

TIN

By James F. Carlin, Jr.

There was no domestic mine production of tin in 1995. Twenty-five firms consumed about 84% of the primary tin used domestically. The major uses were as follows: cans and containers, 30%; electrical, 20%; transportation, 10%; construction, 10%; and other, 30%. The estimated value of primary metal consumed domestically in 1995 was about \$321 million.

About 11,100 metric tons of purchased old and new tin scrap, including tin alloys, was recycled in 1995. Of this, about 7,600 tons was old scrap. About one-fifth of the tin consumed in the United States was produced from scrap at 7 detinning plants and 110 secondary nonferrous metal processing plants. There was continued interest in the recycling of used tin cans, largely owing to the rising costs and limited space of landfills. The recycling rate for steel cans was 56% in 1995, having risen from 53% in 1994, 40% in 1993, and 15% in 1988. In 1995, 11,455 tons of pig tin was sold from the National Defense Stockpile (NDS), leaving 127,797 tons in inventory at yearend, all of which was considered to be in excess.

World tin mine output in 1995 increased slightly, but still remained less than in most of the recent 5-year span, reflecting a concerted effort by producers to restrict production. It was generally believed that there was still an excess of tin on the world market for the 14th consecutive year, but that supply and demand moved fairly close to equilibrium. Excess world stocks were believed to be about 20,000 tons at yearend.

The average Metals Week composite price of tin rose by about 13% in 1995. The continued price strength was attributed generally to increased consumption and some success by major tin-producing countries in curtailing or leveling output.

Tin was mined in 25 countries in 1995, of which the top 5 accounted for about three-fourths of the world total of 187,000 tons. China was the largest producer with 28% of the world total, followed by Indonesia (20%), Peru (12%), Brazil (9%), and Bolivia (8%).

World tin reserves were estimated at 7 million tons and were considered adequate to meet the world's future tin requirements. Assuming world primary tin consumption of 200,000 tons annually, these reserves would last 35 years. Most of these tin reserves were in Asia and South America.

Legislation and Government Programs

The NDS continued in its sixth year of being managed by the Department of Defense, with day-to-day operations guided by the Defense Logistics Agency (DLA). The DLA sold 11,455 tons of pig tin from the stockpile in 1995. The bulk of the sales, 9,090 tons, was handled through long-term sales contracts to

firms such as Considar Corp. (New York, NY), American Iron and Metal Corp. (Quebec, Canada), and RMT Corp. (New York, NY). Also, direct sales were held each day, with orders for lots of 5 tons or more being accepted daily between 1:30 p.m. and 3:30 p.m. at the price set by DLA for that day.

The Hammond, IN, depot held the largest tin inventory, followed by the Point Pleasant, WV, depot; the Curtis Bay, MD, depot; and the Granite City, IL, depot. At yearend, there were 127,797 tons in the stockpile.

Production

Mine Production.—There was no domestic tin mine production in 1995. This was the second consecutive year there had been no domestic tin mine production, after many years of having one or two small tin mines operating.

Secondary Production.—The United States is believed to be the world's largest producer of secondary tin. Tin metal recovered from new tinplate scrap and from used tin cans was the only type of secondary tin available in the marketplace as free tin; most secondary tin was produced from the various scrapped alloys of tin and recycled in those same alloy industries. Secondary tin from recycled fabricated parts was used in many kinds of products and was a major source of material, particularly for the solder and the brass and bronze industries.

The former Steel Can Recycling Institute that had been funded in 1988 by five domestic tinplate producers to advance the collection, preparation, and transportation of steel can scrap was in its second full year of expanded activities under its new name, the Steel Recycling Institute (SRI). The SRI fostered the collection of all steel scrap (ranging from appliances to cars), not just steel cans. The SRI continued to maintain a program of having representatives in various regions of the United States work with municipalities, scrap dealers, and detinners to promote the recycling of tin cans. The SRI announced that the recycling rate for steel cans reached a new high of 56% in 1995. In the 7 years of SRI's existence, the recycling rate for steel cans has nearly quadrupled, from 15% in 1988 to 56% in 1995. SRI continued to actively sponsor the recycling of aerosol steel cans. It announced that about 95 million Americans now have access to empty aerosol can recycling. More than 2,600 communities nationwide now actively recycle aerosol steel cans.

