



2006 Minerals Yearbook

COPPER

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In the United States, mine production of recoverable copper in 2006 rose by about 60,000 metric tons (t) (5%) to 1.20 million metric tons (Mt) owing to uninterrupted production by a major producer which had experienced a 16-week strike during 2005; higher copper ore grades and mill throughput by a major producer that had altered mine plans, to favor molybdenum production in 2005; and startup of several small producers. Downstream, U.S. smelter production was down by 4% from that in 2005, in large part owing to temporary closures at the three operating smelters during the year, and refinery production was essentially unchanged. Equipment, labor shortages, and production problems reduced output at startup operations.

Electrowon production of refined copper from the leaching of copper ores, which declined for the fifth consecutive year, decreased by 23,000 t and accounted for 44% of mine output and 42% of refined copper production. U.S. reported consumption of refined copper declined by 7% to the lowest level in 15 years and was down by 30% from peak consumption in 2000.

Global mine production of copper was essentially unchanged in 2006. Owing to production shortfalls in Chile, Indonesia, and Mexico, global mine production fell short of its anticipated level, and mine capacity utilization fell for the fifth consecutive year. The United States accounted for about 8% of world production and was the world's second leading mine producer behind Chile, which accounted for 36% of total world production. Global smelter and refinery production rose by about 4% and 5%, respectively, owing to increased secondary production and a drawdown of concentrate stocks. The United States fell to ninth place behind Canada in world smelter production and remained fourth in refinery output behind China, Chile, and Japan.

According to data compiled by the International Copper Study Group (ICSG) (2007a, p. 19-20), global consumption of refined copper rose by about 400,000 t (2%), primarily owing to strong demand in Europe. Apparent demand in China, which had risen by more than 95% during the preceding 5 years, declined by about 1%. China remained the leading consumer, however, accounting for 21% of global consumption. Note, however, that changes in unreported inventories held by industry and China's State Reserve Bureau may have distorted year-on-year measurement of apparent consumption.

The refined copper production deficit relative to demand that had developed during the preceding 3 years eased during 2006, and according to the ICSG, estimated global inventories of refined copper rose by almost 240,000 t, yet remained about one-half the level held in 2002 (International Copper Study Group, 2007a, p. 9). Despite this, copper prices continued a 4-year upward trend, and the COMEX (COMEX Division of the New York Mercantile Exchange) spot price reached a record-high value of more than \$4.00 per pound of copper in

May, more than double the previous record set during 2005, and averaged more than \$3.08 per pound of copper for 2006.

The principal mining States for copper were, in descending order of production, Arizona, Utah, New Mexico, Nevada, and Montana, which accounted for 99% of domestic production; copper was also recovered at mines in Idaho and Missouri. Although copper was recovered at 26 mines that operated in the United States, 17 mines accounted for about 99% of production. The remaining mines were either small leach operations or byproduct producers of copper.

In 2006, copper recovered from refined or remelted scrap (about 85% from new scrap and 15% from old scrap) comprised 32% of the total U.S. copper supply. The conversion of old scrap to alloys and refined copper decreased by about 18% to 150,000 t of recoverable copper. Copper was consumed as refined copper and as direct melt scrap at about 30 brass mills, 16 wire-rod mills, and 500 chemical plants, foundries, and miscellaneous operations.

Legislation and Government Programs

In July 2006, the U.S. Environmental Protection Agency (EPA), as part of its review of existing drinking water standards, proposed and solicited comments on seven targeted regulatory changes aimed at reducing public exposure to lead in drinking water. While copper levels were not targeted, several actions, including the required advance notification and approval of changes to water treatment protocols that could affect a water systems corrosion control, changes in proposed timelines for allowing plumbing replacement as a treatment option for reducing lead or copper levels, and changes to sampling frequency, could affect the use of copper and copper alloys in water supply markets (U.S. Environmental Protection Agency, 2006).

In October, the EPA proposed national emission standards for hazardous air pollutants (NESHAP) for four area source categories, including primary and secondary copper smelters. It concluded that for primary copper smelters, emission control devices and work practices at these facilities represented the generally available control technology (GACT). For secondary copper smelters, the proposed NESHAP was for new area sources, as there were no existing sources in this category. In the final rule issued in January 2007, however, it recognized that not all smelters used the continuous converting technology, upon which their initial analysis was based, and that for those that use batch technology, a different standard was required. As such, the EPA developed GACT standards for these smelters based on one batch-converting operation it determined was effectively controlling its hazardous air pollutants (U.S. Environmental Protection Agency, 2007).

Production

Domestic mine production rose by about 60,000 t to its highest level since 2001, following a return to full production of mines affected by a 16-week strike in 2005; startup of new mines in Montana, Nevada, and Utah; higher output at mines that had reduced output during 2005 owing to pit stability and weather problems; and restart of concentrate production at a major mine in Arizona. Capacity utilization remained low, however, owing to startup problems at the new mines and the preferential mining of high-molybdenum ore by at least one producer. After final permits were received, construction began on a major new mine-for-leach operation in Arizona. Downstream copper smelter production decreased by about 4% from the low level of 2005 to the lowest level since World War II owing to temporary shutdowns during the year at the three operating smelters. Refinery production remained essentially unchanged owing to a drawdown of in-process material and increased imports of anode and blister feed material. Four primary electrolytic refineries and 14 solvent extraction-electrowinning (SX-EW) facilities operated during 2006. Despite lower or stagnant output, the calculated smelter and refinery capacity utilization rates rose to 72% and 57%, respectively. U.S. smelter and refinery capacity declined to 700,000 (22%) and 2.1 Mt (7%), respectively owing to the permanent closures and announced dismantling of facilities that had been retained on care-and-maintenance status since closing in 2001.

Company Reviews.—Asarco LLC (formerly ASARCO Incorporated) continued to operate under Chapter 11 reorganization protection throughout 2006. In December, Asarco applied for and was subsequently granted a 4-month extension to its January 5, 2007, extended deadline for filing a reorganization plan in order to settle claims from asbestos claimants, creditors, and environmental liabilities. The January 5 extension had been granted to allow negotiation of a new labor contract, which was tentatively reached on December 29 between Asarco and the United Steel Workers Union, and which was subsequently ratified by the membership. The new contract was to run through June 30, 2010 (Barry, 2006a, c; 2007a, b).

Mine production at Asarco's three mines in Arizona (Mission Complex, Ray, and Silver Bell) rose by almost 25% from that in 2005 owing to the settlement of a 16-week strike that had sharply curtailed production during 2005. Beginning June 17, Asarco's Hayden smelter in Arizona was closed for 5 weeks following partial collapse of the roof of the building that housed its two anode furnaces (Barry, 2006b).

Copper production from BHP Billiton's (Melbourne, Australia) residual Arizona leach operations at Miami and Pinto Valley continued to decline, decreasing to 7,700 t in 2006 from 8,800 t in 2005 (BHP Billiton, 2007b, p. 2). In September, Resolution Copper Company [55% Rio Tinto plc (London, United Kingdom) and 45% BHP Billiton] announced that it had completed rehabilitation of the Never Sweet Tunnel as part of the first phase of a comprehensive 5-year, \$200 million feasibility study. This milestone would provide access for future development of the large Resolution copper sulfide deposit located more than 2,100 meters below the surface and beneath

BHP Billiton's shuttered Magma Mine (Resolution Copper Company, 2006).

Constellation Copper Corp. (Denver, CO) began applying acid solution to its leach dumps at its Lisbon Valley Mine in Utah in December 2005, commissioned its SX-EW plant in March 2006, and reported its first commercial production in November. A series of issues including materials handling problems associated with mining sandstone, high acid consumption, reduced efficiency of solvent extraction during cold weather, and disruption to its acid supply, led to lower than anticipated annual production of 5,270 t of cathode. Though ore mined in 2006 averaged 0.303% copper, yearend reserves were expanded to 172,000 t of copper contained in ore grading an average of 0.513% copper (Constellation Copper Corp., 2007, p. 3-17).

In December, Mercator Minerals Ltd. (Kingman, AZ, and Vancouver, British Columbia, Canada) published an updated preliminary feasibility study for a proposed expansion of its Mineral Park Mine in northwestern Arizona. The existing operation consisted of a run-of-the-mine leach facility with a capacity to produce 6,800 metric tons per year (t/yr) of electrowon copper, though production was reported to be at about one-half that level. The revised technical report was for the two-stage development of 45,000-metric-ton-per-day (t/d) milling capacity that would produce 26,000 t/yr and 5,700 t/yr, respectively, of copper and molybdenum in concentrate. Startup of a 23,000-t/d mill was expected by the second quarter of 2008, with a duplicate mill expected to start about 1 year later. Proven and probable reserves of mill ore were estimated to be 396 Mt with a copper equivalent grade of 0.368% copper. Life-of-mine mill production was projected to be 500,000 t of copper and 117,000 t of molybdenum. Leach reserves were estimated to be 75 Mt grading 0.07% copper (Mercator Minerals Ltd., 2006a, b; 2007).

Mines Management, Inc. (Spokane, WA) announced that having received final approval in November from the Montana State Department of Environmental Quality, it was proceeding with development activities at its Montanore silver-copper project in northwestern Montana. Noranda Minerals Corp. (now owned by Xstrata plc) had previously developed an adit and surface facility at the site that it abandoned in 1996 (Mines Management, Inc., 2007).

Nord Resources Corporation (Dragoon, AZ) continued working toward the reopening of its Johnson Camp Mine located in southern Arizona, which last produced in August 2003. In October, Nord Resources announced plans for it to be acquired by Platinum Diversified Mining, Inc., a Cayman Islands acquisition corporation seeking businesses in the metals and mining industry. As of February 2007, the merger had not been effected, as Platinum was seeking to secure a \$30 million credit facility (Nord Resources Corporation, 2006; 2007).

St. Geneviève Resources Ltd. (Montreal, Quebec, Canada), which had previously acquired two past producing mines in Arizona, Emerald Isle and Zonia, announced completion of independent technical reports and estimates of resources for the two mines based on inherited and new drill core information. The estimated resources for Emerald Isle totaled 2.2 Mt of ore at a cutoff grade of 0.3% copper, and for Zonia, 63 Mt of ore at a cutoff grade of 0.37% copper and 460 Mt at a cutoff grade of

0.25% copper. An expansion and modification to the existing 2,900-t/yr SX-EW facilities were underway with an objective of eventually producing 4,500 t/yr of cathode. At yearend, the company was still awaiting completion of a prefeasibility study (St. Geneviève Resources Ltd., 2006a, b).

In 2006, Phelps Dodge Corp. reported copper production of 1.16 Mt, which included minority participants' share of 248,000 t, from its worldwide operations, compared with 1.17 Mt and 223,000 t, respectively, in 2005. U.S. production in 2006, including minority participation in the Morenci Mine, was 642,000 t of copper (459,000 t electrowon and 183,000 t in concentrate), down from 671,000 t of copper (515,000 t electrowon and 168,000 t in concentrate) in 2005 (Phelps Dodge Corp., 2007, p. 14).

At yearend 2005, Phelps Dodge announced its intent to return to its core business of mining and refining. In April 2006, Phelps Dodge reported that it had sold its Columbian Chemicals Company, a leading producer of carbon black. It also sold its North American magnet wire assets to Rea Magnet Wire Company, Inc. (Fort Wayne, IN), and its High Performance Conductors of SC & GA, Inc. to International Wire Group, Inc. (St. Louis, MO) (Phelps Dodge Corp., 2006c, d; Rea Magnet Wire Company, Inc., 2006).

