COPPER

By Daniel L. Edelstein

Domestic survey data and tables were prepared by Hema Edupuganti, Michael V. Leahy, and Wanda G. Wooten, statistical assistants, and the world production tables were prepared by Regina R. Coleman and Glenn J. Wallace, international data coordinators.

In 2003, mine production of recoverable copper in the United States fell by about 26,000 metric tons (t) to the lowest level since 1985. A global oversupply of refined copper and resulting sustained low copper prices led to the continuation of previously announced cutbacks and an additional cutback at the Mission Mine in Arizona by ASARCO Incorporated (Asarco) (ASARCO Incorporated, 2002). Phelps Dodge Corp. reported that though there were production shifts between operations, production for its U.S. operations rose nominally to 658,000 t (Phelps Dodge Corp., 2004b, p. 5).

Downstream smelter and refinery production fell by 21% and 13%, respectively. Only three primary smelters and no secondary smelters operated during the year. Electrowon production, which declined by about 9,000 t, accounted for 52% of mine output and a record-high 47% of primary refined copper production. The United States was fifth in world smelter production and fell to fourth place in refinery output behind Chile, China, and Japan.

Reported domestic consumption of refined copper in 2003 declined by about 3% and was at the lowest level in 10 years. In 2002, China became the world's largest consumer of refined copper.

Global mine production of copper remained essentially unchanged in 2003 at 13.6 million metric tons (Mt). The strong growth trend in world mine production that began in 1995 came to an abrupt halt in 2002 when producers, primarily in Chile and the United States, instituted cutbacks. Production was stagnant in 2003 despite an almost 800,000 t increase in global mine capacity during the 2001-03 period. The United States, which accounted for about 8% of world production, reclaimed its position as the world's second leading mine producer from Indonesia, where production fell far short of expectations owing to a major landslide at its dominant producer. Chile, where mine production rose by about 7% to a record-high 4.9 Mt, remained the leading mine producer and accounted for more than one-third of total world production.

U.S. Geological Survey estimates indicated world copper reserves of 470 Mt and a copper reserve base of 940 Mt. The United States had about 7% each of the world's reserves and reserve base.

The principal mining States, which were, in descending order of production, Arizona, Utah, and New Mexico, accounted for 99% of domestic production; copper was also recovered at mines in Idaho, Missouri, and Montana. Although copper was recovered at 22 mines that operated in the United States, just 13 mines accounted for more than 99% of production. The remaining 10 mines were either small leach operations or producers of byproduct copper.

During the year, 3 primary smelters, 4 electrolytic and 3 fire refineries, and 12 solvent-extraction electrowinning (SX-EW) facilities operated in the United States. The three fire refineries processed scrap to recover unalloyed copper products; one of the refineries operated for only a portion of the year. Scrap was also consumed in relatively small quantities at several of the primary smelters. The last remaining U.S. secondary smelter closed in October 2001.

Smelter capacity remained unchanged at about 900,000 t, while refinery capacity declined by about 50,000 t to 2.25 Mt owing to the dismantling of Cerro Copper Products secondary refinery and the permanent closure of Equatorial Mining Co.'s Tonopah NV, electorwinning facility. Smelter and refinery capacity utilization rates fell to 60% and 58%, respectively, down from 91% and 78%, respectively, as recently as 2001.

In 2003, copper recovered from refined or remelted scrap (about 78% from new scrap and 22% from old scrap) composed 30% of the total U.S. copper supply. Following 5 years of decline, the conversion of old scrap to alloys and refined copper was essentially unchanged. Copper recovered from new scrap (738,000 t) declined by about 12%, and to a large extent was a reflection of reduced manufacturing levels.

Copper was consumed as refined copper and as direct melt scrap at about 30 brass mills, 13 wire-rod mills, and 500 chemical plants, foundries, and miscellaneous operations. Owing to erosion in U.S. refined production, the net import reliance for refined copper as a percentage of apparent consumption increased to a record-high 40%. Chile, Peru, and Canada, in descending order, accounted for 93% of U.S. imports for consumption of refined copper.

Legislation and Government Programs

In April 2002, the U.S. Environmental Protection Agency (EPA) published the results of its review of existing drinking water standards for 69 substances (including copper), for which national primary drinking water regulations (NPDWRs) were established prior to 1997, and requested public comment on their proposed rules. At that time, the EPA agreed to follow a National Research Council (NRC) recommendation that the current NPDWR for copper (issued in June 1991), that established a maximum contaminant level goal (MCLG) for copper of 1.3 milligrams per liter, be retained pending collection of additional data on health risks. In July 2003, the EPA published the major comments received on its NPDWR review. The published comments did not challenge the MCLG for copper but rather addressed the need for greater flexibility in control strategies afforded utilities in addressing copper and lead leaching into the water. The EPA concluded, however, that utilities had sufficient flexibility under the existing lead copper rule (LCR) to adopt new control strategies and that

the requirement to notify the State when changing control strategies remained necessary and appropriate. It recognized, however, that the current LCR may limit the ability to adopt new or emerging technologies and that the EPA would continue to monitor new developments and may consider revisions at the end of the next 6-year review cycle (U.S. Environmental Protection Agency, 2003a).

The U.S. Fish and Wildlife Service, U.S. Department of the Interior, conducted a preliminary screening of existing data and literature pertaining to injuries to natural resources from releases of hazardous chemicals from Phelps Dodge's Chino, Morenci, and Tyrone Mines in southwestern Arizona. They determined, that pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act, that there is reasonable probability of making a successful claim for natural resource injuries from releases from these mines. In its determination, the Fish and Wildlife Service noted that there had been high concentration metal pulses in several ephemeral streams downstream of these mines, and that in 2000, numerous dead birds had been discovered at all three mine sites (U.S. Department of the Interior, U.S. Fish and Wildlife Service, 2003).

In October, the EPA proposed revisions to the definition of solid waste that would identify certain recyclable hazardous secondary materials as not discarded, and thus not subject to regulation under subtitle C of the Resource Conservation and Recovery Act. In its proposed ruling, the EPA attempted to identify those materials, including mining byproducts, sludges, scrap metal, and processing solutions, including those from the secondary smelting of nonferrous metals, metals plating and polishing, and printed circuit board production, that are recycled by reclamation within the same industry. The EPA cited copper-bearing sludge as an example that would be excluded from regulation, even if it required multiple processing steps to produce a marketable product such as copper sulfate, as long as each reclamation step took place within the same industry (U.S. Environmental Protection Agency, 2003b).

Production

In response to the continuing global oversupply and resulting sustained low copper prices, domestic mine production fell by about 3% as previously announced mine cutbacks extended into 2003, and at least one additional cutback by Asarco was announced. As a result, and though fluctuating from month to month, mine production remained low throughout the year. Capacity utilization at domestic mines fell by only about 1% to 72%, and capacity fell to 1.55 Mt owing to the permanent closure of the Tonopah Mine in Nevada that had been maintained on care and maintenance since 2001.

Smelter production plummeted by about 21%, and was only about 42% of the production in 1999. Since then, five smelters have permanently closed—three primary smelters in 1999 and two secondary smelters in 2000 and 2001. One primary smelter, the Chino smelter in New Mexico, did not operate and was retained on care-and-maintenance status. The production drop in 2003 was attributable to a shortage of copper concentrate and copper scrap feed materials, and to a temporary smelter shutdown early in the year at Kennecott Utah Copper Corp.'s smelter. A decline in imports of copper concentrates, which were down by 45,000 t (62%) from imports in 2002, and depletion of concentrate stocks in 2002 contributed to the shortage of concentrate.

Company Reviews.—Downstream, primary electrolytic refined copper production declined by about 21%, which matched the fall in smelter output.

In 2003, Phelps Dodge reported copper production of 1.18 Mt, which included minority participants' share of 223,000 t, from its worldwide operations, compared with 1.16 Mt and 224,000 t, respectively, in 2002. U.S. production in 2003 amounted to 652,000 t (517,000 t electrowon and 135,000 t in concentrate), which was up slightly from 642,000 t (525,000 t electrowon and 117,000 t in concentrate) in 2002 (Phelps Dodge Corp., 2004a, p. 8).

The Morenci Mine in Arizona produced a record-high 382,000 t of electrowon copper despite a fire at its Metcalf SX-EW facility, one of four such facilities at the mine, that disrupted production in October (Phelps Dodge Corp., 2003b). Leach ore mined declined by almost 6%, while ore grades remained unchanged at 0.28% copper (Phelps Dodge Corp., 2004a, p. 8-11).

At the Bagdad Mine in Arizona, production rose by 28% to 97,000 t (74,800 t in concentrate and 22,200 t electrowon). While mill throughput increased by 24%, no new material was added to leach stockpiles. Production exceeded company expectations released in January 2002, when Phelps Dodge announced a cutback of 64,000 tons per year (t/yr) of capacity. Owing to improved SX-EW production, higher than anticipated ore grades, and improved copper recoveries, production in 2003 was only down by 25,000 t (Phelps Dodge Corp., 2004a, p. 3).

In April, Phelps Dodge commissioned a demonstration leach plant designed to recover 16,000 t/yr of commercial-grade copper cathode from chalcopyrite concentrates. The $40 million plant reached capacity during the second quarter and by yearend had processed 40,000 t of copper concentrates to produce 11,000 t of cathode (Phelps Dodge Corp., 2004a, p. 3).

At Miami, AZ, the electrolytic refinery remained shuttered, while electrowon production rose by 70% to 16,000 t despite cessation of all mining activity in 2002. Owing to a shortage of concentrate, the smelter operated at less than full capacity, producing 182,000 t of anode, down from 221,000 t in 2002 (Phelps Dodge Corp., 2004a, p. 3-10).

At the Sierrita Mine in Arizona, production of 68,600 t of copper (60,000 t in concentrate and 8,600 t electrowon) was essentially unchanged from that of the previous year, despite cessation of electrowon production during the fourth quarter. Electrowon copper production was curtailed owing to suspension of a lease agreement for the land upon which its electrowinning tankhouse was located (Phelps Dodge Corp., 2004a, p. 3, 8).

At the Chino Mine in New Mexico, electrowon production fell to 36,200 t from 48,800 t in 2002, yet exceeded original expectations. Phelps Dodge had anticipated that this residual leach operation would become uneconomic to operate in mid-2002, but higher than expected recoveries led to resumption of mining-for-leach in September 2003, and the anticipated operational life was extended for several years. The Chino Mine concentrator and smelter remained on care and maintenance (Phelps Dodge Corp., 2004a, p. 4, 8).

In May, Phelps Dodge announced that it had reached an agreement with the State of New Mexico on the financial assurances required as part of its closure and closeout plans for the company's New Mexico operations at Tyrone, Chino, and Cobre. Under the agreement, the operating companies for the three facilities would provide $484.1 million in financial assurances to the State through a combination of cash, collateral, accelerated reclamation expenditures, and a corporate guarantee. Phelps Dodge had previously met its financial assurances through surety bonds (Phelps Dodge Mining Co., 2003). Subsequent to the agreement, Phelps Dodge announced that one of its wholly owned subsidiaries (Chino Acquisition Inc.) had agreed to acquire Heisei Mineral Corp.'s one-third interest in Chino. Heisei paid $62 million into a closure trust fund and $50 million to Chino Acquisition for its share of other obligations related to the Chino facilities (Phelps Dodge Corp., 2003a).