One of the major domestic detinners, Proler International Corp., announced the completion and startup of an addition to its Coolidge, AZ, plant. The addition has a capacity of 325 tons annually of tin recovered from recycled sludges and etchings

from the electronics industry. The Coolidge plant was built in 1978 to recover tin from tinplate and tin cans. The expansion was part of a \$5 million program to diversify the range of products recycled. The expansion plant utilized technology adapted from the detinning process to recycle tin-lead slimes and circuit board etchings from the computer industry of Arizona and California. Proler produced secondary tin in a variety of end-products, including anodes, ingots, and a tin "popcorn" (a high-surface area, high-grade tin product favored by the chemical industry).

AMG Resources Corp., a major domestic detinner based in Pittsburgh, PA, and Hoogovens Group BV, a major steel producer and tinplate manufacturer also active in detinning, based in the Netherlands, signed a joint-venture agreement to market detinning technologies as well as to build plants to process both industrial tinplate scrap and used steel cans. The two companies said they believed that as municipal recycling increases and the volume of postconsumer steel cans coming into the market grows, detinning would become increasingly important to meet the steel industry's needs for low-residual scrap. AMG officials noted that while both companies already operate detinning plants, they planned to cooperate in building and operating new detinning plants in central and eastern Europe and Asia. AMG Resources has four domestic detinning plants and also has detinning operations in Australia, Great Britain, and Spain. In addition to steelmaking plants, Hoogovens operates an array of scrap processing facilities in Belgium and the Netherlands.¹

Consumption

Consumption of primary tin increased slightly in 1995. Consumption in most categories remained fairly steady, with the tin chemicals field showing the greatest relative increase.

Tinplated steel and tin-free steel accounted for 24% of the 134 billion cans shipped domestically; aluminum accounted for 76%. These percentages were the same as in 1994, when 139 billion cans were shipped domestically. Aluminum held an overwhelming advantage (virtually 100% of the market) in the beverage can market, while steel dominated in the food can and the "general-line" markets.²

One of the domestic tinplate producers, Wheeling-Pittsburgh Steel Corp., based in Wheeling, WV, began construction of a new joint-venture tinplate mill in Belmont County, OH. Completion was planned for late 1996. The tin mill was a joint-venture with Dong Yang Tinplate Industries Co., Ltd., South Korea, and Nittetsu Shoji Inc., Los Angeles, CA. Wheeling-Pittsburgh and the United Steelworkers of America reportedly reached an agreement in principal concerning all employment issues for the \$80 million mill. The mill was expected to use about 500 tons of tin per year. It would be the first tinplating facility constructed in the United States since the early 1960's and would replace Wheeling's current 50-year-old tin mill in Yorkville, OH. The State of Ohio assisted in the venture, obtaining a 10-year tax abatement for the mill and working with the county in seeking government grants for equipment and

employee training. Capacity of the new facility was expected to be 218,000 tons annually, which was slightly higher than that of the Yorkville plant. The plant would at first produce tinplate, and then later, tin-free steel.³