Production of electrowon copper at the Morenci Mine complex in Arizona of 355,000 t was down by about 9,000 t from that in 2005. In June 2005, Phelps Dodge announced that it would spend \$210 million to recommission its concentrator and construct the first-ever commercial-scale copper concentrate leaching and direct electrowinning facility at Morenci using proprietary pressure leaching technology developed at its Bagdad Mine in Arizona. Though startup of the 68,000-t/yr-of cathode leach plant was not scheduled until mid-2007, Morenci produced 15,000 t of copper in concentrate during the fourth quarter of 2006 for treatment at its Miami smelter. Mill-head grades for concentrated ore averaged 0.56% copper compared with 0.33% mine-for-leach ore (Phelps Dodge Corp., 2007, p. 3-14).

Production at Phelps Dodge's Bagdad Mine in Arizona declined to 75,000 t (53,000 t in net concentrate and 22,000 t electrowon) from 91,300 t (76,900 t in net concentrate and 14,300 t electrowon) in 2005. Net concentrate production decreased owing to an 18% drop in mill-head grade to 0.33% copper and to increased leaching of concentrate (Phelps Dodge Corp., 2007, p. 5-13).

At the Sierrita copper-molybdenum mine in Arizona, copper production remained essentially unchanged at about 73,300 t (66,800 t in concentrate and 6,500 t electrowon) while production of molybdenum rose to 9,000 t from 8,400 t in 2005. A new 18,000-t/yr copper sulfate plant started in early 2006, though it operated below capacity (Phelps Dodge Corp., 2007, p. 5-16).

At Miami, AZ, Phelps Dodge's electrowon production from residual leach operations decreased to 8,600 t of copper from 11,200 t in 2004. At yearend, the mine, which has remained on care-and-maintenance status since mining was suspended in 2001, had reported reserves of 87,000 t of leach ore grading 0.41% copper. Production of refined copper at its El Paso, TX, refinery declined to 256,000 t from 268,000 t in 2005 (Phelps Dodge Corp., 2007, p. 9-16).

In New Mexico, concentrate production at the Chino Mine rose by about 2,000 t to 48,000 t owing to significantly higher mill-head grades (0.67% copper compared with 0.51% in 2005). Electrowon production declined to 36,000 t from 49,000 t in 2005 owing to a 32% drop in leach ore placement. At the current rate of extraction, proven and probable reserves at Chino were sufficient for only 7 years of production. An additional 85 Mt of leachable reserves are located at the nearby, shuttered Cobre Mine, which could be trucked to Chino for processing. At the Tyrone Mine, production of electrowon copper decreased for the fifth consecutive year to 28,800 t, less than one-half the production rate in 2002 (Phelps Dodge Corp., 2007, p.13-20).

In February, Phelps Dodge announced that its board of directors had given approval to develop its Safford Mine in Arizona. The mine-for-leach project, scheduled for startup in the second half of 2008, was expected to cost \$550 million and was projected to produce about 110,000 t/yr of electrowon copper during a mine life of 18 years. In July, the company received the necessary air quality permit for it to begin construction (Phelps Dodge Corp., 2006b, e).

PolyMet Mining Corp. (Vancouver, British Columbia, Canada) announced in November that permitting of its NorthMet copper-nickel-precious metals project (mine and processing plant) in northeastern Minnesota was well advanced and it was working with the State to insure that its draft environmental impact statement would be acceptable. PolyMet expected to meet its target of producing metal by the fourth quarter of 2008. In December, PolyMet announced that it had secured a power contract and had purchased additional infrastructure from Cleveland-Cliffs Inc, whose Erie taconite mill, located about 10 kilometers from NorthMet, and connecting rail line had been previously purchased. Annual production during the first 5 years was projected to average 33,000 t/yr of electrowon copper cathode, 7,000 t/yr of contained nickel, and 3,300 kilograms per year of precious metals. The proven and probable reserves were estimated to be 165 Mt grading 0.31% copper (Polymet Mining Corp., 2006a, b, c).

Quadra Mining Ltd. (Vancouver, British Columbia) reported that its Robinson Mine in Nevada produced 55,100 t of copper in concentrate compared with 57,200 t in 2005. While mill-head grade rose to 0.61% copper from 0.55% in 2005, mill recovery rates declined to 65.4% from 76.3% in 2005 and cash operating costs (net of byproduct credits) rose to \$1.74 per pound of copper from the revised figure of \$1.31 per pound in 2005. At yearend, proven and probable reserves had declined to more than 122 Mt of ore grading 0.69% copper and 0.26 grams per ton (g/t) gold (Quadra Mining Ltd., 2007b, p. 3-6).

In November, Quadra announced that the board of directors had approved development of the \$128 million Carlota project in the Globe/Miami Arizona mining district. Startup was scheduled for the second half of 2008 with expected production of 13,000 t of electrowon copper in 2008, ramping up to 34,000 t in 2009. Mine life was projected to be 11 years, from 78 Mt of leachable reserves grading 0.45% copper. In 2005, Quadra had acquired the Carlota project from Cambior Inc. (Longueuil, Quebec, Canada) for about \$23 million (Quadra Mining Ltd., 2007a).

At Rio Tinto plc's Bingham Canyon Mine in Utah, production of copper in concentrate rose by 20% to 266,000 t owing to higher mill throughput and ore grades. Copper mill-head grade rose to 0.63% copper from 0.53% copper in 2005, while byproduct molybdenum grades declined to 0.033% from 0.058% in 2005. Refinery production, however, decreased to 218,000 t from 232,000 t owing to a planned maintenance shutdown of the Garfield, UT, smelter in September and October. The East 1 pushback of overburden, which would extend the life of the open pit, continued throughout the year (Rio Tinto plc, 2007, p. 13, 24).

Consumption

U.S. reported consumption of refined copper declined by 7% to the lowest level in 15 years and was down by more than 30% from peak consumption in 2000. Shipments by domestic producers of wire rod declined by 5.8%, and U.S. apparent consumption of wire rod declined by 6.1% from that in 2005. Net imports of wire rod declined to 204,000 t from 220,000 t in 2005. Shipments during the fourth quarter were particularly weak, declining by 23% from those during the fourth quarter of 2005. The sharp decline was attributed to the weak housing market and high copper prices that encouraged destocking along the entire supply chain (American Bureau of Metal Statistics, 2007b).

Brass mill product shipments by domestic producers declined to 737,000 t in 2006 from 770,000 t in 2005. The performance of individual market segments was mixed, however, with building-related product markets such as copper tube and alloy rod declining by 14% and 1%, respectively, and industrial and electrical market segments such as alloy strip and sheet, flat rolled copper products, and copper rod and bar increasing by 4.4%, 2.1%, and 1.6% respectively. In addition to weakness in the housing market, the copper tube market, which accounted for 33% of brass mill shipments in 2006, down from 37% in 2005, was affected by the substitution of plastic in light of high copper prices (American Bureau of Metal Statistics, Inc., 2007a).

According to preliminary data from the Copper Development Association, Inc. (2007, p. 18-21), the total supply of copper and copper-alloy products to the U.S. market by fabricators (brass mills, wire mills, foundries, and powder producers), which included net imports, declined by about 2% in 2006 from the revised shipments for 2005. Brass mill products accounted for about 47% of total shipments to the domestic market; wire mill products, 50%; and foundry and powder products, 3%. Building construction, which was the largest end-use sector, accounted for about 51% of the market, followed by electric/electronic products (19% market share), consumer and general products (11% market share), transportation equipment (10% market share), and industrial machinery and equipment (9% market share).

Prices and Stocks

Copper prices continued the upward trend begun in the second half of 2003 that had led to a progression of record-high prices

during the second half of 2005. The COMEX spot price which closed 2005 at \$2.16 per pound, continued to trend upward during the first quarter of 2006, peaking at \$2.50 per pound on March 30. The price rise took place despite a nominal rise in global commodity exchange inventories in January and February [(COMEX, London Metal Exchange Ltd. (LME), and Shanghai Futures Exchange (SHFE)] from their low levels at yearend 2005. In April, prices began a precipitous climb, and reached an alltime high of almost \$4.08 per pound on May 23. The price spike coincided with a decline in global exchange inventories, which by the end of April had fallen back to near yearend 2005 levels. The sharp rise in prices also coincided with a downward assessment by industry analysts of the near-term availability of copper supply, specifically owing to reduced copper production in Indonesia and labor unrest in Mexico (Platts Metals Week, 2006a). A price decline in June to an average of \$3.40 per pound of copper, coincided with a reported selloff of contracts by commodity funds and industry reports of limited buying on the spot market by U.S. consumers of copper owing to a combination of greater scrap availability and a desired reduction in inventory by consumers ahead of a summer slowdown (Barry, 2006e).

The COMEX price averaged \$3.54 per pound of copper during the third quarter, sustained by low stock levels and continued concern over disruptions to supply. During the fourth quarter, however, slumping demand, especially in Europe and North America, concern over material substitution resulting from high prices, and increasing global inventories, led to a decline in prices (Platts Metals Week, 2006b). At yearend, the COMEX spot price had fallen back to \$2.85 per pound, global commodity exchange inventories had risen to 253,000 t, an increase of almost 100,000 t from those at yearend 2005, and the COMEX and LME prices were at parity.

Copper scrap prices generally followed the upward trend in refined copper prices. With higher refined prices, however, the discount of most grades of copper scrap to refined copper rose to record-high levels. According to American Metal Market data, the average discount for refiners No. 2 scrap rose to 48 cents per pound from 31 cents per pound in 2005 and from 21 cents per pound in 2004, and the discount for brass mill No. 1 scrap rose to 18 cents per pound from 15 cents per pound in 2005 and from about 3 cents per pound in 2004.

Foreign Trade

According to the U.S. Census Bureau data, net refined copper imports in 2006 of 967,000 t were essentially unchanged from those in 2005. Chile was the leading source of unwrought copper products from 2001 through 2006 and accounted for 39% of unmanufactured imports, followed by Canada, 32%, and Peru, 15%. Refined copper accounted for 79% of unwrought copper imports during the same period. According to U.S. Census Bureau data, adjusted by the USGS to reflect copper content, exports of contained copper in concentrates totaled 108,000 t in 2006.

According to the U.S. Census Bureau data compiled by the Copper and Brass Fabricators Council Inc. (2007, p.1-9), U.S. imports of 311,000 t of copper and copper-alloy semifabricated

products (excluding wire-rod mill products) were up by 7% from those of the previous year, and exports of 164,000 t were unchanged from those in 2005. Consequently, net imports rose to 147,000 t in 2006 from 122,000 t in 2005. In 2006, Canada and Mexico collectively accounted for 72% of semifabricate copper exports and 27% of imports.

According to the American Bureau of Metal Statistics (2007b) adjusted trade data, imports of copper wire rod decreased to 355,000 t from 366,000 t in 2005, exports rose nominally to 148,000 t from 145,000 t in 2005, and the resulting net imports declined to 206,000 t from 220,000 t in 2005. Canada remained the leading source of imports (48%), followed by Russia (31%), Mexico (12%), and Brazil (9%). Despite losing their duty-free status under the General System of Preferences program effective July 1, 2005, that had waived the 3% ad valorem tariff, imports of wire rod from Russia increased to 110,000 t from 102,000 t in 2005 and 29,000 t in 2004.

Exports of copper scrap for 2006 totaled 803,000 t, up from 643,000 t in 2005. China (including Hong Kong) was the destination for 66% of domestic scrap exports and, based on import data, accounted for 68% of reported global scrap imports of 7.5 Mt (International Copper Study Group, 2007a, p. 41-44).