At its Tyrone, NM, leach operation, production was partially curtailed in September and as a result production fell to 51,600 t in 2003 from 63,400 t in 2003. Leach ore production continued its downward trend falling to less than 10 Mt, down from 32 Mt in 2002 and 46 Mt in 2000. The Cobre Mine remained on care and maintenance (Phelps Dodge Corp., 2004a, p. 4-8).

On March 3, the U.S. Bureau of Land Management (BLM) in Arizona forwarded an administrative final environmental impact statement for Phelps Dodge's Safford, AZ, copper project to BLM's Washington, DC, headquarters for review. Following a final decision, the Arizona Department of Environmental Quality and the Army Corps of Engineers will need to issue mine permits. Phelps Dodge has been trying to permit a 100,000-t/yr SX-EW project for about 10 years. If permitting is completed, Phelps Dodge indicated that further feasibility studies would be commissioned. Construction would take 3 to 4 years following final project approval (Platts Metals Week, 2003b).

At yearend, construction of a new plant employing biotechnology to recover copper sulfide was nearing completion in Bisbee, AZ. The $1.9 million plant would be operated by Copreco LLC, a joint-venture company between BioteQ Environmental Technologies Inc. (Vancouver, British Columbia, Canada) and Phelps Dodge Mining Co. The plant will process leach streams coming from a large, low-grade ore stockpile left from Phelps Dodge's old Copper Queen Mine. Currently, these leach streams are processed over scrap iron to produce cement copper. The new facility will use a "BioSulfide Process" that employs anaerobic bacteria to produce a copper sulfide precipitate. The new plant is expected to begin production in January and is expected to produce 1,360 t/yr of copper in sulfide concentrate (Lawrence, 2003§[1]).

Following a series of cutbacks by Asarco for its Arizona mines, the last in December 2002, production at the Mission Mine fell to 23,400 t from 36,600 t in 2002; production of electrowon copper at the Ray Mine fell to 38,900 t from 41,900 t; and production of copper in concentrate at the Ray Mine fell to 84,500 t from 131,400 t. At the Silver Bell Mine, however, production of electrowon copper rose to 22,000 t from 20,400 t (Grupo México, S.A. de C.V., 2004, p. 13).

Asarco and the U.S. Department of Justice (DOJ) reached a final agreement on a plan to transfer the company's 54.2% interest in Southern Peru Copper Corp. (SPCC) to Americas Mining Corp. (AMC), the mining division of Asarco's parent company, Grupo México S.A. de C.V. The agreement, filed in the Phoenix District Court, effectively ended a lawsuit brought by the DOJ in August 2002 that blocked the sale by Asarco (ASARCO Incorporated, 2003a). The settlement required AMC to pay about $765 million, more than $100 million above that proposed earlier, to ensure adequate funding for an independent environmental trust fund to pay for remediation at contaminated sites for which Asarco is responsible (Platts Metals Week, 2003a).

On March 31, Grupo México announced that it had signed and received funding for a loan of $200 million from a syndicate of banks. With completion of the loan package, AMC acquired the 54% share of SPCC owned by its subsidiary, Asarco. Asarco, in turn, was relieved of all its short-term debt, $550 million, or 77% of its overall debt (ASARCO Incorporated, 2003b).

In November, Montana Resources, a general partnership between Montana Resources, Inc. (51%) and Asarco (49%), restarted its Continental Mine, in Butte, MT. Prior to closure in 2000, the mine was producing about 40,000 t/yr of copper and 4,500 t/yr of molybdenum. Montana Resources had attributed closure to low molybdenum prices and high power costs associated with an electricity price squeeze following expiration of its electrical supply contract (Montana Resources, 2003; Platts Metals Week, 2003d).

In September, Constellation Copper Corp. announced that it had signed a letter of intent to purchase the copper processing facilities from Australia-based Equatorial Mining Ltd.'s shuttered Tonapah, NV, operations. The assets to be acquired included crushing equipment and a complete SX-EW plant with a rated capacity of 25,000 t/yr of copper. Constellation concurrently announced the commissioning of a technical update to its feasibility study for the company's Lisbon Valley Project (UT) in order to confirm capacity of the purchased processing equipment, revise the mine plan, and update the financial model for development of the project. The company subsequently entered into agreements to acquire additional copper resources near its Lisbon Valley Project, increasing the company's reserves to 293,000 t of copper from 217,000 t. Constellation hoped that the purchase of Tonapah's equipment would reduce capital costs and construction time, as well as allow the project to be developed in 2004 and to achieve full capacity by early 2005 (Constellation Copper Corp., 2003a, b).

Prior to the sale of its Tonopah assets, Equitorial Mining was successful in its claim that Aker Kvaerner ASA had misrepresented the value of the Tonapah copper project and was awarded a $136.9 million judgment against Kvaerner by the Fifth Judicial Court of Nevada. A bankable feasibility study conducted by Kvaerner in 1997 for Equitorial at the time it purchased Tonapah indicated that the mine could profitably produce 25,000 t/yr of electrowon cathode. The mine, which had begun production in March 2000 and closed in July 2001, never achieved anticipated production rates and was viewed as an economic disaster (American Metal Market, 2003b).

Kennecott Utah Copper Corp. and its labor unions reached a new 6-year contract in June. Operations had continued

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

uninterrupted since expiration of their last 6-year contract in September 2002 (Platts Metals Week, 2003c). Production of copper in concentrates rose to 282,000 t in 2003 from 260,000 t in 2002. Production in 2002 had fallen by 53,000 t from that in 2001 owing to the processing of harder and lower grade ore from the south side of the Bingham Canyon pit. Mill-head grade continued to fall, however, and was down to 0.67% copper from 0.69% copper in 2002 and 0.73% copper in 2001. Mill ore processed rose to 46.1 Mt from 40.7 Mt in 2002. While treatment of concentrates at the smelter dropped by only about 3%, anode production plummeted by about 50,000 t (17%) owing to a drop in concentrate grade to 24.5% in 2003 from 26.2% in 2002. Downstream refinery production fell to 243,000 t from 294,000 t in 2002 (Rio Tinto plc., 2004, p. 14).

BHP Billiton's remaining copper operations in Arizona and Nevada remained shuttered throughout 2003. Copper production from the company's residual Arizona leach operations at Miami and Pinto Valley totaled 10,000 t, down from 13,200 t in 2002 (BHP Billiton, 2004a, p. 6). In December, BHP Billiton continued its divestiture of North American copper properties when it reached an agreement to sell its 100% interest in the shuttered Robinson Mine near Ely, NV, to Quadra Mining Ltd. (Vancouver, British Columbia, Canada) for $18 million. Quadra Mining Ltd. was formed in 2002 with the goal of becoming a midtier base-metals development and operating company (BHP Billiton, 2003).

Nord Resources Corp. continued to seek financing to restart mining operations at its Johnson Camp Mine in Arizona with the hope of producing about 9,000 t/yr of electrowon copper. Though the mine has been on care and maintenance for several years, Nord continued to produce limited amounts of electrowon copper from residual leach operations through May 2003 (Nord Resources Corp., 2004).

Consumption

Reported domestic consumption of refined copper in 2003 declined by about 3% and was at its lowest level in 10 years. The continued slump in copper consumption in the production of brass mill and wire mill products was attributed by industry to weak commercial construction, telecommunications, and numismatic markets; industry destocking; and rising imports of manufactured items, especially from China, which had become the world's largest consumer of refined copper in 2002 (American Bureau of Metal Statistics, Inc., 2003). According to one market analysis, copper tube and brass mill products were not benefiting from the strong housing market and there was a "disconnect" between the copper market and the economy (Platts Metals Week, 2003h). CRU International Ltd. supported this contention but noted that despite an 8.8% rise in residential construction spending, and a 3.9% rise in total U.S. construction spending compared with that in 2002, private nonresidential construction (where, for example, copper tube is used most intensely) declined by 4.9% (CRU International Ltd., 2003; 2004a, p. A-24).

According to the American Bureau of Metal Statistics, Inc. (ABMS) shipments of brass mill products by domestic producers were down by 4.8% for the year, despite a 3.1% year-on-year increase in the fourth quarter. All copper and copper alloy product sectors declined in 2003—plate, strip and sheet (5.7%); rod and bar (7.6%); and tube (1.3%). Similarly, ABMS data indicated that domestic wire rod shipments for 2003 declined by 6.6% compared with those in 2002, despite a 7% year-on-year fourth quarter growth. Apparent consumption of wire rod, including net imports, fared even worse, falling by 8.5% (American Bureau of Metal Statistics, Inc., 2004a, b).

Preliminary data compiled by the Copper Development Association, Inc. (2004, p. 18) indicated that wire mill shipments to the telecommunications industry in 2003 fell by 16% and were down by 57% from the record level in 2000. According to U.S. telecommunication giant Lucent Technologies Inc., there had been a "significant reduction in capital spending by service providers." According to industry analysts, the communication wire segment continued to be depressed owing to an overbuilding of networks prior to the industry collapse in 2000 that was allowing companies to defer capital spending on building out and upgrading their networks (Platts Metals Week, 2003g).

On March 3, Superior TeleCom Inc. [parent to Superior Essex (formerly Essex International)] announced that it had filed a voluntary petition for reorganization under Chapter 11 of the U.S. Bankruptcy Code. Superior TeleCom was the third largest U.S. copper cable and wire rod manufacturer, primarily producing telecommunications wire and cable and magnet wire for motors, transformers, etc. The company attributed the need for restructuring to a sustained downturn in telecom markets, particularly from their traditional local telephone company customers for communications cable products used in the local loop, and the continued lack of a "visibly strong economic recovery" (Superior TeleCom, Inc., 2003).

According to preliminary data from the Copper Development Association, Inc. (2004, p. 18-20), 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 in 2003 to 3.17 Mt, which was down by 4.5% from the revised total of 3.32 Mt in 2002, and by 25% from the record-high shipments in 2000 of 4.23 Mt. About 74% of shipments in 2003 was as unalloyed copper products. Brass mill products accounted for about 47% of total shipments to the domestic market; wire mill products, 49%; and foundry and powder products, 4%. In building construction, which was the largest end use sector, shipments declined by 4.6% and accounted for about 48% of the market. Building construction included products used for air conditioning, architectural applications, builder's hardware, building wire, commercial refrigeration, and plumbing and heating. Shipments for electric/electronic products (21% market share), industrial machinery and equipment (10% share), transportation equipment (10% share), and consumer and general products (10% share) declined by 9%, 6%, 3%, and 1%, respectively.