During the year, there was increased confidence in the opportunity for tinplate to regain market share lost to aluminum in the beverage can sector. Higher aluminum prices in 1994 and 1995 gave hope to steel producers who would like to penetrate the overwhelming beverage can market share held by aluminum. Weirton Steel Corp., Weirton, WV, reportedly was considering forming a steel industry alliance to bolster tinplate marketing efforts in this direction. National Steel Corp., Mishawauka, IN, was reportedly considering a joint effort with a soft drink maker toward the same goal. Weirton, which has a much higher segment of its total steel output geared to tinplate production than other major domestic tinplate producers, completed development of new steel canmaking technology in 1993 and had tried unsuccessfully in 1993 and 1994 to convince canmakers to apply it to beverage can production. Weirton attributed that earlier lack of success to relatively low aluminum prices in 1993 and even in 1994, and to the costs to the canmakers of converting canmaking equipment from an aluminum to a steel feedstock. A Weirton spokesperson observed that while the conversion costs remained, aluminum prices had risen substantially again in 1995, making steel more competitive; also observed was that steel can recycling had been rising and that light-gauge steel could now be formed into cans with minimal rejection rates. Crown, Cork, and Seal Corp., Philadelphia, PA, a major producer of metal cans, made a bid to take over Carnaud Metalbox (CMB) Paris, France, for \$5.2 billion. CMB was one of the world's largest producers of metal containers. CMB had been formed via the 1989 merger of Britain's Metalbox Plc. and France's Carnaud. Crown, Cork, and Seal planned to assume \$1.2 billion of CMB's debt and offer CMB shareholders \$44 per share or Crown equity for their stock. France's Compagnie Generale d'Industrie et de Participation, which holds a 32% stake in CMB and would be the largest stockholder in the combined company, reportedly agreed to back the transaction and swap its holding for Crown stock. The combined company would have annual sales of about \$10 billion. The takeover was still pending at yearend.⁴

Silgan Corp. acquired American-National Can Corp.'s food packaging plants, which produce metal cans, rigid plastic containers, and metal closures. Silgan announced that its purchase of 16 American-National plants, combined with its own 33 plants, made it the major factor in the domestic food can market, with an estimated \$1.3 billion in annual sales.

The American Iron and Steel Institute's (AISI) Steel Packaging Council, formerly the market development arm of AISI's Tin Mill Products Committee, continued in the second year of a 5-year, \$12.5 million program to promote the nutritional value and convenience of canned foods. The intent of the campaign was to help forge a modern image for canned food and thereby boost tin mill shipments to canmakers.

Prices

The Metals Week composite price for tin metal reached its peak for the year in May, but ended the year about where it started. The annual average was 13% higher than that in 1994. Analysts believed the continued price strength was due to continuing growth in world demand and to select successes by some large tin-producing countries in restricting their output or exports. Analysts felt that a world supply-demand equilibrium was closer to being achieved than in many prior years.

The London Metal Exchange (LME) remained the primary trading arena for tin. Tin was one of only six metals (along with aluminum, copper, lead, nickel, and zinc) to be traded on the LME. The Kuala Lumpur Commodities Exchange in Malaysia continued as an active tin trading forum.

Foreign Trade

Imports, which supply most domestic requirements, remained about the same as those in 1994. Imports of tin in all forms (ore and concentrate, metal, waste, and scrap) remained free of U.S. duty. (See tables 5, 6, and 7). The marketing of tin metal in the United States was performed mostly through trading firms, which imported the tin from a variety of countries and warehoused it in this country until they sold it to customers. Foreign-owned trading firms tended to dominate the field. Most tin dealers were based in the New York, NY, area. Some tin also was marketed directly in the United States by large foreign producers who maintained sales offices here and sold their tin metal, usually on a 1-year contract basis, only to the largest users. Perhaps foremost among these direct-sale operations was Indo-Metal Corp., which served as the exclusive North American sales outlet for tin metal produced by Indonesia's large tin producer, P.T. Tambang Timah.

For the fourth consecutive year, Brazil was the major source of U.S. tin metal imports. Indonesia ranked second, followed by Bolivia, China, and Malaysia.

World Review

At the Association of Tin Producing Countries' (ATPC) 13th minister's conference in Santa Cruz, Bolivia, in September, several important events occurred:

- (a) It was announced that the ATPC would maintain its tin export quota system through the first half of 1996.
- (b) Under its Supply Rationalization Scheme, member countries would be allowed to export a total of 50,900 metric tons for the first half of 1996, which represented 56% of the 90,000-ton total for the whole year of 1995.
- (c) For the first half of 1996, export controls, in metric tons, were allocated thusly:

Australia	5,000 tons
Bolivia	8,300 tons
China	12,500 tons
Indonesia	18,000 tons
Malaysia	3,800 tons