The International Trade Administration, U.S. Department of Commerce, initiated sunset reviews of the antidumping and countervailing duty (CVD) orders against certain brass sheet and strip from Brazil, Canada, France, Italy, Germany, and Japan. While it held that the revocation of duties would likely lead to recurrence of dumping or countervailing subsidy for 200 series brass (as defined by the Copper Development Association, Inc.) sheet between 0.15 millimeters (mm) and 4.8 mm from France, Germany, Italy, and Japan, it revoked CVD orders for material from Brazil and Canada (U.S. Department of Commerce, 2006a, b).

World Industry Structure

World production of refined copper rose by about 5% to 17.4 Mt. World copper use, according to the ICSG, rose by about 2% to 17.1 Mt (International Copper Study Group, 2006, p. 19). Consequently, the global market balance, which had experienced a production deficit and drawdown in inventories in each of the preceding 3 years, indicated a small production surplus and increase in global inventories of about 240,000 t. That increase however, only developed during the fourth quarter of the year, with inventories below those of yearend 2005 during the second and third quarters of the year. Owing to the production deficit during the preceding 3 years (2003-05) of about 1.5 Mt, global inventories remained very low by historical standards and at yearend 2006 represented only a 23-day supply. Yearend inventories held on the global commodity exchanges rose to 253,000 t from 124,000 t at yearend 2005, but were down from 1.3 Mt at the beginning of 2003.

While world primary smelter and refinery production rose significantly, world mine production of copper remained essentially unchanged from that in 2005, increasing by about 40,000 t. Though total mine production rose nominally owing to an 160,000-t increase in electrowon production, the production of copper in concentrates declined by about 120,000 t, principally owing to production problems in Indonesia.

Consequently, there was a shortage in the production of copper in concentrate, that, according to CRU International Ltd., led to tight concentrate supplies and a drawdown in concentrate inventories of about 400,000 t of contained copper (CRU International Ltd., 2007, p. 56-60). Spot treatment and refining charges at global smelters, which had averaged about 40 cents per pound of copper during the fourth quarter of 2005, averaged less than 10 cents per pound during the third quarter of 2006 before rising to about 12 cents per pound during the fourth quarter. According to ICSG data, capacity utilization at global smelters rose by 0.7% to 86.3% as the growth in smelter production was essentially matched by an increase in capacity (International Copper Study Group, 2007a, p. 13; 2007b, p. 13).

The upward trend in world use of refined copper (2002-04) that stalled in 2005, resumed in 2006 when world refined copper use rose to 17.1 Mt from 16.7 Mt in 2005. North America was the only major copper-consuming region of the world where use declined. In the European Union-15 countries, apparent use rose by 11% from its depressed 2005 level, and in Asia, use remained unchanged as growth in Japan was countered by declines in China and the Republic of Korea. In China, the leading global consumer of refined copper, apparent consumption declined by about 1% to 3.63 Mt following a more than 13% increase in 2005. China's consumption, however, was based on reported data (production plus net trade plus or minus SHFE stock changes) and did not take into account changes in unreported stocks (State Reserve Bureau, producer, consumer and merchant/traders), which were thought to have declined significantly during 2006 (International Copper Study Group, 2007a, p. 9-10).

Consolidation of the global copper industry continued in 2006. During a 4-month period beginning in June, several global mining companies vied for control of Canadian metals producers Inco Ltd. (Toronto, Ontario) and Falconbridge Ltd. (Toronto, Ontario). On June 25, Falconbridge, Inco, and Phelps Dodge entered into a "combination agreement" where Inco would first acquire Falconbridge and Phelps Dodge would then acquire the enlarged Inco. On July 28, Inco, having failed to acquire its minimum tender condition of 50.01% of Falconbridge common shares, terminated its offer for Falconbridge. On September 5, Inco and Phelps Dodge terminated their agreement, and Inco paid Phelps Dodge a gross termination fee of \$125 million (\$82.3 million net of expenses), freeing Inco to accept an all-cash offer by Companhia do Vale Rio Doce (CVRD) (Rio de Janeiro, Brazil) for 100% of Inco's outstanding common shares. By November 3, CVRD held 87% of Inco's common shares. CVRD was the leading global producer of iron ore and had significant interests in aluminum, kaolin, and fertilizer raw materials. In 2004, CVRD entered the copper market with the startup of the Sossego Mine in Brazil (Companhia do Vale Rio Doce, 2006a, b; Inco Ltd., 2006; Phelps Dodge Corp., 2006d, p. 5).

On July 19, Xstrata plc (Zug, Switzerland) extended a cash offer to purchase all the outstanding common shares of Falconbridge, and by November 1, had acquired 100% ownership. Xstrata plc is a global mining company with significant holdings in seven mineral commodities, including copper. Xstrata Copper is headquartered in Brisbane, Australia, and, following the acquisition of Falconbridge, had annual

managed production of more than 1 million metric tons per year (Mt/yr) of copper from operations in Argentina, Australia, Canada, Chile, and Peru (Xstrata plc, 2006a, b).

On November 19, Phelps Dodge and Freeport-McMoRan Copper & Gold Inc. (FCX) (New Orleans, LA) announced that they had signed a definitive merger agreement under which Freeport-McMoRan would acquire Phelps Dodge for approximately \$29.5 billion in cash and stock. Under terms of the agreement, Phelps Dodge shareholders would receive a combination of cash and stock worth about \$126 per share, which represented a 33% premium based on the November 17 closing price of Phelps Dodge stock. The combined company would be the largest North American-based mining company and the largest privately held copper company in the world based on the combined production of the two companies in 2005 of about 1.5 Mt of copper. While Phelps Dodge had copper assets in Africa, North America, and South America and Freeport-McMoRan's only mine was the Grasberg Mine in Indonesia. The corporate headquarters would be in Phoenix, though management of Grasberg would remain in New Orleans. The acquisition was subsequently completed on March 19, 2007, and each share of Phelps Dodge common stock was exchanged for 0.67 share of FCX common stock and \$88.00 in cash (Phelps Dodge Corp., 2006a; Freeport-McMoRan Copper & Gold Inc., 2007).

World Review

Mine Production.—In 2006, world mine capacity continued its strong upward growth, and according to estimates, increased by more than 300,000 t (2%) (International Copper Study Group, 2006, p. 12-63). Significant capacity growth took place in Chile (85,000 t), China (55,000 t), Congo (Kinshasa) (25,000 t), Iran (35,000 t), Laos (30,000 t), and Zambia (50,000 t). The capacity utilization rate declined for the second consecutive year, falling to 88.5% in 2006 from 89.9% in 2005 and 92.2% in 2004 and was at its lowest level in more than 10 years. Mine production during 2006 continued to suffer from a number of problems including equipment breakdowns, revisions of mine production plans, and a global shortage of major equipment including haulage trucks and tires (CRU International Ltd., 2007, p. 24).

Australia.—Despite the opening of several new mines during 2005, mine production decreased by about 6%, led by a drop in production at BHP Billiton's Olympic Dam Mine to 183,000 t owing to lower ore grades and mill throughput. Production in the second half of 2006 decreased to 81,300 t from 102,600 t in the second half of 2005. BHP Billiton acquired Olympic Dam during the third quarter of 2005 from WMC Resources Ltd. During 2006, BHP Billiton undertook a prefeasibility study to assess a major expansion of the facilities (BHP Billiton, 2007a, b).

Chile.—Production rose by about 40,000 t as increases at some mines were largely offset by reduced production from Corporación Nacional del Cobre de Chile (Codelco) mines. Total production from Codelco's mines declined to 1.78 Mt in 2006 from 1.83 Mt in 2005 as all but its Salvador Division and its proportional share of El Abre had lower output. Despite a capacity increase during 2005 at Codelco Norte, production

decreased to 941,000 t from 965,000 t, primarily owing to a landslide on July 23 that knocked out an ore conveyor system and led to reduced output through mid-September. Operations started at the 129,000-t/yr heap-treatment plant for ore from the north expansion of the Mina Sur ore body. At the Andina Division, production decreased to 236,000 t from 248,000 t, in part owing to a concentrator fire in August, and at El Teniente production declined to 418,000 t from 437,000 t in 2005. Production at Salvador rose to 80,600 t from 77,500 t (Corporación Nacional del Cobre de Chile, 2007, p. 34-40).

At the Escondida Mine, the world's leading copper mine, production decreased to 1.22 Mt of payable copper (1.09 Mt in concentrate and 134,000 t electrowon) from 1.24 Mt (1.09 Mt in concentrate and 144,000 t electrowon) in 2005, primarily owing to startup of its sulphide leach plant in June and to a strike in August that led to a temporary declaration of a force majeure on copper concentrate shipments (BHP Billiton, 2007a, b). At the Cerro Colorado Mine, electrowon production rose to 115,400 t from 90,400 t in 2005. At Phelps Dodge's Candalaria, Ojos del Salado and El Abra Mines, combined production rose nominally to 413,000 t from 401,000 t in 2005 (Phelps Dodge Corp., 2007, p. 14).

China.—Production in China rose to 889,000 t from 777,000 t in 2005 without many noteworthy expansions. The Ashelee Mine, which began production in 2001, approached its capacity of 34,000 t/yr of copper in concentrate, and output increased from China's numerous small mines. The Dexing Mine (Jiangxi Copper Industry Co.) produced 136,000 t of copper contained in concentrate (International Copper Study Group, 2006, p. 30-33; Lim and Yu, 2007).

Congo (Kinshasa).—Production rose by 41% (38,000 t) owing to increased output at most of its operations. At First Quantum Minerals Ltd.'s (Vancouver, British Columbia) Bwana/Lonshi operations production rose to 51,000 t of electrowon copper, up from 49,000 t in 2005, as ore grades rose to an average of 10.3% copper (First Quantum Minerals Ltd., 2007). Anvil Mining Ltd. reported that production at its Kulu operations rose to 19,600 t of copper in concentrate from 1,400 t in 2005, from ore grading an average of 8.07% copper, and production at its Dikulushi operations rose to 25,500 t of copper in concentrate from 20,100 t in 2005 from ore grading an average of 5.4% copper (Anvil Mining Ltd., 2007a, b).

Zambia.—First Quantum Minerals reported producing 127,000 t of copper (74,000 t in electrowon and 53,000 t in concentrate), up from 69,600 t of copper (41,500 t in electrowon copper and 28,100 t in concentrate) from the Kansanshi Mine that restarted in 2005, in part owing to an easing of a tire shortage that impaired hauling during 2005. An expansion program completed in early 2006 doubled sulfide ore milling capacity to 8 Mt/yr, and construction of an additional 4-Mt/yr circuit began late in the year. Construction of a high-pressure leach system to treat a portion of its high-grade concentrate was completed and will add 35,000 t/yr of electrowinning capacity in 2007. The Guelb Moghrein Mine, which began producing in the fourth quarter, produced 5,000 t of copper in concentrate (First Quantum Minerals Ltd., 2007).

Smelter and Refinery Production.—According to the ICSG, world smelter and refinery capacity rose by about 500,000 t to 16.3 Mt/yr and 20.5 Mt/yr, respectively (International Copper

Study Group, 2006, p. 17; 2007b, p. 16, 17). About one-half of the refinery capacity increase came from electrowinning associated with mine leach operations. China (230,000 t smelter and 270,000 t refinery), India (150,000 t), and Russia (50,000 t) accounted for most of the smelter and electrolytic refining increase. In China, the Jinchuan Non-ferrous Metal Co. completed an expansion that raised capacity of its smelter and refinery to 350,000 t/yr from 130,000 t/yr in 2005, and in India, the Birla Copper unit of Hindalco Industries Ltd. (Worli, Mumbai, India) commissioned an Ausmelt copper smelting and converting plant in November 2004 that allowed capacity to double to about 500,000 t/yr in 2006 from 250,000 t/yr in 2004. Production in 2006, however, remained well below capacity owing to technical problems encountered during ramp-up. In Russia, completion of expansion of the Karabash smelter in the Urals doubled smelting capacity to 260,000 t/yr, and the associated refinery increased capacity by 40,000 t/yr to 120,000 t/yr. A second expansion was expected to be completed in 2007. Full capacity was restored at Xstrata's Horne smelter in Canada following a reduction of about 25,000 t/yr in 2005 to improve acid recovery circuits.