Prices and Stocks

Copper prices staged a rally early in the year when the COMEX (a division of the New York Merchantile Exchange, Inc.) average monthly spot price rose from $0.72 per pound

of copper in December 2002 to $0.77 per pound in February 2003 (the highest level in almost 2 years) before falling slightly in March to $0.76 per pound. The price rise in January and February was attributed to several factors, including a delayed response to falling inventories (yearend 2002 global inventories were down by about 225,000 t from their peak values in April) and announced supply curtailments at yearend 2002. Copper prices moderated somewhat during the second quarter of the year, averaging about $0.75 per pound, despite a continued slide in inventories. According to International Copper Study Group (ICSG) (2003, p. 22) data, global inventories at the end of June had fallen by more than 100,000 t since yearend 2002. Copper prices resumed their upward trend during the third quarter, and in September, the monthend and average monthly COMEX spot price both rose to about $0.82 per pound of copper. With declining global inventories and growing uncertainty over supply adequacy, the rise was in part spurred by a June 29 pronouncement by Phelps Dodge that it had no immediate plans to restart about 250,000 to 300,000 t/yr of curtailed domestic capacity. According to the company, a decision to restart any of the closed capacity would be predicated on a number of factors including prices, projected world supply and demand balances, and internal needs and shareholder interests (Platts Metals Week, 2003e).

At the beginning of October, prices began a steep climb, breaking through to $0.90 per pound during the third week in the month, the highest level since September 2000. The price rise was attributed to industry announcements that could have constrained supply, including a series of measures by Noranda Inc. aimed at restoring profitability to its Horne smelter in Quebec, Ontario, Canada, that would decrease production by 20% (41,000 t/yr) (Noranda Inc., 2003). The price climb continued through the first week of November, with the COMEX spot price peaking at almost $0.96 per pound on November 4.

The spot COMEX price averaged $0.93 per pound in November, rose to an average of $1.00 in December, and peaked at yearend at $1.04 per pound. Copper prices responded sharply in mid-December to the report of a second landslide at Freeport McMoRan Copper & Gold Inc.'s Grasberg Mine in Indonesia. The slide was within the same work zone that had killed eight miners in October. Following the second landslide, Freeport declared a force majeure on its copper concentrate delivery contracts (American Metal Market, 2003a). Subsequently, Freeport announced that it would accelerate the removal of waste material from its south wall to restore access to the affected higher-grade areas in the pit and its projected production for 2004 was revised downward to 454,000 t from 635,000 t (Freeport McMoRan Copper & Gold Inc., 2004b).

At yearend, inventories on global commodity exchanges [COMEX, London Metals Exchange Ltd. (LME), and Shanghai Futures Exchange] fell to 806,000 t from 1.29 Mt at yearend 2002, and total inventories fell to 1.78 Mt from 2.05 Mt at yearend 2002 (International Copper Study Group, 2004a, p. 22). Most of the offtake had occurred from COMEX warehouses (107,000 t) and U.S. located LME warehouses (425,000 t). A shift in inventories, however, resulted in a 46,000-t rise in inventories on the Shanghai Futures Exchange. According to ICSG data, global inventories at yearend represented about 42 days of supply, down from 49 days in 2002 (International Copper Study Group, 2004a, p. 9).

Copper scrap prices generally followed the trend in refined copper prices. Tight domestic supplies of scrap throughout the year, however, tended to lower the discount to refined copper. According to American Metal Market data, the discount from the COMEX spot price for brass mill No. 1 scrap averaged only 1.2 cents per pound in 2003, down from 1.4 cents per pound in 2002 and 3.0 cents per pound in 2001. The average discount in December 2003 fell to less than 1.0 cent per pound. Similarly, the discount for refiners of No. 2 scrap fell to 10.9 cents per pound in 2003 from 12.2 cents per pound and 13.7 cents per pound in 2002 and 2001, respectively. This contradicted historical patterns where higher refined copper prices generally meant increased scrap discounts. Industry reports indicated that higher grades of scrap were increasingly going to China, which created domestic scrap shortages and caused the spread between refined copper prices and high-grade scrap to remain very narrow despite the rise in refined copper prices (Platts Metals Week, 2003i).

Trade

According to U.S. Census Bureau data, net refined copper imports of 789,000 t were down by about 12% from those in 2002. U.S. import reliance as a percentage of apparent demand rose to a record-high 40%. Canada remained the most significant source of unwrought copper products from 1999 through 2003 and accounted for 28% of unmanufactured imports, followed by Chile, 26%, and Peru, 23%. Refined copper accounted for 75% of unwrought copper imports during the same period.

According to U.S. Census Bureau data compiled by the Copper and Brass Fabricators Council Inc. (2004, p. 1-9), U.S. imports of 268,000 t of copper and copper-alloy semifabricated products (excluding wire-rod mill products) were essentially unchanged from that of the previous year, while exports fell to 122,000 t from 137,000 t in 2002. Consequently, net imports rose to 146,000 t from 133,000 t in 2002. Canada and Mexico accounted for 77% of semifabricated copper exports and 32% of imports.

On June 6, the United States and Chile signed a free trade agreement (FTA) that would eliminate bilateral tariffs, including those on copper. According to the U.S. Trade Representative, the FTA would lower trade barriers, promote economic integration, and expand economic opportunities for both countries. The United States and Chile began negotiations on the FTA in December 2000, holding a series of 14 negotiating rounds, with technical work continuing through the week of signing. Under terms of the agreement, all tariffs and quotas on all goods and services would be eliminated either immediately or after a transition period. More than 90% of bilateral trade in consumer and industrial products would become duty free immediately upon entry into force, and most remaining tariffs were to be eliminated within 4 years (Office of the U.S. Trade Representative, 2003). In the case of refined copper, the U.S. duty initially would be cut to 0.5%, one-half its current level, before being eliminated completely in the second year

(Platts Metals Week, 2003f). Subsequent to the signing of the agreement, the FTA was approved by Congress (along with passage of an implementing bill), signed by the President, and entered into force on January 1, 2004 (Office of the U.S. Trade Representative, 2004§).

Exports of copper scrap for 2003 totaled 689,000 t, up from 511,000 t in 2002. China (including Hong Kong) was the destination for 70% of domestic scrap exports and based on import data, accounted for 63% of global scrap imports. The United States remained the leading source of copper scrap, accounting for 19% of global copper scrap trade (based on exports). This lent support to industry claims that aggressive buying by China exacerbated the limited supply of copper scrap available to U.S. consumers.

Concerns over the rising U.S. exports of scrap to China and domestic imports of manufactured goods from that country led to the formation of the Washington-based Coalition for a Sound Dollar. The 80-plus member coalition (including the American Foundry Society, the Copper and Brass Fabricators Council, and the Forging Industry Association) contended that China's policy of pegging the value of the Chinese yuan to the U.S. dollar, rather than letting it float in world currency markets, constituted currency manipulation that seriously undervalued the yuan and allowed China to produce and sell goods at artificially low prices. The group's aim was to convince the United States to initiate talks to force China's central bank to establish a rate for the yuan that consistently reflected its economy, which had been growing at about 8% per year (Kelly, 2003).

World Industry Structure

The global production surplus and inventory rise for refined copper, which developed at midyear 1997 and faltered only in 2000, reversed during the first quarter of 2003, and by yearend the production deficit and accompanying stock decline were firmly established. According to the ICSG, reported global inventories of refined copper declined throughout the year and by yearend had fallen by about 270,000 t. According to ICSG data, refined copper production fell by 85,000 t to 15.2 Mt, while the use of refined copper rose by about 410,000 t (2.75%) to 15.6 Mt resulting in a calculated production deficit for 2003 of about 360,000 t (International Copper Study Group, 2004a, p. 9, 22).

With the exception of Asia, the major copper consuming regions of the world reported stagnant or negative growth in copper use. In North America, copper use declined by about 2% while use in Europe increased nominally. This reflected a generally positive outlook, as use in Europe and North America had declined by 2.7% and 10%, respectively, in the preceding year. In Asia, copper use growth slowed to 6% (430,000 t) in 2003, down from 12% in 2002. Growth in apparent use was led by China with 320,000 t (12%); Thailand, 18,000 t (10%); and Japan, 35,000 t (3%).

Mine Production.—In 2003, according to ICSG estimates, world mine capacity rose by only about 100,000 t (0.6%) to about 15.2 Mt. The ICSG, however, reduced its estimate of capacity at the Escondida Mine in Chile by about 200,000 t to reflect the temporary processing of lower-grade ore. No significant new projects came onstream during the year, though a major expansion of Escondida was completed at yearend 2002 and several projects were under development for startup in 2004. This followed a period of strong growth that began in 1995 and saw capacity growth of 42% during the 1994-2002 period. In 2003, capacity growth in Chile (50,000 t), Kazakhstan (50,000 t), Zambia (38,000 t), Congo (Kinshasa) (30,000 t), Russia, (24,000 t), Australia (22,000 t), and Peru (21,000 t) was partially offset by declines in Canada, Indonesia, and the United States. In Indonesia, effective capacity was reduced by about 95,000 t when landslides limited access to high-grade ore in the Grasberg Mine (International Copper Study Group, 2004b, p. 12-60).

In Chile, production rose at all four Corporación Nacional del Cobré de Chile (Codelco) divisions for a total gain of 44,000 t. Total costs rose to 73.5 cents per pound of cathode from 65.6 cents per pound in 2002, while cash costs rose to 42.7 cents from 40 cents. The average ore grade was 0.91%, similar to that in 2002. For the 5-year period, 1999-2003, however, the ore grade declined by 13% (Corporación Nacional del Cobré de Chile, 2004, p. 55). Despite a fall in mill-head grade from 1.58% copper to 1.43% copper at the Escondida Mine, copper in concentrate production rose to 847,000 t from 623,000 t in 2002 owing to completion of the $1 billion phase 4 expansion in October 2002 (Rio Tinto plc., 2004, p. 11).

At the El Abra Mine (Phelps Dodge, 51%, and Codelco, 49%), production of electrowon copper rose nominally to 227,000 t, and at the Candaleria Mine (Phelps Dodge, 80%, and Sumitomo Corp., 20%) concentrate production rose to 213,000 t from 200,000 t in 2002 (Phelps Dodge Corp., 2004a, p. 4-9).

In Peru, 15,000 t of copper in concentrate was produced following the restart of sulfide mining at the Tintaya Mine. Production from Tintaya's new leach project, which began operating in 2002, rose nominally to 18,000 t. In Northern Peru, production at the Antamina copper-zinc project (BHP Billiton, Mitsubishi Corp., Noranda Inc., and Teck Cominco Ltd.) fell to 272,000 t of copper in concentrate from almost 320,000 t in 2002 (BHP Billiton, 2004b, p. 10). SPCC reported that production at its Toquepala Mine rose to 142,000 t from 125,000 t in 2002 following completion of the concentrator expansion in September 2002 that expanded capacity by one-third. The Cuajone Mine produced 184,000 t, up from 168,000 t in 2002, and production of electrowon copper declined to 48,000 t from 53,000 t in 2002 (Southern Peru Copper Corp., 2004, p. 6).

In Indonesia, production at the Grasberg Complex fell to 731,000 t of copper in concentrate from 864,000 t in 2002 because of lower average copper ore grades and lower mill throughput caused by failure of the pit wall on October 9 and additional debris flow in December (Freeport McMoRan Copper & Gold Inc., 2004a, p. 16).

In Zambia, First Quantum Minerals Ltd. reported that Bwana Mkubma tailings leach project produced 29,500 t of cathode, up from 11,900 t in 2002. First Quantum completed a $163 million financing package for construction of phase I of the Kansanshi project, and construction and procurement began in September. Phase I will focus on the open pit mining of shallow oxide and mixed oxide and sulfide ores. These reserves were estimated to be 142 Mt and contain an average of 1.43% copper (First Quantum Minerals, Ltd., 2004).