Nigeria	1,000 tons
Thailand	1,750 tons
Zaire	550 tons

- (d) Brazil, which attended the meeting as an observer, agreed to restrict its exports to 14,168 tons during the first half of 1996. Brazil announced that it would soon join the ATPC, meaning the organization would then represent about 70% of the world's tin supply.
- (e) Before the meeting, there was considerable sentiment among some members, especially Indonesia, that the ATPC not renew its export quotas, that they were no longer needed.
- (f) ATPC officials stated they believed that the longstanding world tin oversupply could dwindle to about 20,000 tons by mid-1996.⁵

Argentina.—It was announced that the Argentine subsidiary of Sunshine Mining and Refining Co. (USA) had acquired the assets of Sociedad Minera Pirquitas Pichetti y Cia SA, which consisted mostly of a large silver-tin deposit. Sunshine reported that the Pirquitas deposit was a disseminated silver-tin deposit estimated to contain up to 6,300 tons (202 million troy ounces) of silver and 138,000 tons of tin. The assets also included a 2,000-ton-per-day crusher plant, a 200-ton-per-day gravity-flotation plant, mine support facilities, and other infrastructure. The mine was in production from 1936 until 1990, when Pirquitas went bankrupt. Sunshine planned to verify previously reported grades and to expand the resources. Sunshine planned to invest about \$3 million in 1996 on exploration and a feasibility study.⁶

Australia.—Renison Consolidated Goldfields Ltd. remained the major tin producer in the country. Renison operated the Renison Bell tin mine at Zeehan, Tasmania. In recent years, the company has achieved considerable cost reductions at Renison Bell.

Alluvial tin-mining operations in north Queensland, which closed after the "tin crisis" of 1985, were being revived. Tin mining has been conducted in the region by a large number of small mining firms for more than a century. Norminco (formerly Mount Carrington Mines) planned to develop a 600-ton-per-year alluvial tin mine based at the Leichardt Creek deposit. A \$3 million flotation plant was expected to be operational by yearend and produce a 40% concentrate, which would be further concentrated by electrostatic and magnetic separation at Norminco's nearby Mount Veteran mineral dressing plant. Mount Veteran was commissioned in 1984, but was closed after only a few months following the 1985 "tin crisis." It was built at a cost of \$3 million and incorporated crushing, grinding, and separation facilities, including eight mineral dressing tables. Norminco bought the Mount Veteran plant as well as several tin-mining prospects in 1994 and was now recommissioning the operation. The company expected that the operating cost at Leichardt Creek would be about \$1.30 per pound. Although Norminco's initial output would be relatively modest, the firm viewed this as only the first stage of a large-scale development of its vast reserves in the region. It

planned eventually to introduce additional production capacity there that would raise production to more than 2,100 tons of contained tin by 1998. The Leichardt project would be funded by a \$1.8 million loan from the Macquarie Bank as well as a \$2 million share issue underwritten by Macquarie Underwriting.

BHP Steel Co. announced it had placed a \$70 million contract with Mannesmann Demag Hüttentechnik for a tinning line, a chromium coating line, and an associated plant for its Port Kembla, New South Wales, tinplate works. The contract is part of a \$230 million upgrading of Port Kembla intended to give BHP a larger share of the domestic beverage can market and more material for export. Production capacity was expected to increase 40% to about 514,000 tons annually by the end of 1998. BHP believed it could regain business from aluminum, which accounted for more than 90% of the domestic beverage can market in Australia, one of the highest proportions in the world. BHP hoped to increase its exports of tinplate, especially to Asia.⁷

Bolivia.—At least twice, tin-mining operations were hampered by strikes in 1995. In the spring, a 6-week strike hampered production at the Colquiri tin-zinc mine and the Huanuni and Caracoles tin mines. The strike was sparked by the arrest of teachers protesting a new federal education law; striking teachers were later joined by other sectors, eventually prompting the Government to impose a state of siege in April. During the 6-week strike it was estimated that the Corporación Minera de Boliva (COMIBOL) lost production of about 200 tons daily of tin in concentrate. In July, workers at COMIBOL's Huanuni tin mine struck for 11 days.⁸

