



Mineral Industry Surveys

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BISMUTH IN THE SECOND QUARTER 2003

Total bismuth consumption in the United States was 432,000 kilograms during the second quarter of 2003, about the same as consumption for the first quarter and down from the average quarterly consumption of 2002 (table 1).

Although total consumption essentially remained the same, a shift in estimated consumption occurred in most categories. Compared with the previous quarter of 2003, consumption of bismuth in the second quarter increased 18% for chemical and pharmaceutical uses, decreased 6% for alloying uses, decreased 19% for metallurgical additives, and decreased 4% for the other miscellaneous uses. Total estimated consumption for the second quarter of 2003 decreased when compared with that of the second quarter of 2002.

The New York dealer price for bismuth, as published in *Platts Metals Week*, began the second quarter with a 5-cent-per-pound rise to a price range of \$2.70C\$3.10 per pound. The price range narrowed early in the second quarter and then remained steady to end the quarter in the range of \$2.80C\$3.10 per pound.

Reserves.—Tiberon Minerals Ltd. (Canada) announced the results of a metallurgical test program at its 70%-owned Nui Phao tungsten polymetallic deposit in Vietnam. The test work suggests that an enhanced bismuth recovery of 50% is possible, which would allow bismuth metal production to reach 1,750 metric tons per year (t/yr) (*Platts Metals Week*, 2003a). With completion of the 2003 drilling program, Tiberon has requested an updated resource estimate from AMEC E&C Services Ltd. The next phase of work at Nui Phao will be a bankable feasibility study—including engineering, pilot plant metallurgical studies, detailed geotechnical studies, and a final environmental impact assessment (Tiberon Minerals Ltd., 2003§¹).

Fortune Minerals Limited (Canada) has obtained additional financing to continue a drilling program at its NICO gold-cobalt-bismuth deposit in the Northwest Territories. The program is expected to lead to a feasibility study in 2003 (Fortune Minerals Limited, 2003).

Uses.—Bismuth-209, which for decades was believed to be the heaviest naturally occurring atom that never decays, has recently been found to radioactively decay. Its half-life was recently estimated at 19 quintillion (billion billion) years (De Marcillac and others, 2003; Weiss, 2003).

A recent survey shows that the Japanese electronics industry is still behind the schedule set by the Japan Electronics and Information Technology Industries Association (JEITA), which called for a 50% conversion to lead-free solders by 2002. The lack of a standardized method for evaluating the reliability of lead-free solders has caused Japanese electronics manufacturers to resist a change to lead-free solders. JEITA has, therefore, instituted a project to establish standards for lead-free solders to be completed by the end of 2003. However, the objective still remains a goal for the Japanese industry in order to comply with the European Union's schedule for purchasing only lead-free electronics by 2006 (Metal-Pages, 2003b§).

In Japan, the Republic of Korea, and the European Union, researchers continue to develop system solutions for advanced and sustainable lead-free soldering. The Next Generation Environment-Friendly Soldering Technology (EFSOT) effort is an 11-million-euro project using 132 person-years of research to investigate lead-free soldering technologies. As described in an EFSOT presentation, almost 60% of the effort will be expended on the upgrading of soldering technology as well as new material and process technology; another 20% of the effort will investigate the biological impacts of soldering materials; slightly less than 10% of the effort will be to examine the environmental impact, including evaluations of resource depletion and metal toxicity issues; and the final stage, requiring somewhat greater than 10% of the effort, will be to investigate recycling and

¹References that include a section mark (§) are found in the Internet References Cited section.

component recovery. The European Union, and the Governments of Japan and the Republic of Korea are providing funding for the project (EFSOT, 2003§).

Production.—China is the leading supplier of bismuth and has become more cost efficient in its production in order to offset rising power and transport costs. Although there are no mining restrictions or raw materials shortages, reduction in smelter capacity reportedly continues to affect metal output (Metal Bulletin, 2003).

Yuguang Gold and Lead Co. Ltd., China's largest electrolytic lead producer, announced that it had upgraded its waste processing facilities and was now recovering bismuth from slag. About 82 metric tons (t) of crude bismuth was recovered in the first quarter of 2003 (Metal-Pages, 2003d§).

Industrias Peñoles, S.A. de C.V. (Mexico), the largest producer of bismuth in the world, produced 518 t of bismuth in the first half of 2003, with 272 t of that total being produced in the second quarter (Industrias Peñoles, S.A. de C.V., 2003§; Metal-Pages, 2003c§).

Cía. Doe Run Perú plans to reduce refined metal output by 9% in 2003. This reduction in output is planned for copper, lead, and zinc; production levels for antimony, bismuth, and silver are to be maintained at the same levels as in 2002 (Platts Metals Week, 2003b).

Consumption.—Japan continues to import increasing quantities of bismuth as it leads worldwide efforts to reduce the use of lead and cadmium in soldering, plumbing, and metal alloys. Bismuth is also being used to a greater extent in the Japanese industrial oil sector and as a cheaper alternative to organic compounds in pigments (Metal-Pages, 2003a§).

According to the Bismuth Producers Association (Brussels, Belgium), additional use of bismuth in galvanizing baths is anticipated as a replacement for lead. Bismuth in the bath allows the galvanization to be thinner and more even, with less accumulation on edges. Reduced accumulation avoids edge

growths, which break off and allow rusting to begin (Yves Palmieri, Bismuth Producers Association, oral commun., August 6, 2003).