Smelter Production.—Despite the continued decline in North American smelting capacity, world smelter capacity rose by about 300,000 t to a record-high 14.8 million metric tons per year. Capacity in Canada fell following closure of the Gaspé smelter in 2002. In Chile, modernization of Noranda's Alnorte smelter, including a new Noranda furnace, was completed, which boosted capacity to 290,000 t/yr from 165,000 t/yr. In China, expansions of the Guixi (Jiangxi Copper Corp.) and the Jinchuan Non-ferrous Metal Co. smelters accounted for most of a 190,000-t/yr increase in capacity. In India, the Birla Group installed Ausmelt technology to expand its Outokumpu furnace to an eventual 250,000 t/yr from 150,000 t/yr in 2002, and the Sterlite Industries Ltd., Isasmelt smelter, which started up in 1996, reached capacity of about 180,000 t/yr in 2003, up from 150,000 t/yr in 2002.

With most of the limited growth in world mine output coming from electrowon production, and continued growth in copper smelting capacity, world concentrate output was insufficient to meet demand. According to CRU International Ltd. (2004b, p. 44-48), concentrate inventories fell for the third consecutive year. Yearend inventories of copper concentrate fell by about 45,000 t in 2003, which were down by about 250,000 t from yearend 2000. In response to the continued concentrate shortage, treatment and refining charges plummeted and by the fourth quarter of the year spot prices had fallen below 5 cents per pound of copper, and annual contracts were about 12 cents per pound of copper, down from an average of about 18 cents per pound of copper in 2002. Chinese imports of copper in concentrate continued to rise, rising to 800,000 t of copper content, up from 620,000 t in 2002.

Refinery Production.—World refinery capacity rose by about 450,000 t/yr (2%). No new electrolytic refineries were commissioned in 2003, and for the most part, expansions followed expanded smelter capacities. Refinery growth continued to outpace raw material supplies and capacity utilization at global refineries fell to 81%, down from 88% as recently as 2001 (International Copper Study Group, 2004b, p. 96-106).

Outlook

World mine production of copper was expected to increase by about 900,000 t (6.6%) in 2004, despite the landslide that reduced output in Indonesia. Chile and Peru were expected to account for about two-thirds of the increased output owing to increased capacities and restoration of production cut during 2003. According to projections by the ICSG (International Copper Study Group, 2004c), world refined copper production was expected to grow by about 560,000 t (3.7%), while world use was projected to grow by almost 900,000 t (5.7%). Consequently, the annual production deficit, estimated to be 375,000 t in 2003, was projected to grow to at least 700,000 t in 2004. Copper use in China was projected to increase by almost 7% in 2004, down from about 12% growth in 2003. In response to the shortage of copper, global inventories were expected to decline in 2004. By the first week in October, inventories on the world commodity exchanges had fallen by about 650,000 t, and in response to the tightening supply and weakening U.S. dollar, the COMEX price had reached $1.47 per pound.

In the United States, Phelps Dodge Corp., in response to projected production shortfalls, began to increase output in the second half of 2004 at its Bagdad and Sierrita Mines in Arizona and resumed concentrate production at its Chino Mine in New Mexico (closed in 2001). Other domestic increases were expected from a full year of operation of the Continental Mine in Montana and startup under new ownership of the Robinson Mine in Nevada in the fourth quarter of 2004 (Robinson had last operated in 1999). However, owing to cutbacks at other operations, total U.S. mine production was expected to grow by only about 40,000 t in 2004.

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TABLE 1
SALIENT COPPER STATISTICS[1]

(Metric tons unless otherwise specified)

		1999	2000	2001	2002	2003
United States:						
Mine production:						
Ore concentrated	thousand metric tons	236,000	202,000	148,000	104,000	114,000
Average yield of copper[2]	percent	0.42	0.43	0.47	0.51	0.45
Recoverable copper:						
Arizona		1,050,000	929,000	879,000	767,000	741,000
Michigan, Montana, Utah		313,000	W	W	W	W
New Mexico		197,000	195,000	141,000	112,000	87,800
Other States		37,400	322,000	318,000	263,000	287,000
Total		1,600,000	1,450,000	1,340,000	1,140,000	1,120,000
Total value	millions	$2,680	$2,810	$2,270	$1,910	$2,100
Smelter production:						
From domestic and foreign ores		1,090,000	(3)	(3)	(3)	(3)
From scrap (new and old)		205,000	(3)	(3)	(3)	(3)
Total		1,290,000	1,000,000	919,000	683,000	539,000
Byproduct sulfuric acid, sulfur content	thousand metric tons	1,130	830	813	695	590
Refinery production:						
Primary materials:						
Electrolytic from domestic ores		1,110,000	865,000	808,000	725,000	532,000
Electrolytic from foreign materials		196,000	163,000	192,000	116,000	130,000
Electrowon		586,000	556,000 r	628,000	601,000	591,000
Total		1,890,000	1,580,000 r	1,630,000	1,440,000	1,250,000
Secondary materials (scrap):						
Electrolytic		156,000	(3)	(3)	(3)	(3)
Fire refined		73,700	(3)	(3)	(3)	(3)
Total		230,000	209,000 r	172,000	69,900	53,300
Grand total		2,120,000	1,790,000 r	1,800,000	1,510,000	1,310,000
Secondary copper produced:						
Recovered from new scrap		949,000	955,000	833,000	842,000	738,000
Recovered from old scrap		381,000	358,000 r	317,000 r	208,000 r	206,000
Total		1,330,000	1,310,000	1,150,000	1,050,000	944,000
Copper sulfate production		52,700	55,500	55,200	49,200	32,100
Exports:						
Refined		25,200	93,600	22,500	26,600	93,300
Unmanufactured[4]		395,000	650,000	556,000	506,000	703,000
Imports:						
Refined		837,000	1,060,000	991,000	927,000	882,000
Unmanufactured[4]		1,280,000	1,350,000	1,400,000	1,230,000	1,140,000
Copper stocks, December 31:						
Blister and in-process material		138,000	122,000	98,000	44,400	56,800
Refined copper:						
Refineries		9,830	14,800	28,600	11,700	12,100
Wire-rod mills		33,800 r	39,900 r	37,600	23,000	29,700
Brass mills		23,600 r	23,600	25,500	28,700	20,200
Other industry		4,020 r	4,390 r	4,860	4,800 r	4,870
New York Commodity Exchange (COMEX)		83,100	58,700	244,000	362,000	255,000
London Metal Exchange (LME), U.S. warehouses		412,000	204,000	617,000	601,000	335,000
Total		566,000 r	345,000 r	957,000	1,030,000	657,000
Consumption:						
Refined copper, reported		2,980,000	3,020,000 r	2,620,000	2,370,000	2,290,000
Apparent consumption, primary refined and old scrap[5]		3,130,000	3,090,000 r	2,510,000 r	2,610,000	2,430,000
Price:						
Producer, weighted average	cents per pound	75.91	88.16	76.85	75.80	85.25
COMEX, first position	do.	72.11	83.97	72.57	71.67	81.05
LME, Grade A cash	do.	71.33	82.24	71.57	70.72	80.68
World production:						
Mine	thousand metric tons	12,800	13,200	13,700	13,600	13,600 e
Smelter	do.	11,800 r	12,000 r	12,500 r	12,300 r	12,300 e
Refinery	do.	14,600	14,900 r	15,700	15,500	15,200 e

See footnotes at end of table.

TABLE 1--Continued
SALIENT COPPER STATISTICS[1]

[e]Estimated. [r]Revised. W Withheld to avoid disclosing company proprietary data; included in "Other States."
[1]Data are rounded to no more than three significant digits, except prices; may not add to totals shown.
[2]Yield calculations are for concentrated ore only.
[3]Withheld to avoid disclosing company proprietary data; included in "Total."
[4]Includes copper content of alloy scrap.
[5]In 1999, 2000, 2001, 2002, and 2003, apparent consumption is calculated using general imports of 915,000 metric tons (t), 1,020,000 t, 1,200,000 t, 1,060,000 t, and 687,000 t, respectively.

TABLE 2
LEADING COPPER-PRODUCING MINES IN THE UNITED STATES IN 2003, IN ORDER OF OUTPUT[1]

Rank	Mine	County and State	Operator	Source of copper	Capacity (thousand metric tons)
1	Morenci	Greenlee, AZ	Phelps Dodge Corp.	Copper ore, leached	390
2	Bingham Canyon	Salt Lake, UT	Kennecott Utah Copper Corp.	Copper-molybdenum ore, concentrated	300
3	Ray Mines	Pinal, AZ	ASARCO Incorporated	Copper ore, concentrated and leached	180
4	Bagdad	Yavapai, AZ	Phelps Dodge Corp.	Copper-molybdenum ore, concentrated and leached	120
5	Sierrita	Pima, AZ	do.	do.	120
6	Tyrone	Grant, NM	do.	Copper ore, leached	95
7	Chino	do.	do.	do.	125
8	Mission Complex	Pima, AZ	ASARCO Incorporated	Copper ore, concentrated	70
9	Silver Bell	do.	do.	Copper ore, leached	22
10	Miami Mine	Gila, AZ	Phelps Dodge Corp.	do.	75
11	Pinto Valley	do.	BHP Copper Co.	do.	10
12	Miami	do.	do.	do.	12
13	Continental Pit	Silver Bow, MT	Montana Resources, Inc.	Copper-molybdenum ore, concentrated	40

[1]The mines in this list accounted for more than 99% of the U.S. mine production in 2003.

TABLE 3
MINE PRODUCTION OF COPPER-BEARING ORES AND RECOVERABLE COPPER CONTENT OF ORES PRODUCED IN THE UNITED STATES, BY SOURCE AND TREATMENT PROCESS[1]

(Metric tons)

	2002		2003	
Source and treatment process	Gross weight	Recoverable copper	Gross weight	Recoverable copper
Mined copper ore:				
Concentrated	104,000,000	535,000	114,000,000 [2]	518,000
Leached	NA	601,000	NA	591,000
Total	NA	1,140,000	NA	1,110,000
Copper precipitates shipped; leached from tailings, dumps, and in-place material	950	536	1,210	684
Other copper-bearing ores[3]	3,330,000	6,550	3,170,000	6,060
Grand total	XX	1,140,000	XX	1,120,000

NA Not available. XX Not applicable.
[1]Data rounded to three significant digits; may not add to totals shown.
[2]In 2003, 9,260 kilograms of gold and 164 metric tons of silver were recovered from concentrated ore. The average value of gold and silver per metric ton of ore concentrated was $1.18.
[3]Includes gold ore, lead ore, silver ore, silver-copper ore, zinc ore, and ore shipped directly to smelter.