The Government announced that three foreign firms qualified to participate in the bidding for a 50% interest in several COMIBOL tin mines and smelters. The Bolivian Capitalization Ministry named the three as Glencore International of Switzerland, Renison Goldfields Consolidated of Australia, and a joint bid by Malaysian Mining Corp. and the Malaysian Smelting Corp. These firms were given access to data on the 20,000-ton-per-year Vinto smelter, the Huanuni tin mine, and the Colquiri tin-zinc mine and they reportedly intended to inspect those sites. The other two companies who expressed an interest in the program, Brazil's Paranapanema and Canada's Inmet, were given until the end of the year to clarify their offers. COMIBOL believed that combined output of tin in concentrate from Huanuni and Colquiri could reach 10,000 to 20,000 tons annually by the year 2000 once the capitalization program was completed and technical improvements made. In 1994, output at Huanuni was 2,500 tons, while Colquiri produced about 1,800 tons.⁹

Brazil.—Industry sources indicated that with domestic consumption unchanged in recent years at about 6,000 tons, about 12,000 tons of tin metal could be exported in 1995, almost 7,000 tons less than in 1994, and one-half the total exported in 1993. About one-third of total tin production came from the Bom Futuro operation in Rondônia State. Mining generally was adversely affected by the changes that occurred after the launch of Brazil's new currency in 1994. Almost immediately after its introduction, the Brazilian currency (the

real) rose in value against the U.S. dollar by 25%, while domestic costs rose about 40%. This led to reduced activity at Bom Futuro by the garimpeiros, a drop in the tin content of easily mined tin ore at the site, and an unfavorable exchange rate for exports. Ebesa, the tin producers' consortium that operated the mine, predicted Bom Futuro tin output would decline again in 1996 as the mine became increasingly difficult to operate and additional levels of mechanized production were required. According to an agreement reached between Ebesa and garimpeiro cooperatives, the independent miners were to sell 70% of their output to Ebesa on an LME-based pricing formula. This material was then sold by Ebesa to its member companies.¹⁰

The tin smelter Corumbatai Metais Industria e Comercio announced plans to sign a contract for the supply of tin ore from Bolivian sales agent Adecam, due to difficulty in obtaining tin ore from the Bom Futuro Mine. Corumbatai reportedly built a special furnace for smelting Bolivian tin concentrates. This was necessary because of impurities contained in Bolivian tin ore that were not present in Brazilian tin ore. Corumbatai was not a member of the Brazilian tin company consortium, Ebesa, and therefore did not have an automatic right to purchase tin ore produced at the Bom Futuro Mine. Corumbatai's main customer was steelmaker Cia Siderurgica Nacional, with which it had a supply contract. The latter is a major tinplate producer.¹¹

Canada.—The Canadian Aerosol Information Bureau announced plans to create a national recovery program for the 200 million empty aerosol containers that are generated annually. The organization planned to approach 50 communities and hoped to have at least 9 of them include the aerosol container in curbside recycling collection programs by next spring. A pilot project in the region of Hastings, Ontario, that added aerosol and paint containers to its curbside collection found that additional costs of about \$40 per metric ton were more than offset by extra revenue of about \$90 per metric ton.

Stelco, Inc. was reportedly considering ending its tinplate production. Stelco had gradually been shifting its product mix away from tinplate for several years. Stelco's steel plant was in Hamilton, Ontario, where it made tinplate, chromeplate (tin-free-steel), and blackplate in its tin mill. Stelco's tin mill facilities dated back to the 1940's, and the firm reportedly felt it might be better to focus on alternate steel products rather than upgrade its tin mill. Stelco's tinplate capacity was about 350,000 tons annually, but production had been running about 200,000 tons annually. If Stelco did depart the tinplate field, Dofasco would remain as Canada's sole tinplate producer.