In addition to the temporary closures during the year of the three U.S. smelters, several smelters experienced production difficulties that reduced global capacity utilization rates and freed concentrate for an undersupplied market. Freeport-McMoRan's Gresik smelter in Indonesia was closed for 2 months during the fourth quarter owing to oxygen supply problems. The 165,000-t/yr Rayong smelter and refinery in Thailand, commissioned in 2004 and which employed a rotary smelting reactor and Codelco's Teniente converting technology, had only negligible production (Barry, 2006d; CRU International Ltd., 2007, p. 37).

Outlook

The tight market balance between production and consumption, limited stock availability, and concerns over supply adequacy that characterized 2006 persisted into 2007. According to ICSG data for the first 9 months of 2007, copper availability remained extremely tight, with estimated consumption exceeding production by about 250,000 t, though reported copper inventories rose by about 60,000 t (International Copper Study Group, 2007a, p. 9). This apparent contradiction was probably the result of a surge in unreported inventories in China, where imports of refined and apparent consumption of copper for the first 9 months of the year were up by 195% and 38%, respectively, compared with that in the same period in 2005. Although copper mine capacity was projected to increase by almost 700,000 t/yr in 2007, production levels and the capacity utilization rate remained below expectations owing to labor strikes in Canada, Chile, Mexico, and Peru and lower than anticipated production in Africa, Indonesia, and the United States. Copper prices, which had risen to record-high levels of more than \$4.00 per pound at midyear 2006, fell below \$3.00 per pound during the first quarter of 2007, but rose sharply again in April, with the U.S. producer price averaging \$3.53 per pound during the second and third quarters of the year. Sustained high profits led to competition for and continued consolidation of global copper mining companies.

In the United States, despite initial expectations of growth, mine production was expected to decline slightly owing to lower ore grades at a major mine, and continued labor and equipment shortages throughout the industry. Production by domestic brass mills was lower during the first half of 2007 and was anticipated to decline sharply during the fourth quarter owing to substitution and a weak housing market. Despite lower demand, domestic production of wire rod declined only slightly during the first half of the year as the weak dollar led to a sharp reduction in imports. One copper tube producer announced it was closing one of its casting facilities, and ownership changes were announced at a major brass mill and wire/cable manufacturer. In addition to a major new mine-for-leach project in Arizona due onstream in 2008, several companies announced progress toward startup of new projects in Arizona, Minnesota, and Montana that would add 240,000 t/yr of new mine capacity by 2009.

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TABLE 1
SALIENT COPPER STATISTICS¹

(Metric tons, unless otherwise specified)

	2002	2003	2004	2005	2006	
United States:						
Mine production:						
Ore concentrated	thousand metric tons	104,000	114,000	139,000	154,000	163,000
Average yield of concentrated ore	percent	0.52	0.46	0.38	0.34	0.37
Recoverable copper:						
Arizona		767,000	741,000	723,000	690,000	712,000
New Mexico		112,000	87,800	122,000	131,000	113,000
Other States		263,000	287,000	312,000	319,000	372,000
Total		1,140,000	1,120,000	1,160,000	1,140,000	1,200,000
Total value	millions	\$1,910	\$2,100	\$3,420	\$4,360	\$8,310
Smelter production, primary and secondary						
Byproduct sulfuric acid, sulfur content	thousand metric tons	695	590	600	575	576 ^c
Refinery production:						
Primary materials:						
Electrolytic from domestic ores		725,000	532,000	531,000	524,000	531,000
Electrolytic from foreign materials		116,000	130,000	140,000	130,000	144,000
Electrowon		601,000	591,000	584,000	554,000	530,000
Total		1,440,000	1,250,000	1,260,000	1,210,000	1,210,000
Secondary materials (scrap), electrolytic and fire refined		69,900	53,300	50,800	47,200	44,800
Grand total		1,510,000	1,310,000	1,310,000	1,260,000	1,250,000
Secondary copper produced:						
Recovered from new scrap		840,000	737,000	774,000	769,000	819,000
Recovered from old scrap		190,000	207,000	191,000	183,000 ^r	150,000
Total		1,030,000	944,000	965,000	953,000 ^r	968,000
Copper sulfate production		49,200	32,100	25,100	25,600	19,500
Exports, refined		26,600	93,300	118,000	39,500	106,000
Imports, refined		927,000	882,000	807,000	1,000,000	1,070,000
Stocks, December 31:						
Blister and in-process material		44,400	56,800	51,400	44,300	18,800
Refined copper:						
Refineries		11,700	12,100	10,400	8,190	28,100
Wire-rod mills		23,000	29,700	20,300	20,400	21,500
Brass mills		28,700	20,200	21,500	24,500	34,500
Other industry		4,800	4,240	3,230	5,750	5,750
New York Commodity Exchange (COMEX)		362,000	255,000	43,700	6,180	30,900
London Metal Exchange (LME), U.S. warehouses		601,000	335,000	35,000	800	75,600
Total		1,030,000	656,000	134,000	65,900	196,000
Consumption:						
Refined copper, reported		2,370,000	2,290,000	2,410,000	2,270,000	2,110,000
Apparent consumption, primary refined and old scrap ²		2,610,000	2,430,000	2,550,000	2,400,000	2,190,000
Price:						
Producer, weighted average	cents per pound	75.80	85.25	133.94	173.49	314.75
COMEX, first position	do.	71.67	81.05	128.97	168.23	308.94
LME, Grade A cash	do.	70.72	80.68	129.96	166.84	304.85
World, production:						
Mine	thousand metric tons	13,600 ^r	13,800 ^r	14,700	15,000 ^r	15,100 ^c
Smelter	do.	12,600 ^r	12,700	12,900 ^r	13,600 ^r	14,100 ^c
Refinery	do.	15,600 ^r	15,300	16,000 ^r	16,600	17,400

^cEstimated. ^rRevised.

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

²In 2002, 2003, 2004, 2005, and 2006, apparent consumption is calculated using general imports of 1,060,000 metric tons, 687,000 tons, 704,000 tons, 977,000 tons, and 1,070,000 tons, respectively.

TABLE 2
LEADING COPPER-PRODUCING MINES IN THE UNITED STATES IN 2006, IN ORDER OF OUTPUT¹

Rank	Mine	County and State	Operator	Source of copper	Capacity (thousand metric tons)
1	Morenci	Greenlee, AZ	Phelps Dodge Corp.	Copper ore, concentrated and leached	420
2	Bingham Canyon	Salt Lake, UT	Kennecott Utah Copper Corp.	Copper-molybdenum ore, concentrated	300
3	Ray	Pinal, AZ	Asarco LLC ²	Copper ore, concentrated and leached	150
4	Chino	Grant, NM	Phelps Dodge Corp.	Copper-molybdenum ore, concentrated and leached	100
5	Bagdad	Yavapai, AZ	do.	do.	100
6	Sierrita	Pima, AZ	do.	do.	100
7	Robinson	White Pine, NV	Quadra Mining Ltd.	Copper-molybdenum ore, concentrated	60
8	Mission Complex	Pima, AZ	Asarco LLC ²	Copper ore, concentrated	70
9	Continental Pit	Silver Bow, MT	Montana Resources	Copper-molybdenum ore, concentrated	45
10	Tyrone	Grant, NM	Phelps Dodge Corp.	Copper ore, leached	80
11	Silver Bell	do.	Asarco LLC ²	do.	22
12	Miami	Gila, AZ	Phelps Dodge Corp.	do.	50
13	Phoenix	Elko, NV	Newmont Gold Co.	Gold-copper ore, leached	7
14	Lisbon Valley	San Juan, UT	Constellation Copper Corp.	Copper ore, leached	10
15	Mineral Park	Mohave, AZ	Mercator Minerals Ltd.	do.	5
16	Pinto Valley	Gila, AZ	BHP Billiton	do.	5
17	Miami	do.	do.	do.	5

¹The mines on this list accounted for 99% of U.S. mine production in 2006.

²Formerly ASARCO Incorporated.

TABLE 3
MINE PRODUCTION OF COPPER-BEARING ORES AND RECOVERABLE COPPER CONTENT OF ORES
PRODUCED IN THE UNITED STATES, BY SOURCE AND TREATMENT PROCESS¹

(Metric tons)

Source and treatment process	2005		2006	
	Gross weight ²	Recoverable copper	Gross weight ²	Recoverable copper
Mined copper ore:				
Concentrated	154,000,000	529,000	163,000,000	603,000
Leached	NA	554,000	NA	530,000
Total	NA	1,080,000	NA	1,130,000
Copper precipitates shipped, leached from tailings, dumps, and in-place material	1,490	1,990	1,990	2,840
Other copper-bearing ores ³	5,170,000	55,000	5,000,000	60,700
Grand total	XX	1,140,000	XX	1,200,000

NA Not available. XX Not applicable.

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

²In 2006, 18,000 kilograms of gold and 220 metric tons of silver were recovered from concentrated ore. The average value of gold and silver per metric ton of ore concentrated was \$2.65.

³Includes gold ore, lead ore, silver ore, silver-copper ore, zinc ore, and ore shipped directly to smelters.

TABLE 4
CONSUMPTION OF COPPER AND BRASS MATERIALS IN THE UNITED STATES, BY ITEM¹

(Metric tons)

Item	Brass mills	Wire-rod mills	Foundries, chemical plants, miscellaneous users	Smelters, refiners, ingot makers	Total
2005:					
Copper scrap	874,000 ^{r,2}	W	81,700	192,000	1,150,000 ^r
Refined copper ³	528,000	1,680,000	60,700	4,540	2,270,000
Hardeners and master alloys	10,000	--	2,330	--	12,400
Brass ingots	--	--	89,900	--	89,900
Slab zinc	59,700	--	(4)	(4)	82,500
2006:					
Copper scrap	895,000 ²	W	75,500	179,000	1,150,000
Refined copper ³	490,000	1,570,000	46,500	4,530	2,110,000
Hardeners and master alloys	10,100	--	2,880	--	12,900
Brass ingots	--	--	87,100	--	87,100
Slab zinc	56,400	--	(4)	(4)	79,800

^rRevised. W Withheld to avoid disclosing company proprietary data; included with "Brass mills." -- Zero.

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

²Includes item indicated by symbol W.

³Detailed information on consumption of refined copper can be found in table 5.

⁴Withheld to avoid disclosing company proprietary data; included in "Total."

TABLE 5
CONSUMPTION OF REFINED COPPER SHAPES IN THE UNITED STATES, BY CLASS OF CONSUMER¹

(Metric tons)

Class of consumer	Cathodes	Ingots and ingot bars	Cakes and slabs	Wirebar, billets, other	Total
2005:					
Wire-rod mills	1,680,000	--	--	2,590	1,680,000
Brass mills	361,000	23,300	35,300	108,000	528,000
Chemical plants	--	--	--	1,200	1,200
Ingot makers	W	W	W	4,540 ²	4,540
Foundries	3,780	5,490	--	10,900	20,200
Miscellaneous ³	W	W	W	39,300 ²	39,300
Total	2,040,000	28,800	35,300	167,000	2,270,000
2006:					
Wire-rod mills	1,570,000	--	--	--	1,570,000
Brass mills	334,000	24,400	37,100	94,500	490,000
Chemical plants	--	--	--	1,010	1,010
Ingot makers	W	W	W	4,530 ²	4,530
Foundries	4,360	6,440	--	10,600	21,400
Miscellaneous ³	W	W	W	24,100 ²	24,100
Total	1,910,000	43,700	37,100	135,000	2,110,000

W Withheld to avoid disclosing company proprietary data; included with "Wirebar, billets, other." -- Zero.