TABLE 4
CONSUMPTION OF COPPER AND BRASS MATERIALS IN THE UNITED STATES, BY ITEM[1]

(Metric tons)

Item	Brass mills	Wire-rod mills	Foundries, chemical plants, miscellaneous users	Smelters, refiners, ingot makers	Total
2002:					
Copper scrap	930,000 [2]	W	87,000 [r]	211,000 [r]	1,230,000 [r]
Refined copper[3]	593,000	1,710,000	56,500 [r]	4,570	2,370,000
Hardeners and master alloys	554	--	2,450	--	3,010
Brass ingots	--	--	108,000 [r]	--	108,000 [r]
Slab zinc	67,900	--	(4)	(4)	85,600
2003:					
Copper scrap	840,000 [2]	W	87,600	185,000	1,110,000
Refined copper[3]	587,000	1,640,000	57,400	4,550	2,290,000
Hardeners and master alloys	6,060	--	1,750	--	7,800
Brass ingots	1,180	--	100,000	--	101,000
Slab zinc	65,600	--	(4)	(4)	86,200

[r]Revised. W Withheld to avoid disclosing company proprietary data; included with "Brass mills." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes item indicated by symbol W.
[3]Detailed information on consumption of refined copper can be found in table 5.
[4]Withheld to avoid disclosing company proprietary data; included in "Total."

TABLE 5
CONSUMPTION OF REFINED COPPER SHAPES IN THE UNITED STATES, BY CLASS OF CONSUMER[1]

(Metric tons)

Class of consumer	Cathodes	Ingots and ingot bars	Cakes and slabs	Wirebar, billets, other	Total
2002:					
Wire-rod mills	1,700,000	--	--	8,710	1,710,000
Brass mills	439,000	17,700	72,600	63,700	593,000
Chemical plants	--	--	--	954	954
Ingot makers	W	W	W	4,570 [2]	4,570
Foundries	2,840	5,040 [r]	--	12,000 [r]	19,800 [r]
Miscellaneous[3]	W	W	W	35,700 [2]	35,700
Total	2,140,000	22,800 [r]	72,600	126,000	2,370,000
2003:					
Wire-rod mills	1,630,000	--	--	8,730	1,640,000
Brass mills	439,000	14,900	41,800	91,400	587,000
Chemical plants	--	--	--	959	959
Ingot makers	W	W	W	4,550 [2]	4,550
Foundries	3,100	5,740	--	11,300	20,200
Miscellaneous[3]	W	W	W	36,200 [2]	36,200
Total	2,070,000	20,600	41,800	153,000	2,290,000

[r]Revised. W Withheld to avoid disclosing company proprietary data; included with "Wirebar, billets, other." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes items indicated by symbol W.
[3]Includes 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 RECOVERY[1]

(Metric tons)

	2002	2003
Kind of scrap:		
New scrap:		
Copper-base	803,000 r	701,000
Aluminum-base	37,100	36,400
Nickel-base	18	18
Total	840,000 r	738,000
Old scrap:		
Copper-base	165,000 r	185,000
Aluminum-base	24,000	21,100
Nickel-base	148 r	213
Zinc-base	29	27
Total	190,000 r	206,000
Grand total	1,030,000 r	944,000
Form of recovery:		
As unalloyed copper	77,700	60,200
In brass and bronze	876,000 r	812,000
In alloy iron and steel	425 r	976
In aluminum alloys	63,200 r	58,800
In other alloys	122 r	27
In chemical compounds	12,000 r	12,300
Total	1,030,000 r	944,000

rRevised.
[1]Data 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 OPERATION[1]

(Metric tons)

	From new scrap		From old scrap		Total	
Type of operation	2002	2003	2002	2003	2002	2003
Ingot makers	26,000 r	16,700	73,200 r	75,100	99,200 r	91,800
Refineries[2]	36,500	16,000	33,400	37,300	69,900	53,300
Brass and wire-rod mills	716,000	644,000	18,700	31,800	735,000	676,000
Foundries and manufacturers	19,200	19,700	37,400 r	37,300	56,600 r	57,100
Chemical plants	5,070	5,040	2,780 r	3,130	7,860 r	8,160
Total	803,000 r	701,000	165,000 r	185,000	968,000 r	886,000

rRevised.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Electrolytically 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 SCRAP[1]

(Metric tons)

Item produced from scrap	2002	2,003
Unalloyed copper products:		
Refined copper	69,900	53,300
Copper powder	7,440	6,560
Copper castings	300	338
Total	77,700	60,200
Alloyed copper products:		
Brass and bronze ingots:		
Tin bronzes	14,300 r	9,740
Leaded red brass and semired brass	71,300 r	61,800
High leaded tin bronze	9,550 r	9,770
Yellow brass	4,690 r	4,270
Manganese bronze	8,280 r	8,000
Aluminum bronze	5,490 r	5,010
Nickel silver	1,920 r	2,260
Silicon bronze and brass	3,790 r	3,780
Copper-base hardeners and master alloys	5,420 r	5,420
Miscellaneous	3,850 r	6,040
Total	129,000 r	116,000
Brass mill and wire-rod mill products	916,000	829,000
Brass and bronze castings	44,100 r	44,600
Brass powder	123	102
Copper in chemical products	12,000 r	12,300
Grand total	1,180,000 r	1,060,000 p

pPreliminary. rRevised.
[1]Data 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 STATES[1]

(Metric tons)

	Copper	Tin	Lead	Zinc	Nickel	Aluminum	Total
Brass and bronze ingot production:[2]							
2002r	107,000	4,340	6,700	10,500	218	12	129,000
2003	96,700	3,920	5,810	9,410	217	11	116,000
Secondary metal content of brass mill products:							
2002	736,000	1,450	6,400	171,000	W	W	916,000
2003	677,000	491	5,820	144,000	W	W	829,000
Secondary metal content of brass and bronze castings:							
2002	39,300 r	1,490	1,100	2,110 r	78	72	44,100 r
2003	39,700	1,520	1,080	2,110	114	74	44,600

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes approximately 97% from scrap and 3% from other than scrap in 2002 and approximately 96% from scrap and 4% from other than scrap in 2003.

TABLE 10
CONSUMPTION AND YEAREND STOCKS OF COPPER-BASE SCRAP[1]

(Metric tons, gross weight)

Scrap type and processor	2002		2003	
	Consumption	Stocks	Consumption	Stocks
No. 1 wire and heavy:				
Smelters, refiners, and ingot makers	71,700 r	927 r	68,100	852
Brass and wire-rod mills	379,000	(2)	377,000	(2)
Foundries and miscellaneous manufacturers	33,800 r	(2)	34,000	(2)
No. 2 mixed heavy and light:				
Smelters, refiners, and ingot makers	41,600 r	1,310 r	30,000	921
Brass and wire-rod mills	6,630	(2)	5,750	(2)
Foundries and miscellaneous manufacturers	3,490	(2)	3,160	(2)
Total unalloyed scrap:				
Smelters, refiners, and ingot makers	113,000 r	2,240 r	98,100	1,770
Brass and wire-rod mills	386,000	15,800	383,000	17,600
Foundries and miscellaneous manufacturers	37,300 r	2,660 r	37,100	2,650
Red brass:[3]				
Smelters, refiners, and ingot makers	30,600 r	1,940 r	24,700	1,740
Brass mills	13,500	(2)	11,900	(2)
Foundries and miscellaneous manufacturers	9,090	(2)	10,800	(2)
Leaded yellow brass:				
Smelters, refiners, and ingot makers	9,050 r	863 r	8,240	774
Brass mills	327,000	(2)	297,000	(2)
Foundries and miscellaneous manufacturers	1,200	(2)	1,230	(2)
Yellow and low brass, all plants	105,000	851 r	51,000	608
Cartridge cases and brass, all plants	70,900	(2)	80,500	(2)
Auto radiators:				
Smelters, refiners, and ingot makers	31,400 r	1,620 r	25,700	1,580
Foundries and miscellaneous manufacturers	4,830 r	(2)	3,680	(2)
Bronzes:				
Smelters, refiners, and ingot makers	8,070 r	1,030 r	8,010	945
Brass mills and miscellaneous manufacturers	24,400	(2)	17,300	(2)
Nickel-copper alloys, all plants	15,400 r	200 r	17,300	332
Low grade and residues:				
Smelters, refiners, and miscellaneous manufacturers	30,200 r	886 r	32,200	971
Other alloy scrap:[4]				
Smelters, refiners, and ingot makers	3,010 r	222 r	1,100	207
Brass mills and miscellaneous manufacturers	8,010	(2)	5,210	(2)
Total alloyed scrap:				
Smelters, refiners, and ingot makers	98,000 r	7,610 r	87,200	7,150
Brass mills	544,000	31,300	458,000	26,500
Foundries and miscellaneous manufacturers	49,700 r	2,890 r	50,500	2,570
Total scrap:				
Smelters, refiners, and ingot makers	211,000 r	9,850 r	185,000	8,930
Brass and wire-rod mills	930,000	47,100	841,000	44,100
Foundries and miscellaneous manufacturers	87,000 r	5,550 r	87,600	5,220

rRevised.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Individual breakdown is not available; included in "Total unalloyed scrap," "Total alloyed scrap," and "Total scrap."
[3]Includes cocks and faucets, commercial bronze, composition turnings, gilding metal, railroad car boxes, and silicon bronze.
[4]Includes 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	
	2002	2003	2002	2003	2002	2003
Ingot makers	38,600 r	22,200	102,000 r	109,000	141,000 r	131,000
Smelters and refineries	36,400	16,200	33,900	37,600	70,300	53,800
Brass and wire-rod mills	910,000	808,000	19,300	32,600	930,000	841,000
Foundries and miscellaneous manufacturers	42,300	42,800	44,700 r	44,800	87,000 r	87,600
Total	1,030,000	890,000	200,000 r	224,000	1,230,000 r	1,110,000

rRevised.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Consumption 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 STATES[1]

(Metric tons)

Ingot type or material consumed	2002	2003
Tin bronzes	25,100 r	23,400
Leaded red brass and semired brass	67,000 r	59,300
Yellow, leaded, low brass[2]	5,040	4,730
Manganese bronze	6,130 r	5,790
Nickel silver[3]	1,160	2,850
Aluminum bronze	3,460	3,500
Hardeners and master alloys[4]	2,450	1,750
Lead free alloys[5]	316	377
Total brass ingot	111,000 r	102,000
Refined copper	56,500 r	57,400
Copper scrap	87,000 r	87,600

rRevised.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes brass and silicon bronze.
[3]Includes brass, copper nickel, and nickel bronze.
[4]Includes special alloys.
[5]Includes copper-bismuth and copper-bismuth-selenium alloys.

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

(Cents per pound)

			Dealers' buying (New York)	
Year	Brass mills No. 1 scrap	Refiners No. 2 scrap	No. 2 scrap	Red brass turnings and borings
2002	70.23	59.45	42.36	37.00
2003	80.17	70.42	52.70	38.65

Source: American Metal Market.

