lakes or ponds; other adults were advised to restrict their intake. Michigan was the only other State to issue a statewide warning. Other States in New England issued regional advisories against fish consumption.

In Minnesota, a new State law prohibits the disposal of thermostats and other mercury-containing devices unless the mercury has been removed. It also requires that manufacturers of thermostats provide incentives to induce purchasers to properly manage used thermostats. In response to this regulation, Honeywell, Inc., a major manufacturer of thermostats, started a recycling program involving wholesalers and dealers of heating and cooling equipment in Minnesota. The wholesalers collect the thermostats and return them to Honeywell where the mercury bulbs are removed and shipped to a mercury reprocessor for redistilling. The mercury is then shipped back to Honeywell.¹

An EPA survey determined that 341 tons of mercury had been emitted to the atmosphere in 1993 from domestic sources. The largest volumes of emissions came from the combustion of fossil fuel, primarily coal at powerplants and incinerators.

Production

The only prime virgin mercury produced was a byproduct of gold mining in California,

Nevada, and Utah. Reported production was withheld to avoid disclosing company proprietary data. Secondary production continued to increase in response to greater restrictions being placed on the disposal of mercury-containing products. Secondary production was 466 tons in 1994. Mercury was recovered from a variety of waste materials, such as batteries, dental amalgams, switches (including thermostats), manometers, chlor-alkali wastewater sludges, chemical solutions, and fluorescent light tubes. Three companies were the major refiners: Bethlehem Apparatus Co., Hellertown, PA; D. F. Goldsmith Co., Evanston, IL; and Mercury Refining Co., Albany, NY. Four other companies also produced secondary mercury. Nine companies, with a total of 23 plants, recycled only fluorescent lamps; however, only 12 of the plants recovered mercury, while the others shipped the sorted waste materials to domestic refiners for further processing.

Consumption

Domestic consumption dropped 15% to 483 tons. The use of mercury in the production of chlorine and caustic soda fell 45 tons in 1994 because of the conversion of several plants to membrane cell technology and increased onsite recycling of wastewater sludges, which eliminates the need to purchase mercury. The use of mercury in lighting, which has averaged 31 tons per year since 1990, was 27 tons.

Mercury use in batteries fell to 6 tons. Currently, the only consumer battery type to have added mercury is the alkaline button cell. Mercuric oxide batteries are still produced for military and medical equipment, but research is continuing in development of acceptable substitute batteries for those uses.

Prices

Mercury usually is sold by the 34.5 kilogram flask. The Platt's Metals Week domestic dealer average price for the year was \$194 per flask.

World Review

World production decreased more than 500 tons in 1994, because of reduced output in Kyrgyzstan, Spain, Tajikistan, and Ukraine.

Minas de Almaden, of Spain, produced 300 tons of mercury in 1994, all in the last quarter of the year, compared with 643 tons in 1993. Mercury production was restarted reportedly to replenish stocks.

Outlook

Mercury will continue to be used only where it is necessary, such as in switches, thermostats, and fluorescent lighting. Domestic demand should stabilize in the next few years as nonessential uses are either banned or voluntarily eliminated. Secondary production will become an even more important component of domestic supply, especially if the ban on DLA mercury continues.

¹Sass, B. M., M. Salem, and L. Smith Mercury Usage and Alternatives in the Electrical and Electronics Industries (U.S. EPA Contract 68-CO-0003, Battelle). EPA Rep. 600/R-94/047, Jan. 1994, 48 pp.

OTHER SOURCES OF INFORMATION

U.S. Bureau of Mines Publications

Mercury. Ch. in Mineral Commodity Summaries, annual.

Other Sources

American Metal Market (daily newspaper).

Metal Bulletin (London).

Platt's Metals Week.

TABLE 1
SALIENT MERCURY STATISTICS 1/

(Metric tons, unless otherwise specified)

| | 1990 | 1991 | 1992 | 1993 | 1994 |
|---------------------------------------|----------|----------|----------|----------|----------|
| United States: | | | | | |
| Producing mines | 9 | 8 | 9 | 9 | 7 |
| Mine production: | | | | | |
| Principal product 2/ | 448 | -- | -- | -- | -- |
| Byproduct | 114 | 58 | 64 | W | W |
| Secondary production: | | | | | |
| Industrial | 108 | 165 | 176 | 350 | 466 |
| Government 3/ | 193 | 215 | 103 | -- | -- |
| Shipments from the National | | | | | |
| Defense Stockpile 4/ | 52 | 103 | 267 | 543 | 86 |
| Imports for consumption | 15 | 56 | 92 | 40 | 129 |
| Exports | 311 | 786 | 977 | 389 | 316 |
| Industry stocks, yearend 5/ | 197 | 313 | 436 | 384 | 368 |
| Industrial consumption | 720 | 554 | 621 | 558 | 483 |
| Price: New York, average per flask | \$249.22 | \$122.42 | \$201.39 | \$187.00 | \$194.45 |
| Employment, mine and mill, average 6/ | 21 | 3 | -- | -- | -- |
| World: | | | | | |
| Mine production | 4,100 | 2,540 | 1,890 r/ | 2,290 r/ | 1,760 e/ |

e/ Estimated. r/ Revised. W Withheld to avoid disclosing company proprietary data.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits.

2/ Comprises only the mercury produced at the McDermitt Mine, as reported in Placer Dome Inc. annual and 10-K reports. The mine was closed in November 1990.

3/ Secondary mercury shipped from U.S. Department of Energy stocks.

4/ Primary mercury.

5/ Stocks at consumers and dealers only. Mine stocks withheld to avoid disclosing company proprietary data.