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

²Includes items indicated by symbol W.

³Includes consumers of copper powder and copper shot, iron and steel plants, and other manufacturers.

TABLE 6
COPPER RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES,
BY KIND OF SCRAP AND FORM OF RECOVERY¹

(Metric tons)

	2005	2006
Kind of scrap:		
New scrap:		
Copper-base	730,000	772,000
Aluminum-base	39,600 [†]	47,000
Nickel-base	18	18
Total	769,000	819,000
Old scrap:		
Copper-base	168,000	128,000
Aluminum-base	15,000 [†]	21,300
Nickel-base	214	190
Zinc-base	33	38
Total	183,000 [†]	150,000
Grand total	953,000 [†]	968,000
Form of recovery:		
As unalloyed copper	48,100	45,500
In brass and bronze	837,000	846,000
In alloy iron and steel	985	786
In aluminum alloys	54,500 [†]	68,000
In other alloys	32	36
In chemical compounds	12,300	8,210
Total	953,000 [†]	968,000

[†]Revised.

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

TABLE 7
COPPER RECOVERED AS REFINED COPPER AND IN ALLOYS AND OTHER FORMS
FROM COPPER-BASE SCRAP PROCESSED IN THE UNITED STATES, BY TYPE OF OPERATION¹

(Metric tons)

Type of operation	From new scrap		From old scrap		Total	
	2005	2006	2005	2006	2005	2006
Ingot makers	24,100	21,300	70,100	61,600	94,200	82,900
Refineries ²	16,000	16,000	31,200	28,800	47,200	44,800
Brass and wire-rod mills	667,000	707,000	29,800	12,500	697,000	719,000
Foundries and manufacturers	17,500	22,800	33,800 [†]	22,000	51,300 [†]	44,800
Chemical plants	5,040	5,030	3,130	3,130	8,160	8,160
Total	730,000	772,000	168,000	128,000	898,000	900,000

[†]Revised.

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

²Electrolytically refined based on source of material at smelter level.

TABLE 8
 PRODUCTION OF SECONDARY COPPER AND COPPER-ALLOY PRODUCTS
 IN THE UNITED STATES, BY ITEM PRODUCED FROM SCRAP¹

(Metric tons)

Item produced from scrap	2005	2006
Unalloyed copper products:		
Refined copper	47,200	44,800
Copper powder	314	134
Copper castings	547	612
Total	48,100	45,500
Alloyed copper products:		
Brass and bronze ingots:		
Tin bronzes	10,100	10,100
Leaded red brass and semired brass	68,700	69,400
High leaded tin bronze	10,500	10,100
Yellow brass	5,910	5,610
Manganese bronze	8,240	8,030
Aluminum bronze	5,980	5,960
Nickel silver	1,990	2,110
Silicon bronze and brass	6,010	5,780
Copper-base hardeners and master alloys	5,810	7,620
Miscellaneous	4,930	3,310
Total	128,000	128,000
Brass mill and wire-rod mill products	859,000	880,000
Brass and bronze castings	45,300	43,100
Brass powder	69	68
Copper in chemical products	12,300	8,210
Grand total	1,090,000	1,100,000

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

TABLE 9
 COMPOSITION OF SECONDARY COPPER-ALLOY PRODUCTION IN THE UNITED STATES¹

(Metric tons)

	Copper	Tin	Lead	Zinc	Nickel	Aluminum	Total
Brass and bronze ingot production: ²							
2005	110,000 ^r	3,440 ^r	5,170 ^r	9,070 ^r	185 ^r	12	128,000
2006	109,000	3,900	5,730	9,560	196	12	128,000
Secondary metal content of brass mill products:							
2005	698,000	1,750	3,590	154,000	W	W	859,000
2006	720,000	1,830	3,480	152,000	W	W	880,000
Secondary metal content of brass and bronze castings:							
2005	40,700 ^r	1,450	1,100	1,940	116	60	45,300
2006	38,100	1,480	1,210	2,110	105	42	43,100

¹Revised. W Withheld to avoid disclosing company proprietary data; included in "Total."

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

²Includes approximately 96% from scrap and 4% from other than scrap in 2005 and 2006.

TABLE 10
CONSUMPTION AND YEAREND STOCKS OF COPPER-BASE SCRAP¹

(Metric tons, gross weight)

Scrap type and processor	2005		2006	
	Consumption	Stocks	Consumption	Stocks
Unalloyed scrap:				
No. 1 wire and heavy:				
Smelters, refiners, and ingot makers	68,700	5,890	64,000	6,210
Brass and wire-rod mills	382,000	(2)	400,000	(2)
Foundries and miscellaneous manufacturers	28,000	(2)	22,400	(2)
No. 2 mixed heavy and light:				
Smelters, refiners, and ingot makers	34,900	1,220	28,400	1,470
Brass and wire-rod mills	5,260	(2)	13,600	(2)
Foundries and miscellaneous manufacturers	5,160	(2)	3,890	(2)
Total unalloyed scrap:				
Smelters, refiners, and ingot makers	104,000	7,120	92,400	7,680
Brass and wire-rod mills	387,000	33,800	413,000	34,900
Foundries and miscellaneous manufacturers	33,200	2,220	26,300	2,110
Alloyed scrap:				
Red brass: ³				
Smelters, refiners, and ingot makers	22,900	1,340	20,100	1,210
Brass mills	14,300	(2)	12,400	(2)
Foundries and miscellaneous manufacturers	7,900	(2)	7,540	(2)
Leaded yellow brass:				
Smelters, refiners, and ingot makers	8,010	746	7,570	729
Brass mills	183,000	(2)	177,000	(2)
Foundries and miscellaneous manufacturers	981	(2)	880	(2)
Yellow and low brass, all plants	174,000	901	177,000	877
Cartridge cases and brass, all plants	94,600	(2)	94,100	(2)
Auto radiators:				
Smelters, refiners, and ingot makers	24,300	1,020	24,800	661
Foundries and miscellaneous manufacturers	5,030	(2)	6,370	(2)
Bronzes:				
Smelters, refiners, and ingot makers	10,300	625	10,300	645
Brass mills and miscellaneous manufacturers	17,900	(2)	19,200	(2)
Nickel-copper alloys, all plants	18,700	211	19,100	205
Low grade and residues; smelters, refiners, miscellaneous manufacturers				
Other alloy scrap: ⁴				
Smelters, refiners, and ingot makers	1,180	372	1,820	265
Brass mills and miscellaneous manufacturers	5,400	(2)	4,950	(2)
Total alloyed scrap:				
Smelters, refiners, and ingot makers	88,800	5,850	86,800	5,280
Brass mills	487,000	24,300	482,000	24,900
Foundries and miscellaneous manufacturers	48,500	2,160	49,100	2,370
Total scrap:				
Smelters, refiners, and ingot makers	192,000 ^r	13,000	179,000	13,000
Brass and wire-rod mills	874,000	58,000 ^r	895,000	59,800
Foundries and miscellaneous manufacturers	81,700	4,390 ^r	75,500	4,480

^rRevised.

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

²Individual breakdown is not available; included in "Total unalloyed scrap," "Total alloyed scrap," and "Total scrap."

³Includes cocks and faucets, commercial bronze, composition turnings, gilding metal, railroad car boxes, and silicon bronze.

⁴Includes aluminum bronze, beryllium copper, and refinery brass.

TABLE 11
CONSUMPTION OF PURCHASED COPPER-BASE SCRAP^{1,2}

(Metric tons, gross weight)

Type of operation	From new scrap		From old scrap		Total	
	2005	2006	2005	2006	2005	2006
Ingot makers	48,200 ^r	56,500	96,400 ^r	77,600	145,000	134,000
Smelters and refineries	16,200	16,500	31,700	28,700	47,800	45,200
Brass and wire-rod mills	842,000	882,000	31,600	13,100	874,000	895,000
Foundries and miscellaneous manufacturers	40,100	48,200	41,600	27,200	81,700	75,500
Total	947,000	1,000,000	201,000	147,000	1,150,000	1,150,000

^rRevised.

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

²Consumption at brass and wire-rod mills assumed equal to receipts.

TABLE 12
FOUNDRIES AND MISCELLANEOUS MANUFACTURERS CONSUMPTION
OF BRASS INGOT, REFINED COPPER AND COPPER SCRAP
IN THE UNITED STATES¹

(Metric tons)

Ingot type or material consumed	2005	2006
Tin bronzes	16,400	14,200
Leaded red brass and semired brass	54,400	50,600
Yellow, leaded, low brass ²	7,840	5,240
Manganese bronze	3,870	3,980
Nickel silver ³	2,410	2,890
Aluminum bronze	3,970	3,630
Hardeners and master alloys ⁴	2,330	2,880
Lead free alloys ⁵	974	1,250
Total brass ingot	92,200	84,700
Refined copper	60,700	46,500
Copper scrap	81,700	75,400

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

²Includes brass and silicon bronze.

³Includes brass, copper nickel, and nickel bronze.

⁴Includes special alloys.

⁵Includes copper-bismuth and copper-bismuth-selenium alloys.

TABLE 13
AVERAGE PRICES FOR COPPER SCRAP AND ALLOY-INGOT, BY TYPE

(Cents per pound)

Year	Brass mills No. 1 scrap	Refiners No. 2 scrap	Dealers' buying (New York)	
			No. 2 scrap	Red brass turnings and borings
2005	153.46	137.28	95.92	61.10
2006	291.03	260.50	183.93	105.43

Source: American Metal Market.

TABLE 14
U.S. EXPORTS OF UNMANUFACTURED COPPER (COPPER CONTENT), BY COUNTRY¹

Country	Ore and concentrate ²		Matte, ash and precipitates		Refined		Unalloyed copper scrap		Blister and anodes		Total	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
2005	137,000	\$224,000	41,800	\$48,300	39,500	\$97,000	366,000	\$637,000	41,600	\$97,300	626,000	\$1,100,000
2006:												
Belgium	--	--	75	65	--	--	1,380	13,100	461	1,640	1,920	14,800
Canada	23,300	156,000	71,600	105,000	81,500	165,000	71,700	1,290	4,410	7,570	253,000	436,000
China	37,000	214,000	6,360	14,000	11,000	39,700	247,000	12,700	388	2,640	302,000	283,000
Germany	--	--	2	3	126	127	15,200	14,000	1,360	7,390	16,700	21,500
Hong Kong	--	--	6	17	66	142	7,060	13,200	3,920	24,300	11,100	37,600
India	5,200	35,800	3	5	5,090	9,160	1,600	6,570	171	1,040	12,100	52,600
Japan	19,200	96,800	2	21	(3)	10	7,730	25,400	812	1,960	27,700	124,000
Korea, Republic of	2,980	13,400	11	19	123	495	20,700	21,200	946	6,590	24,700	41,700
Malaysia	--	--	--	--	9	82	70	213	119	801	197	1,100
Mexico	20,000	124,000	13,800	74,300	5,230	15,500	815	15,400	337	1,260	40,200	231,000
Peru	--	--	--	--	72	108	--	--	3	7	75	115
Singapore	--	--	44	145	11	23	59	13,800	421	2,850	535	16,800
Spain	104	659	--	--	59	115	386	14,100	253	1,430	802	16,400
Taiwan	16	102	15	46	191	429	22,300	36,300	1,590	10,700	24,100	47,600
Thailand	--	--	1	16	--	--	201	26,800	320	1,870	523	28,700
United Kingdom	4	22	27	39	213	808	105	25,600	141	967	490	27,500
Other	52	324	3,630	6,280	2,370	4,660	2,640	238,000	3,290	10,800	12,000	260,000
Total	108,000	642,000	95,600	200,000	106,000	237,000	399,000	478,000	18,900	83,800	727,000	1,640,000

-- Zero.