TABLE 14
U.S. EXPORTS OF UNMANUFACTURED COPPER (COPPER CONTENT), BY COUNTRY[1]

Country	Ore and concentrate		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)
2002	23,000	$40,100	17,100	$17,100	26,600	$48,000	213,000	$258,000	32,900	$51,400	313,000	$415,000
2003:												
Belgium	87	110	39	14	2	3	2,630	4,420	--	--	2,760	4,550
Canada	7,540	14,500	6,740	9,700	2,100	4,290	21,200	20,600	17,200	21,300	54,800	70,500
China	1,380	2,260	153	345	71,600	154,000	225,000	233,000	567	3,590	299,000	394,000
Germany	--	--	(2)	11	185	541	7,900	8,510	441	1,050	8,530	10,100
Hong Kong	27	40	74	108	52	129	2,530	2,140	2,650	6,070	5,330	8,490
India	--	--	175	159	1,370	1,340	5,550	5,120	118	288	7,210	6,910
Japan	107	196	40	66	251	361	6,790	9,730	85	187	7,270	10,500
Korea, Republic of	--	--	12	18	742	849	25,400	32,500	788	2,040	27,000	35,400
Malaysia	3	9	12	110	54	212	3,620	3,920	92	205	3,780	4,450
Mexico	224	464	8,090	13,100	12,200	4,890	3,200	8,320	252	534	23,900	27,300
Peru	214	618	20	65	--	--	--	--	--	--	234	684
Singapore	6	14	4	14	71	107	169	58	478	1,110	728	1,300
Spain	46	103	36	50	5	13	109	68	422	963	618	1,200
Taiwan	11	19	--	--	3,630	8,840	8,500	11,400	1,270	3,000	13,400	23,300
Thailand	14	24	--	--	14	37	1,170	514	116	261	1,310	836
United Kingdom	41	81	77	187	42	84	97	512	430	999	686	1,860
Other	165	275	163	220	1,040	2,160	1,490	1,850	1,210	2,540	4,070	7,050
Total	9,860	18,700	15,600	24,200	93,300	178,000	316,000	343,000	26,100	44,200	460,000	608,000

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 15
U.S. EXPORTS OF COPPER SEMIMANUFACTURES, BY COUNTRY[1]

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)
2002	24,300	$75,500	25,300 r	$84,100 r	108,000 r	$219,000 r	32,000	$161,000	1,650	$1,440
2003:										
Australia	20	44	12	146	7	111	59	1,020	5	4
Brazil	41	155	25	341	11	278	146	1,630	--	--
Canada	9,130	27,900	9,890	33,700	12,400	30,000	5,780	15,900	1,490	1,340
China	105	430	1,260	3,010	83	400	303	2,180	189	192
Denmark	--	--	--	--	--	--	4	47	--	--
France	35	218	160	1,310	52	546	72	2,300	--	--
Germany	26	174	619	4,060	46	839	110	3,580	--	--
Hong Kong	19	55	772	3,180	82	1,080	147	1,610	54	55
Italy	420	1,230	9	255	11	88	112	1,110	--	--
Japan	8	55	175	957	59	700	223	2,750	13	15
Korea, Republic of	23	175	88	413	21	181	469	3,580	2	9
Malaysia	225	898	27	844	23	203	13	272	--	--
Mexico	10,600	35,800	5,940	15,600	101,000	203,000	18,000	77,500	--	--
Netherlands	630	2,380	21	313	15	241	287	10,100	--	--
Portugal	794	1,700	1	32	--	--	--	--	--	--
Saudi Arabia	644	1,780	16	52	(3)	4	135	478	--	--
Singapore	(3)	3	152	987	23	249	70	805	--	--
Sweden	6	13	9	130	6	131	21	548	--	--
Taiwan	14	67	499	2,280	30	319	46	509	19	35
United Kingdom	67	330	207	2,750	94	493	199	2,740	80	92
Other	1,090	3,290	420	3,220	1,180	4,100	1,800	13,400	214	196
Total	23,900	76,700	20,300	73,600	115,000	243,000	28,000	142,000	2,070	1,940

rRevised. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Total revised exports of wire rod in 2002 were 85,551 tons valued at $160 million and in 2003, wire rod exports were 100,014 tons valued at $197 million.
[3]Less 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 COUNTRY[1]

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)
2002	71,900	$107,000	1,040	$1,660	148,000	$369,000	927,000	$1,480,000	29,300	$39,000	1,180,000	$2,000,000
2003:												
Brazil	--	--	--	--	(3)	3	11,800	24,800	--	--	11,800	24,800
Canada	86	143	187	336	83,600	247,000	218,000	395,000	4,130	6,940	306,000	649,000
Chile	4,940	8,730	--	--	45,200	76,700	348,000	609,000	18	29	398,000	695,000
Costa Rica	--	--	--	--	--	--	--	--	921	812	921	812
Dominican Republic	--	--	--	--	--	--	--	--	1,100	1,020	1,100	1,020
Finland	--	--	--	--	--	--	911	1,810	--	--	911	1,810
Germany	--	--	59	107	--	--	8,530	17,900	19	22	8,610	18,000
Honduras	--	--	--	--	--	--	--	--	534	558	534	558
Japan	--	--	--	--	(3)	3	5,020	12,400	77	626	5,090	13,000
Mexico	22,000	7,720	501	265	10,200	34,700	21,600	38,800	9,950	11,300	64,300	92,800
Namibia	--	--	--	--	17,700	34,700	--	--	--	--	17,700	34,700
Peru	--	--	--	--	5	10	258,000	459,000	18	36	258,000	459,000
Taiwan	--	--	699	1,230	--	--	--	--	--	--	699	1,230
United Kingdom	--	--	--	--	2	158	10,100	20,700	278	853	10,400	21,800
Other	--	--	54	84	23	92	308	646	2,560	2,400	2,940	3,220
Total	27,100	16,600	1,500	2,030	157,000	393,000	882,000	1,580,000	19,600	24,600	1,090,000	2,020,000

-- Zero.

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

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

[3]Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 17
U.S. IMPORTS FOR CONSUMPTION OF COPPER SEMIMANUFACTURES, BY COUNTRY[1]

	Pipes and tubing		Plates, sheets, foil, bars		Bare wire, including wire rod[2]		Wire and cable, stranded		Copper sulfate[4]	
Country	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)
2002	69,500 r	$199,000 r	81,800	$225,000	252,000	$453,000	4,280	$18,500	45,400 r	$33,900 r
2003:										
Australia	55	141	231	512	--	--	--	--	--	--
Brazil	6	22	903	2,350	27,800	77,100	--	--	--	--
Canada	11,900	39,500	5,680	17,700	113,000	217,000	1,840	4,860	8,550	7,260
Chile	968	2,400	3,970	10,100	--	--	--	--	260	169
China	1,450	4,520	611	2,110	110	276	94	247	8,050	5,440
Finland	134	1,100	3,300	10,400	506	1,720	64	356	180	98
France	1,180	3,350	1,930	5,460	415	3,680	33	435	--	--
Germany	3,520	11,300	23,200	63,800	428	2,040	460	1,850	62	63
Hong Kong	2	5	--	--	4	40	(4)	9	--	--
Israel	--	--	1	33	(4)	6	1,830	8,160	20	20
Italy	16	100	3,370	8,460	63	462	49	388	--	--
Japan	5,930	17,400	5,440	22,100	315	2,670	2	57	51	275
Luxembourg	--	--	743	4,960	--	--	--	--	--	--
Mexico	42,800	110,000	1,760	5,030	24,200	42,100	8	30	30,700	22,100
Peru	--	--	3,760	8,890	430	1,080	408	976	1,680	1,520
Russia	(4)	2	192	457	52,900	97,700	--	--	--	--
Sweden	--	--	8,050	26,100	26	112	(4)	10	--	--
Taiwan	106	181	181	947	112	492	64	553	1,310	721
Turkey	--	--	16	40	7,830	22,900	924	2,800	--	--
United Kingdom	1,910	4,160	650	2,870	234	835	105	275	--	--
Other	5,120	14,500	1,480	4,670	763	4,270	112	1,110	30	27
Total	75,100	208,000	65,500	197,000	230,000	474,000	5,990	22,100	50,900	37,600

rRevised. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Total revised imports of wire rod in 2002 were 234,000 metric tons (t) valued at $403 million, and in 2003, wire rod imports were 212,000 t valued at $394 million.
[3]Cost, insurance, freight value at U.S. port.
[4]Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 18
U.S. EXPORTS OF COPPER SCRAP, BY COUNTRY[1]

	Unalloyed copper scrap				Copper-alloy scrap			
	2002		2003		2002		2003	
Country	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Belgium	2,210	$5,540	2,630	$4,420	7,050	$10,800	6,010	$8,370
Canada	20,100	18,900	21,200	20,600	19,900	25,200	17,500	23,200
China	122,000	136,000	225,000	233,000	155,000	92,600	245,000	174,000
Germany	14,200	16,800	7,900	8,510	16,400	19,600	7,680	7,310
Hong Kong	7,180	17,100	2,530	2,140	6,140	3,810	9,600	4,790
India	3,920	3,920	5,550	5,120	43,500	34,800	45,400	38,800
Japan	11,000	15,900	6,790	9,730	9,120	14,500	9,110	15,600
Korea, Republic of	14,900	21,100	25,400	32,500	18,700	25,700	15,500	25,600
Mexico	2,280	5,260	3,200	8,320	248	555	808	1,380
Taiwan	10,100	13,200	8,500	11,400	9,060	13,000	6,860	10,200
Other	4,840	4,740	6,650	6,920	12,500	9,910	10,000	11,800
Total	213,000	258,000	316,000	343,000	298,000	250,000	373,000	321,000

[1]Data 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 COUNTRY[1]

	Unalloyed copper scrap		Copper-alloy scrap		
Country	Quantity (metric tons)	Value[2] (thousands)	Gross weight (metric tons)	Copper content[e, 3] (metric tons)	Value[2] (thousands)
2002	29,300	$39,000	70,900	51,000	$88,800
2003:					
Canada	4,130	6,940	37,300	26,800	51,300
China	--	--	824	593	1,210
Costa Rica	921	812	404	291	437
Dominican Republic	1,100	1,020	766	552	453
Germany	19	22	5,250	3,780	16,400
Guatemala	474	436	869	625	1,030
Honduras	534	558	488	351	437
Jamaica	640	545	140	101	81
Japan	77	626	261	188	181
Mexico	9,950	11,300	18,700	13,500	19,300
Nicaragua	238	395	207	149	237
Panama	8	7	553	398	762
United Kingdom	278	853	781	562	1,540
Venezuela	159	141	957	689	536
Other	1,080	941	3,490	2,910	5,720
Total	19,600	24,600	71,000	51,500	99,600