6/ McDermitt mine only.

TABLE 2
BYPRODUCT MERCURY-PRODUCING MINES IN THE UNITED STATES IN 1994

| Mine | County and State | Operator |
|----------------------|------------------|--------------------------------|
| Alligator Ridge | White Pine, NV | Placer Dome U. S. |
| Carlin Mines Complex | Eureka, NV | Newmont Gold Co. |
| Enfield Bell | Elko, NV | Independence Mining Co Inc. |
| Getchell | Humboldt, NV | FMC Gold Co. |
| McLaughlin | Napa, CA | Homestake Mining Co. |
| Mercur | Tooele, UT | Barrick Mercur Gold Mines Inc. |
| Paradise Peak | Gabbs, NV | FMC Gold Co. |

TABLE 3
U. S. INDUSTRIAL CONSUMPTION OF REFINED MERCURY METAL, BY USE 1/

(Metric tons)

| SIC Code | | 1993 | 1994 |
|----------|---------------------------------------|------|------|
| 28 | Chemical and allied products: | | |
| 2812 | Chlorine and caustic soda manufacture | 180 | 135 |
| 2819 | Laboratory uses | 26 | 24 |
| -- | Other chemical and allied products 2/ | 18 | 25 |
| 36 | Electrical and electronic uses: | | |
| 3641 | Electric lighting | 38 | 27 |
| 3643 | Wiring devices and switches | 83 | 79 |
| 3692 | Batteries | 10 | 6 |
| 38 | Instruments and related products: | | |
| 382 | Measuring and control instruments | 65 | 53 |
| 3843 | Dental equipment and supplies | 35 | 24 |
| -- | Other uses 3/ | 103 | 110 |
| | Total | 558 | 483 |

1/ The input of refined liquid mercury to domestic manufacturing establishments.

2/ Includes pharmaceutical uses and miscellaneous catalysts.

3/ Includes other electrical and electronic uses, other instruments and related products, and unclassified uses.

TABLE 4
U.S. IMPORTS FOR CONSUMPTION OF MERCURY AND MERCURY-BEARING WASTE AND SCRAP,
AND EXPORTS, BY COUNTRY 1/

| Country | 1993 | | 1994 | |
|-------------|-------------|-------------------|-------------|-------------------|
| | Metric tons | Value (thousands) | Metric tons | Value (thousands) |
| | Imports | | | |
| Canada | 34 | \$49 | 5 | \$8 |
| Russia | -- | -- | 117 | 290 |
| Other | 5 2/ | 94 2/ | 6 | 196 |
| Total | 40 | 143 | 129 | 494 |
| | Exports | | | |
| Hong Kong | 52 | 136 | 87 | 242 |
| India | 96 | 186 | 149 | 249 |
| Netherlands | 108 | 308 | 2 | 20 |
| Venezuela | 55 3/ | 148 3/ | -- | -- |
| Other | 78 2/ | 452 2/ | 78 | 373 |
| Total | 389 | 1,230 | 316 | 885 |

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Unspecified group of countries differs from that published in the 1993 Annual Mineral Industry Survey, Annual Review.

3/ All or part of these data have been referred to the Bureau of the Census for verification.

Source: Bureau of the Census.

TABLE 5
MERCURY: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

| Country | 1990 | 1991 | 1992 | 1993 | 1994 e/ |
|----------------------|-------|-------|----------|----------|---------|
| Algeria | 637 | 431 | 476 | 475 e/ | 475 |
| China e/ | 1,000 | 760 | 580 r/ | 520 r/ | 500 |
| Czechoslovakia 3/ 4/ | 126 | 75 | 60 | XX | XX |
| Finland | 141 | 74 | 85 | 98 r/ e/ | 100 |
| Kyrgyzstan e/ | XX | XX | 300 | 250 | 200 |
| Mexico | 735 | 340 | 21 | 12 r/ | 10 |
| Morocco 5/ | -- | 20 | 20 e/ | 20 e/ | 20 |
| Russia e/ | XX | XX | 70 | 60 | -- |
| Slovakia 4/ | XX | XX | XX | 50 e/ | 50 |
| Slovenia e/ 6/ | XX | XX | 7 | -- | -- |
| Spain | -- | -- | -- | 643 | 300 |
| Tajikistan e/ | XX | XX | 100 | 80 | 55 |
| Turkey | 60 | 25 | 5 | -- | -- |
| U.S.S.R. e/ 7/ | 800 | 750 | XX | XX | XX |
| Ukraine e/ | XX | XX | 100 | 80 | 50 |
| United States 8/ | 562 | 58 | 64 | W | W |
| Yugoslavia 6/ 9/ | 37 | 9 | XX | XX | XX |
| Total | 4,100 | 2,540 | 1,890 r/ | 2,290 r/ | 1,760 |

e/ Estimated. r/ Revised. W Withheld to avoid disclosing company proprietary data; excluded from "Total." XX Not applicable.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Table includes data available through Apr. 24, 1995.

3/ Dissolved Dec. 31, 1992.

4/ All production in Czechoslovakia from 1990-92 came from Slovakia.

5/ Mercury was produced only as a byproduct of silver mining.

6/ All production in Yugoslavia from 1990-91 came from Slovenia.

7/ Dissolved in Dec. 1991.

8/ For 1990, data are the combined output from the McDermitt Mine, as reported in the Randol Mining Directory, and from mercury produced as a byproduct of gold mining operations. Beginning in 1991, mercury was produced only as a byproduct of gold mining.

9/ Dissolved in Apr. 1992.