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

²Data for 2006 adjusted by the U.S. Geological Survey to reflect estimated copper content.

³Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 15
U.S. EXPORTS OF COPPER SEMIMANUFACTURES, BY COUNTRY¹

Country	Pipes and tubing		Plates, sheets, foil, bars		Bare wire, including wire rod ²		Wire and cable, stranded		Copper sulfate	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
2005	29,200	\$135,000	28,500	\$136,000	154,000	\$608,000	38,800	\$212,000	3,220	\$4,520
2006:										
Australia	32	298	66	368	47	410	27	463	177	1,150
Brazil	141	1,260	48	515	118	821	83	1,270	78	547
Canada	5,880	50,100	17,600	130,000	17,800	119,000	4,310	32,200	4,540	16,200
China	107	710	1,180	6,800	4,670	15,300	3,740	15,200	3,080	19,700
Denmark	(3)	9	9	157	2	59	47	449	92	608
France	3	46	121	1,500	154	1,830	188	3,700	90	647
Germany	2	32	296	3,400	256	2,180	188	5,290	353	2,270
Hong Kong	31	257	183	3,890	130	1,290	230	3,260	22	150
Italy	2	22	24	540	26	289	81	1,190	258	1,730
Japan	41	423	559	4,510	15	339	96	2,090	1,200	7,900
Korea, Republic of	65	844	1,200	4,540	77	1,920	886	5,640	3,810	22,700
Malaysia	83	209	1,230	10,100	47	293	44	678	445	3,110
Mexico	23,600	172,000	7,240	43,100	139,000	959,000	14,400	93,000	182	646
Netherlands	83	882	131	730	42	483	152	2,040	620	4,450
Saudi Arabia	211	1,630	80	651	2	17	113	982	--	--
Singapore	8	72	185	1,590	32	270	234	3,230	591	4,080
Sweden	(3)	3	4	70	25	687	11	459	2,110	10,500
Taiwan	20	136	205	2,050	1,140	7,930	703	3,830	975	6,390
Thailand	7	56	399	3,200	110	460	65	773	38	164
United Kingdom	83	698	136	1,790	197	1,550	156	3,470	1,470	9,450
Other	851	7,100	917	8,390	1,100	10,500	8,110	52,400	1,580	11,100
Total	31,300	237,000	31,800	228,000	165,000	1,120,000	33,900	232,000	21,700	123,000

-- Zero.

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

²Total exports of wire rod in 2005 were 138,000 metric tons (t) valued at \$530 million, and in 2006, wire rod exports were 144,000 t valued at \$992 million.

³Less than 1/2 unit.

Source: U.S. Census Bureau, adjusted by the U.S. Geological Survey for misclassified wire rod shipments to Mexico.

TABLE 16
U.S. IMPORTS FOR CONSUMPTION OF UNMANUFACTURED COPPER (COPPER CONTENT), BY COUNTRY¹

Country	Ore and concentrate		Matte, ash and precipitates		Blister and anode		Refined		Unalloyed scrap		Total	
	Quantity (metric tons)	Value ² (thousands)	Quantity (metric tons)	Value ² (thousands)	Quantity (metric tons)	Value ² (thousands)	Quantity (metric tons)	Value ² (thousands)	Quantity (metric tons)	Value ² (thousands)	Quantity (metric tons)	Value ² (thousands)
2005	223	\$476	1,640	\$4,890	132,000	\$423,000	1,000,000	\$3,540,000	30,100	\$73,000	1,170,000	\$4,040,000
2006:												
Belgium	--	--	13	38	--	--	--	--	--	--	13	38
Brazil	--	--	--	--	--	--	20,200	125,000	--	--	20,200	125,000
Canada	191	187	585	2,280	87,800	374,000	256,000	1,320,000	7,740	43,400	352,000	1,740,000
Chile	--	--	--	--	79,100	540,000	521,000	3,480,000	4,040	29,800	604,000	4,050,000
Costa Rica	--	--	--	--	--	--	--	--	1,760	1,560	1,760	1,560
Dominican Republic	--	--	--	--	--	--	--	--	255	379	255	379
Finland	--	--	--	--	967	6,790	--	--	--	--	967	6,790
Germany	--	--	(3)	8	8	85	25,200	162,000	35	137	25,200	162,000
Honduras	--	--	--	--	--	--	--	--	1,700	3,280	1,700	3,280
Japan	--	--	--	--	(3)	16	5,850	43,300	104	188	5,950	43,500
Mexico	--	--	22	53	2,810	10,300	28,800	166,000	6,920	14,200	38,600	190,000
Peru	--	--	--	--	--	--	158,000	1,000,000	40	446	158,000	1,000,000
Taiwan	--	--	1,170	5,010	--	--	--	--	--	--	1,170	5,010
United Kingdom	--	--	(3)	3	1	82	(3)	10	183	1,470	184	1,560
Other	1	9	124	388	21	176	58,800	363,000	2,160	4,520	61,100	368,000
Total	192	196	1,910	7,780	171,000	932,000	1,070,000	6,670,000	24,900	99,300	1,270,000	7,700,000

-- Zero.

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

²Cost, insurance, freight value at U.S. port.

³Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 17
U.S. IMPORTS FOR CONSUMPTION OF COPPER SEMIMANUFACTURES, BY COUNTRY¹

Country	Pipes and tubing		Plates, sheets, foil, bars		Bare wire, including wire rod ²		Wire and cable, stranded		Copper sulfate	
	Quantity (metric tons)	Value ³ (thousands)	Quantity (metric tons)	Value ³ (thousands)	Quantity (metric tons)	Value ³ (thousands)	Quantity (metric tons)	Value ³ (thousands)	Quantity (metric tons)	Value ³ (thousands)
2005	505	\$3,310	71,800	\$347,000	385,000	\$1,480,000	11,600	\$45,600	55,900	\$64,000
2006:										
Australia	--	--	--	--	1	6	12	116	--	--
Belgium	--	--	97	1,150	--	--	--	--	137	308
Brazil	15	98	1,300	10,000	29,500	189,000	--	--	--	--
Canada	53	561	6,100	45,900	169,000	1,160,000	232	2,900	10,700	12,200
Chile	22	175	6,860	52,700	20	91	--	--	1,970	3,830
China	177	1,300	1,860	12,700	283	1,840	10,500	18,500	10,900	16,900
Finland	15	231	3,370	29,300	979	9,360	(4)	17	--	--
France	20	723	3,000	21,600	499	6,770	26	423	19	22
Germany	541	5,270	24,100	170,000	1,010	8,790	572	5,660	232	376
Israel	--	--	4	42	--	--	3,140	28,200	--	--
Italy	15	121	2,240	15,500	46	198	195	1,030	--	--
Japan	1	41	3,650	32,100	412	4,210	1	15	21	228
Luxembourg	--	--	2,090	26,900	--	--	--	--	--	--
Mexico	169	1,550	2,440	19,300	44,000	286,000	1,280	5,430	24,200	50,200
Norway	--	--	--	--	--	--	--	--	--	--
Peru	--	--	3,750	25,800	269	1,910	189	1,210	981	1,730
Russia	--	--	2,020	10,900	106,000	725,000	(4)	38	20	43
Sweden	(4)	4	8,740	69,800	30	189	--	--	--	--
Taiwan	(4)	3	173	2,160	119	565	15	458	4,300	5,890
Turkey	--	--	--	--	7,630	56,900	4,680	37,900	--	--
United Kingdom	3	52	394	2,280	93	562	4	64	--	--
Other	5	171	3,480	25,200	762	4,150	880	6,760	83	142
Total	1,040	10,300	75,700	574,000	360,000	2,460,000	21,700	109,000	53,600	91,900

-- Zero.

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

²Total imports of wire rod in 2005 were 366,000 metric tons (t) valued at \$138 million, and in 2006, wire rod imports were 350,000 t valued at \$237 million.

³Cost, insurance, freight value at U.S. port.

⁴Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 18
U.S. EXPORTS OF COPPER SCRAP, BY COUNTRY¹

Country	Unalloyed copper scrap				Copper-alloy scrap			
	2005		2006		2005		2006	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Belgium	644	\$1,250	1,380	\$13,100	6,890	\$10,500	12,700	\$17,100
Canada	27,900	33,300	71,700	1,290	13,900	28,900	38,800	5,510
China	265,000	440,000	247,000	12,700	182,000	236,000	257,000	23,000
Germany	10,600	16,400	15,200	14,000	9,990	15,900	15,400	27,000
Hong Kong	9,200	7,650	7,060	13,200	12,800	13,300	11,600	39,700
India	4,460	4,930	1,600	6,570	15,800	27,200	10,700	26,800
Japan	6,710	21,900	7,730	25,400	7,950	20,400	8,020	38,400
Korea, Republic of	27,200	69,900	20,700	21,200	10,200	20,500	13,000	42,300
Mexico	1,010	3,070	815	15,400	1,570	5,140	6,770	39,900
Taiwan	11,600	32,500	22,300	36,300	10,600	20,100	9,930	25,700
Other	2,410	6,410	3,460	319,000	19,700	21,100	20,400	428,000
Total	366,000	637,000	399,000	478,000	291,000	419,000	404,000	713,000

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

Source: U.S. Census Bureau.

TABLE 19
U.S. IMPORTS FOR CONSUMPTION OF COPPER SCRAP, BY COUNTRY¹

Country or territory	Unalloyed copper scrap		Copper-alloy scrap		
	Quantity (metric tons)	Value ² (thousands)	Gross weight (metric tons)	Copper content ^{e, 3} (metric tons)	Value ² (thousands)
2005	30,100	\$73,000	83,700	60,200	\$203,000
2006:					
Canada	7,740	43,400	43,900	31,600	184,000
Chile	4,040	29,800	6,110	4,400	47,000
Costa Rica	1,760	1,560	1,740	1,250	6,100
Dominican Republic	255	379	620	446	2,020
Guatemala	190	870	2,310	1,660	11,200
Honduras	1,700	3,280	821	591	2,260
Jamaica	364	361	167	120	253
Mexico	6,920	14,200	29,600	21,300	94,000
Nicaragua	874	2,000	443	319	689
United Kingdom	183	1,470	646	465	3,850
Other	908	2,060	6,270	4,510	30,400
Total	24,900	99,300	92,600	66,700	382,000

^eEstimated.

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

²Cost, insurance, freight value at U.S. port.

³Content is estimated by the U.S. Geological Survey to be 72% of gross weight.

Source: U.S. Census Bureau.