[e]Estimated. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Cost, insurance, freight value at U.S. port.
[3]Content 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	1999	2000	2001	2002	2003[e]
Albania[e]	900	--	--	--	--
Argentina	210,126	145,197	191,566 [r]	203,744 [r]	198,537 [3]
Armenia	9,830	12,234	16,460 [r]	16,641 [r]	18,000
Australia:					
Concentrates	655,900	732,000 [r]	769,000 [r]	787,000	763,000 [3]
Leaching, electrowon	84,000 [r]	97,000 [r]	102,000 [r]	96,000 [e]	67,000 [3]
Total	739,900 [r]	829,000	871,000 [r]	883,000 [e]	830,000 [3]
Bolivia	252	110	18 [e]	3 [r]	86 [p]
Botswana[4]	20,960	20,977	19,209 [r]	21,182 [r]	23,800 [3]
Brazil	31,371	31,786	30,111	30,642 [r]	27,300 [3]
Bulgaria	96,000	92,000	88,000	92,800 [r]	91,700 [3]
Burma:					
Concentrates[e]	97 [3]	100	--	--	--
Leaching, electrowon	26,736	26,711	26,300 [e]	27,600 [r]	27,900
Total	26,833	26,811	26,300 [e]	27,600 [r]	27,900
Canada, concentrates	620,085	633,855	633,531	603,498 [r]	557,565 [3]
Chile:[5]					
Concentrates	3,029,100	3,229,800	3,200,800	2,979,000	3,300,000
Leaching, electrowon	1,362,100	1,372,600	1,538,200	1,602,000	1,600,000
Total	4,391,200	4,602,400	4,739,000	4,581,000	4,900,000
China:[e]					
Concentrates	520,000	593,000	587,000	560,000	580,000
Leaching, electrowon	13,000	20,000	18,000	25,000	30,000
Total	533,000	613,000	605,000	585,000	610,000
Colombia	2,295	2,062	2,192 [r]	1,853 [r]	1,599 [3]
Congo (Kinshasa), leaching, electrowon[e, 6]	32,000	21,000	20,988 [3]	29,000	52,700 [3]
Cuba	1,090	1,346	-- [r, e]	-- [r, e]	--
Cyprus, leaching, electrowon	5,004	5,197 [r]	5,176 [r]	3,631 [r]	2,500
Ecuador[e]	100	100	100	100	100
Finland	10,500 [e]	14,354	13,715	14,400	14,900
Georgia[e]	7,000	8,000	8,000	10,000 [r]	12,000
Honduras[e]	(7) [3]	--	--	--	--
India	34,100 [e]	31,900	32,400	31,500 [r]	28,400 [3]
Indonesia[6]	766,027	1,012,054	1,081,040	1,160,000 [e]	978,690 [3]
Iran:[e]					
Concentrates	131,000	125,000	121,000	121,000	130,000
Leaching, electrowon	10,000	10,000	12,000	12,000	12,000
Total	141,000	135,000	133,000	133,000	142,000
Japan	1,038	1,211	744	750 [e]	700
Kazakhstan[e]	374,000	430,000	470,100 [3]	490,000	485,000
Korea, North[e]	14,000	13,000	13,000	13,000	13,000
Macedonia[e]	10,200 [3]	10,000	10,000	10,000	10,000
Malaysia	4,600	--	--	-- [e]	--
Mexico:					
Concentrates	330,232	308,966	310,623	260,574	285,000
Leaching, electrowon	50,952	55,600	60,500	69,000 [e]	76,000
Total	381,184	364,566	371,123	329,574	361,000
Mongolia	126,700	125,227	133,503	131,705	131,600 [3]
Morocco	7,747	7,080	5,800	5,000 [r]	4,900
Namibia	--	5,620	12,392	18,012	19,500
Papua New Guinea	187,921	200,900	218,000 [e]	211,311	190,200 [3]
Peru:					
Concentrates	421,470	426,614	590,896	686,748	660,025 [3]
Leaching, electrowon	114,917	127,310	131,139	156,465	171,198 [3]
Total	536,387	553,924	722,035	843,213	831,223 [3]

See footnotes at end of table.

TABLE 20--Continued
COPPER: WORLD MINE PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country	1999	2000	2001	2002	2003[e]
Philippines	34,600	30,644	20,322	18,364	20,400
Poland	463,200	454,100	474,000	502,800	495,000 [3]
Portugal[e]	99,500	76,200 [3]	82,900 [3]	77,000	78,000
Romania[8]	16,807	16,079	19,185	18,962 [r]	21,317 [3]
Russia[e]	530,000	570,000	600,000	695,000	675,000
Saudi Arabia[e]	821 [3]	900	800	800	800
Serbia and Montenegro[e]	51,700 [3]	41,000	22,000	23,000	16,000
Slovakia[e]	124	--	--	--	--
South Africa	144,263	137,092	141,865	129,589	89,500
Spain	1,738	23,312	9,700	-- [r]	--
Sweden	71,200	77,765	74,269	72,100	83,000
Tanzania, in concentrates and bullion	--	--	2,645	2,700 [r]	2,700
Turkey[8]	73,051	76,253	56,864 [r]	48,253 [r]	58,000
United States:[6]					
Concentrates	1,010,000	887,000	714,000	601,000	525,000 [3]
Leaching, electrowon	586,000	557,000	624,000	542,000	591,000 [3]
Total	1,600,000	1,440,000	1,340,000	1,140,000	1,120,000 [3]
Uzbekistan[e]	65,000 [r]	70,000 [r]	78,000 [r]	80,000 [r]	80,000
Zambia:					
Concentrates	213,000	184,100	233,000	251,100	250,000
Leaching, electrowon	67,000	65,000	79,000	78,900	80,000
Total	280,000 [9]	249,100	312,000 [9]	330,000	330,000
Zimbabwe:					
Concentrates	3,491	2,104	2,057	2,502	2,400
Leaching, electrowon[e]	1,020 [3]	--	--	--	--
Total	4,511	2,104	2,057	2,502	2,400
Grand total:	12,800,000	13,200,000	13,700,000	13,600,000	13,600,000
Of which:					
Concentrates	10,400,000	10,900,000	11,100,000	11,000,000	10,900,000
Leaching, electrowon	2,350,000	2,360,000 [r]	2,620,000 [r]	2,640,000	2,710,000

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

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

[2]Table represent copper content by analysis of concentrates produced (includes cement copper, if applicable), except where otherwise noted. Table includes data available through July 22, 2004.

[3]Reported figure.

[4]Copper content of pelletized nickel-copper matte produced in smelter.

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

[6]Recoverable content.

[7]Less than 1/2 unit.

[8]Excludes copper content of pyrite.

[9]Data are for fiscal years beginning April 1 of year stated.

TABLE 21
COPPER: WORLD SMELTER PRODUCTION, BY COUNTRY[1, 2]

(Metric tons, gross weight)

Country	1999	2000	2001	2002	2003[e]
Albania, primary	1,281	--	-- [e]	-- [e]	--
Australia, primary	332,000	394,000	455,000	458,000 [e]	435,000 [3]
Austria, secondary	77,573	70,000 [e]	68,642	64,932 [r]	65,084 [3]
Belgium, secondary	143,300	144,700	138,200	125,900 [r]	117,500 [3]
Botswana, primary[4]	20,960	18,722 [r]	19,209 [r]	21,590 [r]	22,000
Brazil, primary	193,014	185,345	212,243 [r]	189,651 [r]	190,000
Bulgaria:					
Primary	107,000	173,000	152,000	167,000 [r]	199,300 [3]
Secondary[e]	5,000	5,000	5,000	15,000 [r]	16,000
Total	112,000 [e]	178,000	157,000	182,000 [r]	215,000
Canada:					
Primary	550,171 [r]	543,593 [r]	601,359 [r]	513,934 [r]	430,116 [3]
Secondary	66,282 [r]	60,109 [r]	41,640 [r]	24,761 [r]	26,789 [3]
Total	616,453 [r]	603,702 [r]	642,999 [r]	538,695 [r]	456,905 [3]
Chile, primary	1,473,900 [r]	1,460,400	1,503,300	1,439,000	1,542,400 [3]
China:[e]					
Primary	837,000	1,020,000	1,120,000	1,180,000 [r]	1,350,000
Secondary	190,000	180,000	190,000	310,000 [r]	350,000
Total	1,030,000	1,200,000	1,310,000	1,490,000	1,700,000
Congo (Kinshasa), primary, electrowon[e]	32,000	21,000	20,988 [3]	10,000 [r]	8,000
Finland:					
Primary	149,600	155,400	169,300	160,900	160,600 [3]
Secondary[e]	2,000	2,000	2,000	2,000	2,000
Total	151,600	157,400	171,300	162,900	162,600 [3]
France, secondary[e]	1,000	--	--	--	--
Germany:					
Primary	250,200 [r]	211,200 [r]	317,700 [r]	295,100 [r]	288,800 [3]
Secondary	355,600 [r]	360,400 [r]	240,900 [r]	283,100 [r]	205,300 [3]
Total	605,800 [r]	571,600 [r]	558,600 [r]	578,200 [r]	494,100 [3]
India, primary[e]	224,400	256,000	293,000	385,400 [r]	391,000 [3]
Indonesia, undifferentiated	126,739	173,726	217,500	211,200	247,400 [3]
Iran, undifferentiated[e, 5]	132,000	135,000	135,000	146,000	150,000
Japan:					
Primary	1,256,276	1,331,352	1,328,489	1,317,291	1,343,353 [3]
Secondary	133,188	149,282	139,764	182,069	172,724 [3]
Total	1,389,464	1,480,634	1,468,253	1,499,360	1,516,077 [3]
Kazakhstan, undifferentiated	383,457	413,859	433,600	446,200	431,930 [3]
Korea, North, primary and secondary[e]	14,000	13,000	13,000	13,000	13,000
Korea, Republic of, undifferentiated[e]	370,000	410,000	410,000	410,000	460,000
Mexico:					
Primary	326,000 [r]	292,000 [r]	305,000 [r]	243,000 [r]	238,000 [3]
Secondary[e]	5,000	5,000	5,000	5,000	5,000
Total	331,000 [r]	297,000 [r]	310,000 [r]	248,000 [r]	243,000
Namibia, primary[6, 7]	-- [e]	5,082	27,015	26,703 [r]	26,036 [3]
Oman, primary	16,818	23,790	24,200	24,000	17,000
Peru, primary	363,100	366,700	396,400	314,228 [r]	314,228 [3]
Philippines, primary	162,000	160,000	165,000	165,800	227,900 [3]
Poland:					
Primary	466,200	462,800	485,900	511,000 [r]	485,000
Secondary[e]	27,300	19,700	27,900	30,000 [r]	30,000
Total	493,500	482,500	513,800	541,000 [r]	515,000
Romania:					
Primary	24,010	16,429	9,279	8,871 [r]	4,456 [3]
Secondary[e]	2,000	2,000	2,000	2,000	500
Total	26,010	18,429	11,279	10,871 [r]	4,960

See footnotes at end of table.

TABLE 21--Continued
COPPER: WORLD SMELTER PRODUCTION, BY COUNTRY[1, 2]

(Metric tons, gross weight)

Country	1999	2000	2001	2002	2003[e]
Russia:[e]					
Primary	580,000	600,000	650,000	660,000	670,000
Secondary	158,000	220,000	245,000	200,000	170,000
Total	738,000	820,000	895,000	860,000	840,000
Serbia and Montenegro:[e]					
Primary	45,000 [r]	34,000 [r]	24,000 [r]	30,000 [r]	10,000
Secondary	13,000 [r, 4]	14,000 [r]	14,000 [r]	10,000 [r]	5,000
Total	58,000 [r, 4]	48,000 [r, 4]	38,000 [r]	40,000 [r]	15,000
Slovakia, primary[e]	10,000	--	--	--	--
South Africa, primary	149,300	123,978 [r]	117,237 [r]	116,996 [r]	112,025 [3]
Spain:					
Primary	292,800	258,600	255,200	281,300	272,000
Secondary	25,000 [e]	31,300	24,700	16,700 [e]	18,000
Total	317,800	289,900	279,900	298,000	290,000
Sweden:[e]					
Primary	85,000	95,000	173,000	188,000	185,000
Secondary	30,000	35,000	35,000	35,000	30,000
Total	115,000	130,000	208,000	223,000	215,000
Turkey, undifferentiated[8]	32,900	32,500	33,504 [r]	32,550 [r]	30,000
United States:					
Primary	1,090,000	W	W	W	W
Secondary	205,000	W	W	W	W
Total	1,290,000	1,000,000	919,000	683,000	539,000 [3]
Uzbekistan:[e]					
Primary	60,000 [r]	75,000	80,000 [r]	75,000	75,000
Secondary	10,000 [r]	10,000 [r]	10,000 [r]	-- [r]	--
Total	70,000 [r]	85,000 [r]	90,000 [r]	75,000 [r]	75,000
Zambia, primary[9]	217,600 [r]	180,000 [r]	215,000 [r]	253,500 [r]	250,000
Zimbabwe, primary[e, 6]	14,500	14,500	2,160	2,502	2,767 [3]
Grand total:	11,800,000 [r]	12,000,000 [r]	12,500,000 [r]	12,300,000 [r]	12,300,000
Of which					
Primary:					
Electrowon	32,000 [r]	21,000 [r]	21,000 [r]	10,000 [r]	8,000
Other	9,300,000 [r]	8,460,000 [r]	9,100,000 [r]	9,030,000 [r]	9,240,000
Secondary	1,450,000 [r]	1,310,000 [r]	1,190,000 [r]	1,310,000 [r]	1,210,000
Undifferentiated	1,060,000	2,180,000 [r, 10]	2,160,000 [r, 10]	1,940,000 [r, 10]	1,870,000 [10]

[e]Estimated. [r]Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

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

[2]This 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 is 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 22, 2004.