China.—It was announced that U.S.-based Pacific Vista Industries Inc. (PVI) entered into a joint venture with China's Tanashan Metallurgical Industrial Co. for the construction of an electrolytic tinplating plant. The venture was capitalized at about \$30 million, with PVI and its Heisei Construction Co. subsidiary contributing the bulk of the funding in exchange for an 82% stake in the venture. The plant would be located in the Jingtang port development zone. Construction was expected to require 2 to 3 years.

China National Nonferrous Metals Industry Hainan Corp. and

two South Korean firms jointly began construction of a 100,000-ton-per-year tinplate plant on Hainan Island. The \$58 million Haiwoo Tinplate Industrial Corp. plant would be 42% owned by CNNC Hainan Corp. and 58% owned jointly by Daewoo Corp. and Dongyang Tinplate Co. The plant was expected to start production by mid-1997. The company anticipated purchasing 700 tons of refined tin annually from the Guangzhou Smelter in Guangdong and the Yunnan Tin Co. smelter in Yunnan to supply its new plant. It was expected that as much as 80% of the plant's products will be sold to consumers in Hainan, which consumes 50,000 tons of tinplate annually. Equipment and technology for the new plant was to be supplied by Dongyang Tinplate Co.¹²

France.—It was announced that the Government-controlled steelmaker, Usinor, would take steps to undergo privatization to reduce its debts and strengthen its balance sheet. Also, it was felt that privatization would give Usinor the flexibility to pay for acquisitions with listed shares rather than cash. Usinor ranked as one of the world's largest steelmakers and also one of the world's major tinplate producers.¹³

At the start of the year, the Government announced that it planned to sell its entire 56% stake in Pechiney Group, a major world aluminum producer and canmaker, and a major tinplate consumer. The sale was to be a complex transaction involving a five-for-nine share exchange for minority investors in the Group's 67%-owned packaging division. Private investors were to be offered up to a maximum total of 12 million shares. By yearend, the privatization had been completed. The firm claimed a 21% worldwide market share in the canmaking field, including a 28% share of the U.S. market and a 33% share of the European market. Pechiney planned to focus future expansion of its canmaking operations on the developing countries, especially China and Latin American countries. Plans included listing Pechiney shares on the New York Stock Exchange.¹⁴

India.—HAMCO Mining and Smelting Ltd., the only tin producer in India, announced it would increase tin production to 8,000 tons annually by 1996. HAMCO began primary tin production in 1993 and was currently producing about 6,000 tons of tin yearly. The firm recently acquired an Indian tin mine, which was expected to boost total output to 8,000 tons per year. Another expansion program included a greenfield tin smelter that was expected to come on-stream in 1996 and be financed internally by HAMCO. The company signed a renewable, 5-year exclusive agreement with Belgian trader Sté Générale des Minerais S.A. to market HAMCO's brand of refined tin ingots. In addition to its own tin mine sources, HAMCO's smelter also treated tin concentrates from the South Crofty tin mine in the United Kingdom. HAMCO intended to apply for LME registration of its "HAMCO" tin brand in early 1996. Domestic tin demand was believed to be 3,000 tons annually, with the company exporting the remainder to Asia, Europe, and the United States.¹⁵

Indonesia.—Government-owned tin producer P.T. Tambang Timah proceeded with announced plans to privatize. This entailed offering 35% of its shares through an initial public

offering, with 25% of these to be listed on the London Stock Exchange and the remaining 10% on the Jakarta and Surabaya exchanges. The stock offering was expected to raise about \$200 million. Proceeds from the offering were slated to be used by Timah to upgrade its dredging fleet, to develop supporting facilities, and to explore for new production sites. The company expected to produce 37,000 tons of tin in 1995, with about 5% of that slated for domestic consumption. It expected a further increase from 46,000 tons in 1996 to 50,000 tons by the year 2000. Timah rated itself as the world's lowest cost producer, with plans to cut production costs further from \$4,300 per ton to \$3,800 per ton by the year 2000 through increased efficiency.¹⁶ Although Timah intended to have its main focus remain on tin, it also planned to explore for base and precious metal deposits.