TABLE 20
COPPER: WORLD MINE PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country	2002	2003	2004	2005	2006 ^e
Argentina	204,027	199,020	177,143	187,317 ^f	180,100 ^p
Armenia	16,641	18,000 ^c	17,700 ^c	16,400	15,000
Australia:					
Concentrates	790,700 ^f	772,600 ^f	795,800 ^f	865,300 ^f	806,400 ³
Leaching, electrowon	77,100 ^f	67,000	58,300	51,000	52,400
Total	867,800 ^f	839,600 ^f	854,100 ^f	916,300 ^f	858,800 ³
Bolivia	3	182	596	714	1,000
Botswana ^e	21,600	27,400	22,500 ³	26,100	24,000
Brazil	32,711	26,275	103,153	133,325 ^f	143,000 ^p
Bulgaria	92,800	91,700	79,600 ^f	94,000 ^f	84,000 ³
Burma, leaching, electrowon	27,500	27,870	31,756	34,478	19,544 ³
Canada, concentrates	603,498	557,082	562,795 ^f	595,383 ^f	606,958 ^p
Chile: ⁴					
Concentrates	2,979,000	3,251,100	3,776,200	3,735,900	3,669,000 ³
Leaching, electrowon	1,602,000	1,653,100	1,636,300	1,584,600	1,691,800 ^{p,3}
Total	4,581,000	4,904,200	5,412,500	5,320,500	5,360,800 ³
China: ^e					
Concentrates	568,000	610,000	742,000	762,000 ^f	873,000
Leaching, electrowon	25,000	10,000	10,000	15,000	16,000
Total	593,000	620,000	752,000	777,000 ^f	889,000
Colombia	1,853	1,578	1,701	1,259 ^f	1,300
Congo (Kinshasa): ^{e,5}					
Concentrates	27,500	30,300	31,800	44,200 ^f	81,000
Leaching, electrowon	6,500	29,513 ^f	41,546 ^f	49,538 ^f	51,100
Total	34,000	59,813 ^f	73,346 ^f	93,738 ^f	132,100
Cuba ^e	-- ^f	--	--	--	--
Cyprus, leaching, electrowon	3,695	2,552	1,240	--	--
Ecuador ^e	-- ^f	-- ^f	242 ^f	-- ³	--
Finland	14,400	14,900	15,500	15,000	15,000
Georgia ^e	10,000	12,000	12,000	12,000	12,000
India	31,500	28,500	29,500	26,900	23,600 ³
Indonesia ⁵	1,171,726	1,005,831	840,318	1,065,000	816,000 ³
Iran: ^e					
Concentrates	121,000	130,000	140,000 ^f	150,000 ^f	208,000
Leaching, electrowon	12,000	12,000	11,000 ^f	10,000 ^f	9,000
Total	133,000	142,000	151,000 ^f	160,000 ^f	217,000
Kazakhstan ^e	490,000	485,000	461,000 ³	422,000 ^f	457,000
Korea, North ^e	12,000	12,000	12,000	12,000	12,000
Laos	--	--	--	30,480 ^f	60,803 ³
Macedonia ^e	5,600	700	--	6,000 ^f	8,400 ³
Mexico:					
Concentrates	260,574	279,254 ^f	327,432 ^f	336,376 ^f	250,000
Leaching, electrowon	69,300	76,399 ^f	78,108 ^f	92,675 ^f	88,000
Total	329,874	355,653 ^f	405,540 ^f	429,051 ^f	338,000
Mongolia	131,705	131,600	132,000	126,547	129,693 ³
Morocco	5,000	4,900	4,400	4,400	4,400
Namibia	18,012	16,175	11,174	10,900	6,000
Pakistan	--	3,200	15,000	17,700	19,100 ³
Papua New Guinea	204,000 ^f	202,300 ^f	173,370 ^f	192,978 ^f	194,355 ³

See footnotes at end of table.

TABLE 20—Continued
COPPER: WORLD MINE PRODUCTION, BY COUNTRY^{1, 2}

(Metric tons)

Country	2002	2003	2004	2005	2006 ^e
Peru:					
Concentrates	688,086 ^r	691,380 ^r	868,574 ^r	844,368 ^r	875,026 ³
Leaching, electrowon	156,467	171,198	167,000	165,530	173,871 ³
Total	844,553 ^r	862,578 ^r	1,035,574 ^r	1,009,898 ^r	1,048,897 ³
Philippines	18,364	20,414 ^r	15,984	16,323	16,700
Poland	502,800	495,000	531,000	523,000	512,000
Portugal	77,227 ^r	77,581 ^r	95,743 ^r	89,541 ^r	78,600 ³
Romania ⁶	18,962	23,389	18,767	15,000	12,200 ³
Russia ^c	695,000	675,000	675,000	700,000	725,000
Saudi Arabia ^c	800	800	500	700	700
Serbia and Montenegro ^c	36,900	26,400	24,000 ^r	26,100 ^r	25,100 ³
South Africa	129,589	120,800	102,570 ^r	97,000 ^r	97,000
Spain	--	643 ^r	1,448 ^r	4,889 ^r	5,000
Sweden	76,200	96,000	90,600	97,800	97,000
Tanzania, in concentrates and bullion	4,222 ^r	3,715	4,240 ^r	3,462 ^r	3,500
Turkey ^{e, 6}	48,253 ³	58,000 ^e	49,000 ^e	54,000 ^{r, e}	46,000
United States: ⁵					
Concentrates	601,000	525,000	576,000	586,000	594,000
Leaching, electrowon	542,000	591,000	584,000	554,000	603,000
Total	1,140,000	1,120,000	1,160,000	1,140,000	1,200,000
Uzbekistan ^c	80,000	80,000	110,000 ^r	110,000 ^r	115,000
Zambia:					
Concentrates	251,100	269,000	344,300	317,000 ^{r, e}	350,000
Leaching, electrowon	78,900	80,000	82,600	106,000	126,000
Total	330,000	349,000	426,900	423,000	476,000
Zimbabwe, concentrates	2,502	2,767	2,383	2,500 ^r	2,600
Grand total	13,600,000 ^r	13,800,000 ^r	14,700,000 ^r	15,000,000 ^r	15,100,000
Of which:					
Concentrates	11,000,000 ^r	11,100,000 ^r	12,000,000 ^r	12,400,000 ^r	12,300,000
Leaching, electrowon	2,600,000 ^r	2,720,000 ^r	2,700,000 ^r	2,660,000 ^r	2,283,000

^eEstimated. ^pPreliminary. ^rRevised. -- Zero.

¹World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Table represent copper content by analysis of concentrates produced (includes cement copper, if applicable), except where otherwise noted. Table includes data available through July 22, 2007.

³Reported figure.

⁴Reported by Comisión Chilena del Cobre. Includes recoverable copper content of nonduplicative mine and metal products produced from domestic ores and concentrates and leach production for electrowinning.

⁵Recoverable content.

⁶Excludes copper content of pyrite.

TABLE 21
COPPER: WORLD SMELTER PRODUCTION, BY COUNTRY^{1,2}

(Metric tons, gross weight)

Country	2002	2003	2004	2005	2006 ^c
Armenia, primary ^e	6,700	7,500	7,500	9,800 ³	8,818 ³
Australia, primary	458,000 ^c	435,000	443,000	410,000	377,000 ³
Austria, secondary	64,932	75,000	88,000	90,000	90,000
Belgium, secondary	125,900	117,500	107,000	99,200	114,600 ³
Bolivia, primary	--	--	441 ^r	--	--
Botswana, primary ⁴	21,590	25,292	21,195	26,700	26,700
Brazil, primary	189,651	173,378	208,020	199,043 ^r	220,000 ^p
Bulgaria:					
Primary	181,000	215,300	227,100	240,100	245,000
Secondary ^c	15,000	16,000	7,000	5,000	5,000
Total	196,000	231,300	234,100	245,100	250,000
Canada:					
Primary	513,934	430,116	446,209 ^r	441,325 ^r	484,675 ³
Secondary	24,761	26,789	29,962	30,000	36,000
Total	538,695	456,905	476,171 ^r	471,325 ^r	521,000
Chile, primary	1,438,700	1,542,400	1,517,600	1,558,100	1,565,400 ^{p,3}
China:^c					
Primary	1,180,000	1,380,000	1,500,000	1,700,000	1,810,000
Secondary	310,000	350,000	440,000	540,000	700,000
Total	1,490,000	1,730,000	1,940,000	2,240,000	2,510,000
Congo (Kinshasa), primary, electrowon	10,000	8,000	20,000	10,000	10,000
Finland:					
Primary	160,900	176,400	168,600	170,000	170,000
Secondary ^c	2,000	2,000	2,000	2,000	2,000
Total	162,900	178,400	170,600	172,000	172,000
Germany:					
Primary	295,100	288,800	278,600	257,200	273,800 ³
Secondary	283,100	306,600	262,600	251,400	266,300 ³
Total	578,200	595,400	541,200	508,600	540,100 ³
India:					
Primary	385,400	391,000	401,000	486,600	610,000
Secondary ^c	--	--	--	38,000	15,000
Total	385,400	391,000	401,000	524,600	625,000
Indonesia, undifferentiated	211,200	247,400	211,600	275,000	201,200 ³
Iran, undifferentiated ⁵	171,591	168,613	184,814	227,000 ^r	244,000
Japan:					
Primary	1,317,291	1,343,353	1,270,495	1,319,247	1,409,087 ³
Secondary	182,069	172,724	194,927	198,516	219,203 ³
Total	1,499,360	1,516,077	1,465,422	1,517,763	1,628,290 ³
Kazakhstan, undifferentiated	446,200	431,930	445,200	426,000 ^r	426,000
Korea, North, primary and secondary ^c	15,000	15,000	15,000	15,000	15,000
Korea, Republic of:					
Primary	380,000	410,000	392,500 ^r	436,600 ^r	449,200 ³
Secondary	50,000	50,000	50,000	49,900 ^r	34,800 ³
Total	430,000	460,000	442,500 ^r	486,500 ^r	484,000 ³

See footnotes at end of table.

TABLE 21--Continued
 COPPER: WORLD SMELTER PRODUCTION, BY COUNTRY^{1,2}

(Metric tons, gross weight)

Country	2002	2003	2004	2005	2006 ^c
Mexico:					
Primary	260,700 ^r	220,100 ^r	271,000 ^r	301,200 ^r	260,200 ^p
Secondary ^c	5,000	5,000	5,000	5,000	5,000
Total	265,700 ^r	225,100 ^r	276,000 ^r	306,200 ^r	265,000
Namibia, primary ^{6,7}	26,703	26,036	24,704 ^r	23,300	22,000
Oman, primary ^c	25,000	18,000	25,000	25,000	25,000
Pakistan, primary	--	3,000	15,000	15,000	20,000
Peru, primary	396,400 ^r	376,100 ^r	377,800	381,600	381,300 ³
Philippines, primary	165,800	227,900	217,300	201,300	239,600 ³
Poland:					
Primary	511,000	560,000	545,000	550,000	530,000
Secondary ^c	39,400	24,100	25,000	25,000	20,000
Total	550,400	584,100	570,000	575,000	550,000
Romania:					
Primary	8,871	4,493	61	3,000 ^r	3,000
Secondary ^c	2,000	500	500 ^r	500 ^r	500
Total	10,871	4,993	561 ^r	3,500 ^r	3,500
Russia: ^c					
Primary	660,000	670,000	662,000	686,000	712,000
Secondary	200,000	170,000	257,000	272,000	290,000
Total	860,000	840,000	919,000	958,000	1,000,000
Serbia and Montenegro: ^{c,7}					
Primary	36,000	14,000	12,000	16,300	28,900
Secondary	6,700	3,600	1,100	6,000	9,800
Total	42,700	17,600	13,100	22,300	38,700
Slovakia, secondary	8,100	58,000	13,300	15,500	22,000
South Africa, primary	116,996	112,025	89,300 ^c	100,000	94,000
Spain:					
Primary	281,300	276,300	210,200	278,600	263,100 ³
Secondary ^c	16,700	14,000	14,100	5,000	600
Total	298,000	290,300	224,300	283,600	264,000
Sweden: ^c					
Primary	188,000	185,000	206,000 ^r	192,000	190,000
Secondary	35,000	30,000	30,000	30,000	30,000
Total	223,000	215,000	236,000 ^r	222,000	220,000
Thailand:					
Primary ^c	--	--	17,700	28,600	1,000
Secondary ^c	--	--	1,900	2,000	--
Total	--	--	19,600	30,600	1,000 ^c
Turkey, undifferentiated ⁸	32,550	30,400 ^c	11,500	9,000	12,000
United States, undifferentiated	683,000	539,000	542,000	523,000	501,000 ³
Uzbekistan, undifferentiated ^c	75,000	75,000	94,000 ^r	105,000 ^r	110,000
Zambia, primary:					
Electrowon	60,000	50,000	60,000	50,000	50,000
Other	311,400	200,000	220,000	220,000	240,000
Total	371,400	250,000	280,000	270,000	290,000

See footnotes at end of table.