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TABLE 1
SALIENT BISMUTH STATISTICS¹

(Kilograms unless otherwise specified)

| | 2002 | 2003 | |
|----------------------------------------|-----------|----------------------|----------------------|
| | | First quarter | Second quarter |
| Consumption | 2,230,000 | 431,000 ^e | 432,000 ^e |
| Exports ² | 131,000 | 24,500 | 36,000 |
| Imports for consumption | 1,930,000 | 499,000 | 569,000 |
| Price per pound, dealer, end of period | \$3.20 | \$2.70 | \$2.95 |
| Stocks, end of period, consumer | 88,800 | 133,000 ^e | 234,000 ^e |

^eEstimated.

¹Data are rounded to no more than three significant digits.

²Comprises bismuth metal and the bismuth content of alloys and waste and scrap.

TABLE 2
BISMUTH METAL CONSUMED IN THE UNITED STATES, BY USE¹

(Kilograms)

| Use | 2002 | 2003 ^e | |
|-------------------------|-----------|-------------------|----------------|
| | | First quarter | Second quarter |
| Chemicals ² | 814,000 | 163,000 | 193,000 |
| Bismuth alloys | 985,000 | 160,000 | 150,000 |
| Metallurgical additives | 383,000 | 103,000 | 83,400 |
| Other | 45,300 | 5,430 | 5,190 |
| Total | 2,230,000 | 431,000 | 432,000 |

^eEstimated.

¹Data are rounded to no more than three significant digits, may not add to totals shown.

²Includes industrial and laboratory chemicals, cosmetics, and pharmaceuticals.

TABLE 3
U.S. EXPORTS OF BISMUTH METAL, ALLOYS AND WASTE AND SCRAP, BY COUNTRY¹

(Kilograms)

| Country | 2003 | | | | | | |
|----------------------|---------|-------|---------------|-------|--------|-------|--------------|
| | 2002 | March | First quarter | April | May | June | January-June |
| Belgium | 759 | -- | 10,500 | -- | -- | -- | 10,500 |
| Brazil | 999 | -- | 999 | -- | 500 | -- | 1,500 |
| Canada | 47,700 | 985 | 1,470 | 598 | 196 | 470 | 2,730 |
| China | 3,000 | -- | -- | -- | -- | -- | -- |
| Costa Rica | -- | -- | 492 | -- | -- | -- | 492 |
| Dominican Republic | 500 | 108 | 270 | 363 | 240 | 246 | 1,120 |
| Egypt | -- | -- | 340 | -- | -- | 108 | 448 |
| Germany | 6 | -- | -- | -- | 4 | -- | 4 |
| Guatemala | -- | -- | -- | 143 | -- | -- | 143 |
| Hong Kong | 332 | 26 | 61 | 23 | -- | 25 | 109 |
| Hungary | -- | -- | 136 | -- | -- | -- | 136 |
| Israel | 167 | -- | -- | -- | -- | -- | -- |
| Japan | 66 | -- | -- | -- | 18,800 | 1940 | 20,700 |
| Korea, Republic of | 4 | -- | -- | -- | -- | -- | -- |
| Malaysia | 9,520 | -- | -- | -- | -- | -- | -- |
| Mexico | 34,800 | 6,140 | 7,640 | 5,080 | 7,230 | -- | 19,900 |
| Netherlands | 5,990 | -- | -- | -- | -- | -- | -- |
| Peru | 4,000 | -- | -- | -- | -- | -- | -- |
| Russia | 2,070 | 1,510 | 1,510 | -- | -- | -- | 1,510 |
| Singapore | 150 | -- | -- | -- | -- | -- | -- |
| United Arab Emirates | 58 | -- | -- | -- | -- | -- | -- |
| United Kingdom | 20,600 | 6 | 1,110 | -- | 1 | -- | 1,110 |
| Total | 131,000 | 8,770 | 24,500 | 6,210 | 27,000 | 2,790 | 60,400 |

-- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 4
U.S. IMPORTS FOR CONSUMPTION OF BISMUTH METAL, BY COUNTRY¹

(Kilograms, metal content)

| Country | 2003 ² | | | | | | |
|----------------|-------------------|---------|---------------|---------|---------|---------|--------------|
| | 2002 | March | First quarter | April | May | June | January-June |
| Bahamas, The | 684 | -- | 219 | -- | -- | -- | 219 |
| Belgium | 724,000 | 51,900 | 143,000 | 61,300 | 111,000 | 101,000 | 416,000 |
| Canada | 49,800 | 9,200 | 12,600 | 1,550 | 1,090 | 3,400 | 18,600 |
| China | 393,000 | 20,200 | 153,000 | 67,000 | -- | 17,400 | 237,000 |
| Germany | 835 | 16,600 | 16,600 | 32,300 | -- | -- | 49,000 |
| Hong Kong | 58,500 | -- | -- | -- | 200 | -- | 200 |
| Italy | 208 | -- | 200 | -- | -- | -- | 200 |
| Japan | 3,150 | -- | -- | -- | -- | -- | -- |
| Mexico | 518,000 | 18,000 | 128,000 | 54,200 | 36,200 | 36,800 | 256,000 |
| Netherlands | 102 | 12 | 15 | -- | 21 | -- | 36 |
| Peru | 19,500 | -- | -- | -- | -- | -- | -- |
| Spain | -- | -- | -- | 200 | -- | -- | 200 |
| United Kingdom | 163,000 | 18,700 | 45,600 | 16,800 | 11,500 | 16,700 | 90,600 |
| Total | 1,930,000 | 135,000 | 499,000 | 233,000 | 160,000 | 175,000 | 1,070,000 |

-- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.