[3]Reported figure.

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

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

[6]Includes impure cathodes produced by electrowinning in nickel processing.

[7]Includes 8,000 to 10,000 metric tons per year for 2001-03 produced from imported toll concentrates.

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

[9]For 1998-99, fiscal year beginning April 1 of year stated. Electrowon is total electrowon production reported less the quantity reported as "finished production, leach cathodes."

[10]Includes U.S. production undifferentiated.

TABLE 22
COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country	1999	2000	2001	2002	2003[e]
Albania, primary	342	--	--	--	--
Argentina, secondary[e]	16,000	16,000	16,000	16,000	16,000
Australia:[e]					
Electrowon	84,000 [3]	97,000	102,000	96,000	67,400 [3]
Primary	335,000 [3]	390,000	456,000	449,000	416,600 [3]
Total	419,000 [3]	487,000	558,000	545,000	484,000 [3]
Austria:[e]					
Primary	2,000	2,000	--	--	--
Secondary	75,000	77,000	69,000	65,000	65,000
Total	77,000	79,000 [3]	69,000	65,000	65,000
Belgium:[4]					
Primary	201,100	236,100	236,000 [e]	207,000 [e]	208,000
Secondary[e]	187,000	187,000	187,000	216,000	215,000
Total	388,100	423,100	423,000	423,000	423,000
Brazil, primary	193,014	185,345	212,243	189,651 [r]	173,900 [3]
Bulgaria:[e]					
Primary	16,000	27,500	29,400 [3]	38,000 [r]	40,000
Secondary	5,000	5,000	5,000	3,000 [r]	5,000
Total	21,000	32,500	34,400 [r]	41,000 [r]	45,000
Burma, electrowon	26,736	26,711	26,300 [e]	27,600 [r]	27,900
Canada:					
Primary	476,079	490,093	524,920	513,934 [r]	430,116 [p]
Secondary	72,484	61,300	42,800	24,761 [r]	26,789 [p]
Total	548,563	551,393	567,720	538,695 [r]	456,905 [p]
Chile:					
Electrowon	1,362,100	1,372,600	1,538,200	1,602,000	1,600,000
Primary	1,304,300	1,295,700	1,344,000	1,248,100	1,300,000
Total	2,666,400	2,668,300	2,882,200	2,850,100	2,900,000
China:[e]					
Electrowon	13,000	20,800	18,000	20,000	30,000
Primary	823,000	1,003,000	1,200,000	1,280,000	1,370,000
Secondary	338,000	347,000	300,000	350,000	400,000
Total	1,174,000 [3]	1,370,800 [3]	1,518,000 [3]	1,650,000	1,800,000
Congo (Kinshasa), primary[e, 5]	31,225 [3]	20,500	21,000	10,000	8,000
Cyprus, electrowon	5,004	5,197	5,176	3,631	2,500 [3]
Egypt, secondary[e]	6,000	5,000	5,000	5,000	4,000
Finland:[e]					
Primary	100,000	100,000	105,000	100,000	120,000
Secondary	15,000	14,000	15,000	15,000	16,000
Total	115,000	114,000	120,000	115,000	136,000
France, secondary[e]	1,800	1,500	--	--	--
Germany:[e]					
Primary	242,000	245,000	352,000	330,900 [3]	296,000 [3]
Secondary	454,000	465,000	342,000	364,900 [3]	301,000 [3]
Total	696,000	710,000	694,000	695,800 [3]	597,000 [3]
Hungary, secondary[e]	12,000	12,000	10,000	10,000	10,000
India:[e]					
Primary, electrolytic	200,000	234,000	310,000 [3]	354,000	375,000
Secondary	8,000	9,000	18,000	20,000	19,000
Total	208,000	243,000	328,000	374,000	394,000
Indonesia, primary	90,800	158,400	212,500	192,400	223,300 [3]
Iran:[6]					
Electrowon[e]	10,000	10,000	12,000	12,000	12,000
Primary[7]	131,700 [3]	132,000	132,000	143,000	134,632 [3]
Total	141,700 [3]	142,000	144,000	155,000	146,632
Italy, secondary	28,500 [e]	32,800 [r]	35,500	32,400 [r]	26,700

See footnotes at end of table.

TABLE 22--Continued
COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country	1999	2000	2001	2002	2003[e]
Japan:					
Primary	1,215,248	1,292,351	1,287,165	1,211,111	1,251,728 [3]
Secondary	126,301	149,260	138,526	189,968	178,637 [3]
Total	1,341,549	1,441,611	1,425,691	1,401,079	1,430,365 [3]
Kazakhstan, primary	361,889	394,722	425,700	453,000	432,901 [3]
Korea, North, primary	16,000	14,000	14,000	14,000 [e]	14,000
Korea, Republic of, primary	450,444	467,900	473,624	500,000 [e]	510,000 [3]
Mexico:					
Primary:					
Electrowon	50,952	55,600	59,800	69,100	71,000 [3]
Other	361,000	340,400	333,000 [r]	284,000 [r, e]	249,000 [3]
Secondary[e]	14,000	15,000	15,000	35,000	20,000
Total	426,000 [r]	411,000	408,000 [r]	388,000 [r]	355,000
Mongolia, electrowon	1,545	641	1,476	1,500	1,300 [3]
Norway, primary[7]	33,262	27,000 [e]	26,700	30,500 [e]	35,900 [3]
Oman, primary	17,171	24,281	24,000 [e]	24,000 [e]	17,000
Peru:					
Primary:					
Electrowon	114,425	127,311	131,139	156,465	171,198 [3]
Other	318,914	324,417	340,736	346,277	345,848 [3]
Total	433,339	451,728	471,875	502,742	517,046 [3]
Philippines, primary	147,982	159,000	164,530	144,315	171,200 [3]
Poland:					
Primary	448,300	498,100	498,451	508,674	510,000
Secondary	22,200	19,700	30,286	19,146	20,000
Total	470,500	517,800	528,737	527,820	530,000
Romania:					
Primary	24,983	13,803	18,500	11,453 [r]	16,672 [3]
Secondary[e]	4,000	4,000	4,000	2,000 [r]	2,000
Total	29,000 [r]	17,800 [r]	22,500	13,500 [r]	18,700
Russia:					
Primary	600,000	620,000	650,000	670,000 [e]	670,000
Secondary	160,000	220,000	244,500	200,000 [e]	170,000
Total	760,000	840,000 [e]	894,500	870,000 [e]	840,000
Serbia and Montenegro:					
Primary	48,002	45,602	32,365	35,897	10,000
Secondary[e]	1,900	14,000 [r]	10,000 [r]	10,000 [r]	5,000
Total	49,902	59,602 [r]	42,365 [r]	45,897 [r]	15,000
Slovakia, primary[e, 7]	21,000	--	--	--	--
South Africa, primary[7]	116,400 [r]	105,500 [r]	104,700 [r]	99,100 [r]	93,300 [3]
Spain:					
Primary	250,756	258,000 [e]	235,100	272,000 [e]	259,000
Secondary[e]	65,000	58,000	55,600 [3]	37,000	35,000
Total	315,756	316,000 [e]	290,700	309,000	294,000 [3]
Sweden:[e]					
Primary	95,000	105,000	179,000 [3]	199,000	189,000
Secondary	20,000	25,000	25,000	25,000	25,000
Total	115,000	130,000	204,000 [3]	224,000	214,000
Taiwan, secondary[e]	4,000	4,000	4,000	4,000	4,000
Turkey:[e]					
Primary	55,500	59,100	54,400	39,000	40,000
Secondary	5,000	5,000	4,000	2,000	5,000
Total	60,500	64,100	58,400	41,000	45,000
United Kingdom:[e]					
Primary	5,000	-- [3]	--	--	--
Secondary	45,000	3 [3]	--	--	--
Total	50,000	3 [3]	--	--	--

See footnotes at end of table.

TABLE 22--Continued
COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country	1999	2000	2001	2002	2003[e]
United States:					
Primary:					
Electrowon	586,000	566,000	628,000	601,000	591,000 [3]
Other	1,300,000	1,030,000	1,000,000	841,000	662,000 [3]
Secondary	230,000	208,000	172,000	70,000	53,300 [3]
Total	2,120,000	1,800,000	1,800,000	1,510,000	1,310,000 [3]
Uzbekistan:[e]					
Primary	60,000 [r]	75,000	80,000 [r]	75,000	75,000
Secondary	10,000 [r]	10,000 [r]	10,000 [r]	-- [r]	--
Total	70,000 [r]	85,000 [r]	90,000 [r]	75,000 [r]	75,000
Zambia, primary:					
Electrowon	60,200	50,000	79,000	83,700 [e]	99,800 [3]
Other	258,900	227,400	217,500	253,100	250,000 [3]
Total	319,100 [8]	277,400	296,500	336,800	349,800 [3]
Zimbabwe:[e]					
Electrowon	1,020	--	--	-- [r]	--
Primary	7,000 [3]	7,200	5,300	3,000	3,000
Total	8,020 [3]	7,200	5,300	3,000 [r]	3,000
Grand total:	14,600,000	14,900,000 [r]	15,700,000	15,500,000	15,200,000
Of which:					
Primary:					
Electrowon	2,310,000	2,330,000	2,600,000	2,670,000 [r]	2,670,000
Other	10,400,000	10,600,000 [r]	11,300,000	11,100,000	10,900,000
Secondary	1,930,000 [r]	1,970,000 [r]	1,760,000 [r]	1,720,000 [r]	1,640,000

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

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

[2]This 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 22, 2004.

[3]Reported figure.

[4]Includes reprocessed leach cathode from Congo (Kinshasa).

[5]Excludes leach cathode exported for processing in Belgium.

[6]Data are for Iranian years beginning March 21 of that stated.

[7]May include secondary.

[8]Data are for fiscal year beginning April 1 of that stated. Electrowon covers only high-grade electrowon cathodes reported as "finished production leach cathodes."