TABLE 21--Continued
 COPPER: WORLD SMELTER PRODUCTION, BY COUNTRY^{1,2}

(Metric tons, gross weight)

Country	2002	2003	2004	2005	2006 ^c
Grand total	12,600,000 ^r	12,700,000	12,900,000 ^r	13,600,000 ^r	14,100,000
Of which					
Primary:					
Electrowon	70,000	58,000	80,000	60,000	60,000
Other	9,520,000 ^r	9,710,000 ^r	9,780,000 ^r	10,300,000 ^r	10,700,000
Secondary	1,370,000 ^r	1,420,000 ^r	1,530,000 ^r	1,670,000 ^r	1,860,000
Undifferentiated	1,630,000	1,510,000	1,500,000 ^r	1,580,000 ^r	1,510,000

^cEstimated. ^pPreliminary. ^rRevised. -- Zero.

¹World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²This table includes total production of smelted copper metal, including low-grade cathode produced by electrowinning methods. The smelter feed maybe derived from ore, concentrates, copper precipitate or matte (primary), and/or scrap (secondary). To the extent possible, primary and secondary output of each country are shown separately. In some cases, total smelter production is officially reported, but the distribution between primary and secondary has been estimated. Table includes data available through July 15, 2007.

³Reported figure.

⁴Copper content of nickel-copper matte exported to Norway for refining.

⁵Data are for year beginning March 21 of that stated. Secondary production is estimated to be about 5% of total.

⁶Includes 8,000 to 10,000 metric tons per year for 2002-06 produced from imported toll concentrates.

⁷In June 2006, Montenegro and Serbia formally declared independence from each other and dissolved their union. Mineral production data for 2006, however, still reflect the unified country.

⁸Secondary production is estimated to be about one-third of total.

TABLE 22
COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country	2002	2003	2004	2005	2006
Argentina, secondary ^c	16,000	16,000	16,000	16,000	16,000
Australia, primary:					
Electrowon	96,000 ^e	67,400	58,300	50,900	52,400
Other	449,000 ^e	416,600	439,700 ^r	418,100 ^r	387,000
Total	545,000 ^e	484,000	498,000 ^r	469,000 ^r	439,400
Austria, secondary ^c	65,000	65,100	81,000 ^r	81,000 ^r	99,000
Belgium: ^c					
Primary ³	207,000	208,000	223,000	252,900 ⁴	252,000
Secondary	216,000	215,000	174,000	130,000	138,000
Total	423,000	423,000	397,000	382,900 ⁴	390,000
Brazil, primary	189,651	173,378	208,020	199,043 ^r	200,000 ^e
Bulgaria: ^c					
Primary	38,000	43,000	52,300	60,500	65,500 ⁴
Secondary	3,000	2,000	3,000	3,000	3,000
Total	41,000	45,000	55,300	63,500	68,500
Burma, electrowon	27,500	27,900 ^e	31,800	34,500 ^r	19,500
Canada:					
Primary	469,761 ^r	428,077	495,835 ^r	484,123 ^r	464,637
Secondary	24,761	26,789	29,982 ^r	30,525 ^r	35,826
Total	494,522 ^r	454,866	525,817 ^r	514,648 ^r	500,463
Chile, primary:					
Electrowon	1,602,000	1,653,100	1,636,300	1,584,600	1,691,800 ^p
Other	1,248,100	1,248,800	1,200,400	1,239,400	1,119,500 ^p
Total	2,850,100	2,901,900	2,836,700	2,824,000	2,811,300 ^p
China: ^c					
Primary					
Electrowon	20,000	10,000	10,000	15,000	20,000
Other	1,280,000	1,420,000	1,580,000	1,850,000	2,000,000
Secondary	350,000	430,000	620,000	750,000	1,000,000
Total	1,650,000	1,860,000	2,210,000	2,615,000 ⁴	3,020,000
Cyprus, electrowon	3,695	2,552	1,240	--	--
Egypt, secondary ^c	4,000	4,000	4,000	4,000	4,000
Finland: ^c					
Primary	112,000	120,000	117,000	118,000	118,000
Secondary	15,000	15,000	16,000	16,000	16,000
Total	127,000	135,000	133,000	134,000	134,000
Germany:					
Primary	327,000	286,653	283,686	293,800 ^r	312,000 ^e
Secondary	368,791	310,925	368,956	344,400 ^r	350,000 ^e
Total	695,791	597,578	652,642	638,200 ^r	662,000 ^e
Hungary, secondary ^c	10,000	10,000	5,000 ^r	5,000 ^r	--
India: ^c					
Primary, electrolytic	354,000	375,000	399,000	497,000 ⁴	629,000 ⁴
Secondary	20,000	19,000	20,000	20,000	15,000
Total	374,000	394,000	419,000	517,000	644,000
Indonesia, primary	192,400	223,300	210,500	262,900	217,600
Iran, primary: ⁵					
Electrowon ^c	12,000	12,000	12,000	10,000 ^r	10,000
Other ⁶	131,000	134,632	140,000	163,100	185,000 ^e

See footnotes at end of table.

TABLE 22—Continued
COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country	2002	2003	2004	2005	2006
Total	143,000	146,632	152,000	173,100 ^r	195,000 ^e
Italy, secondary	32,400	26,700 ^e	34,000	32,200	36,400
Japan:					
Primary	1,211,111	1,251,728	1,188,491	1,227,528	1,342,350
Secondary	189,968	178,637	191,653	167,756	189,705
Total	1,401,079	1,430,365	1,380,144	1,395,284	1,532,055
Kazakhstan, primary	453,000	432,901	445,200	388,000 ^r	408,000
Korea, North, primary ^c	15,000	15,000	15,000	15,000	15,000
Korea, Republic of, undifferentiated	499,116	509,970	495,952	526,566	575,492
Laos, electrowon	--	--	--	30,480 ^r	60,803
Mexico, primary:					
Electrowon	69,300	76,399 ^r	78,108 ^r	92,675 ^r	88,000 ^e
Other	440,100 ^r	235,000 ^r	290,200 ^r	317,700 ^r	252,000 ^e
Secondary ^c	6,000 ^r	6,000 ^r	6,000 ^r	6,000 ^r	6,000
Total	515,400 ^r	317,399 ^r	374,308 ^r	416,375 ^r	346,000 ^e
Mongolia, electrowon	1,500	1,341	2,376	2,475	2,618
Norway, primary ⁶	30,500 ^e	35,900	35,600	38,500	38,500 ^e
Oman, primary ^c	24,000	17,000	24,000	24,000	24,000
Peru, primary:					
Electrowon	156,467	171,198	167,000	165,530	173,871
Other	346,282	345,848	338,308	344,862	333,839
Total	502,749	517,046	505,308	510,392	507,710
Philippines, primary	144,315	171,152 ^r	174,628 ^r	172,000	182,000 ^e
Poland:					
Primary	508,674	513,600	550,000 ^r	560,000 ^r	557,000
Secondary	19,146	16,000	21,000	17,000 ^r	20,000
Total	527,820	529,600	571,000 ^r	577,000 ^r	577,000
Romania:					
Primary	11,453	16,739	24,526 ^r	20,739 ^r	21,000
Secondary ^c	2,000	2,000	2,000	2,000	2,000
Total	13,453	18,739	26,526 ^r	22,739 ^r	23,000
Russia:					
Primary	670,000 ^e	670,000 ^e	662,000	664,000	684,000
Secondary	200,000 ^e	170,000 ^e	257,000	269,000	284,000
Total	870,000 ^e	840,000 ^e	919,000	933,000	968,000
Serbia and Montenegro: ⁷					
Primary	35,897	14,000	36,000 ^r	31,300 ^r	41,400
Secondary ^c	17,000	8,000	7,000	21,000 ^r	29,000 ⁴
Total	52,897	22,000	43,000 ^r	52,300 ^r	70,400
South Africa, primary ⁶	119,970	111,400	103,000 ^r	99,400 ^r	100,000 ^e
Spain:					
Primary	272,000 ^r	259,000 ^r	194,100 ^r	242,700 ^r	235,300
Secondary ^c	67,000 ^r	64,000 ^r	64,300 ^r	66,000 ^r	64,000
Total	339,000 ^r	323,000 ^r	258,400 ^r	308,700 ^r	299,300

See footnotes at end of table.

TABLE 22—Continued
 COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country	2002	2003	2004	2005	2006
Sweden: ^c					
Primary	199,000	189,000	210,000	200,000	200,000
Secondary	25,000	25,000	25,000	22,000	22,000
Total	224,000	214,000	235,000	222,000	222,000
Taiwan, secondary ^c	4,000	4,000	4,000	4,000	4,500
Thailand, primary	--	--	20,000 ^r	15,000 ^r	20,000 ^c
Turkey: ^c					
Primary	39,000	40,000	45,000	90,000	100,000
Secondary	2,000	5,000	5,000	5,000	5,000
Total	41,000	45,000	50,000	95,000	105,000
Ukraine, secondary	10	20	20	20	20
United States:					
Primary:					
Electrowon	601,000	591,000	584,000	554,000	530,000
Other	841,000	662,000	671,000	654,000	675,000
Secondary	69,900	53,300	50,800	47,200	44,800
Total	1,510,000	1,310,000	1,310,000	1,260,000	1,250,000
Uzbekistan, primary ^c	75,000	75,000	93,770 ^{r,4}	103,870 ^{r,4}	110,000
Vietnam, primary	--	--	--	--	4,800
Zambia, primary:					
Electrowon ⁸	83,700	109,000	124,000	150,000	200,000 ^c
Other	253,100	240,800	286,000	244,000 ^c	260,000 ^c
Total	336,800	349,800	410,000	394,000 ^c	460,000 ^c
Zimbabwe, primary ^c	7,200 ^{r,4}	7,200 ^{r,4}	7,000 ^r	7,000 ^r	7,000
Grand total	15,600,000 ^r	15,300,000	16,000,000 ^r	16,600,000	17,400,000
Of which:					
Primary:					
Electrowon	2,670,000	2,720,000	2,710,000 ^r	2,690,000 ^r	2,850,000
Other	11,200,000 ^r	10,900,000	11,300,000 ^r	11,800,000 ^r	12,100,000
Secondary	1,730,000	1,670,000	2,010,000 ^r	2,060,000 ^r	2,380,000

^cEstimated. ^pPreliminary. ^rRevised. -- Zero.

¹World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²This table includes total production of refined copper whether produced by pyrometallurgical or electrolytic refining methods and whether derived from primary unrefined copper or from scrap. Copper cathode derived from electrowinning processing is also included. Table includes data available through July 17, 2007.

³Includes reprocessed leach cathode from Congo (Kinshasa).

⁴Reported figure.

⁵Data are for Iranian years beginning March 21 of that stated.

⁶May include secondary.

⁷In June 2006, Montenegro and Serbia formally declared independence from each other and dissolved their union. Mineral production data for 2006, however, still reflect the unified country.

⁸Electrowon covers only high-grade electrowon cathodes reported as "finished production leach cathodes."