Renison Consolidated (Australia) announced plans to proceed with the construction of a new tin smelter at its Koba Tin operations on Bangka Island, Indonesia. The new plant would cost \$4 million and would include two reverberatory furnaces and refining equipment. The new smelter would treat all of the concentrates from the Koba Tin Mine and have an initial capacity of 13,000 tons of refined tin annually. It was expected to begin operations in mid-1996. Currently, all of the concentrates from the mine were smelted at P.T. Tambang Timah's tin smelter at Mentok, Bangka Island. Renison also planned to expand mining operations at Koba Tin with the construction of an additional dredge.

Japan.—Major steel producer NKK Corp. announced it would relocate an idled tin mill at its Keihin Works in Japan to Fujian Province in China as part of a new joint venture owned by Japanese and Taiwanese interests. The new company, Fujian Sino-Japan Metal Corp., expected to begin tinplate production in 1998. The tin mill would be owned 65% by seven Japanese concerns and 35% by Tung Ho Steel Enterprise Corp., a major electric arc steelmaker in Taiwan. The project reportedly represented an investment of \$60 million.¹⁷

Analysts observed that canmakers in Southeast Asia and even the United States were targeting the Japanese beverage can market. About 5% of Japan's 34 billion beverage can demand was imported annually. But high and rising domestic production costs meant that the Japanese market was becoming attractive to foreign can producers, whose costs were often 40 to 50% lower. About 90% of all cans used in Japan were destined for the beverage can market, where products such as canned coffee have long been popular. Aluminum and tinplate shared the Japanese beverage can market about equally.

Kyrgyzstan.—Kara Balta, one of the country's largest mining complexes, announced it was forming a joint venture with Onyx, a Russian investment company, to develop the Sary Dzhas tin and tungsten deposit in the Issyk Kul region. Onyx planned to invest \$8 million in the development of the deposit, which contains more than 150,000 tons of tin and 100,000 tons of tungsten. Tin production was expected to be 1,000 tons yearly and tungsten production 600 tons yearly when the second stage of an on-site mill would be completed in mid-1996. The mill's full capacity would be 300,000 tons of ore annually. The first

stage of the mill was already on-stream and was able to process up to 100,000 tons yearly, producing 300 tons of tin and 200 tons of tungsten.¹⁸

Malaysia.—The Chamber of Mines reported that the number of active mining units continued to decrease, from 76 in 1993 to 67 in 1994. The Chamber attributed the declining trend to the depletion of economic tin reserves, rising production costs, and low global tin prices. The Chamber announced that 35,600 tons of tin-in-concentrate was imported for smelting in Malaysia, mainly from Australia, China, Peru, Portugal, and Vietnam. In 1994, Malaysia exported 35,300 tons of refined tin, about the same as that in 1993. Tin consumption by Malaysia firms increased somewhat, to 5,600 tons in 1994. The Chamber emphasized that a healthy mining industry was vital to the country and urged the Government to extend investment incentives to the mining industry. In 1994, the domestic production values of copper and gold surpassed those of tin. For most of this century, Malaysia was the principal world producer of tin.¹⁹

The Malaysia Smelting Corp. (MSC) announced that it expected work on an addition to its electrolytic tin smelter to be completed by yearend 1995. The major goal of the smelter expansion project was to produce more high-purity tin, increasing MSC's output in that category from 120 tons to 360 tons annually. Part of the expansion project was also aimed at allowing MSC to handle low-grade imported tin concentrates that were constituting an increasing portion of its feedstock. The facility to handle low-grade tin was to be constructed in Butterworth, about 10 kilometers from MSC's present large tin smelter. MSC expected to smelt about 40,000 tons of tin concentrates in 1995, yielding about 25,000 tons of tin metal. The combined production of the two large Malaysian tin smelters (MSC and Escoy) was expected to be about 40,000 tons of tin metal in 1995. MSC, along with three other worldwide organizations, prequalified for eventual purchase of Bolivia's Vinto tin smelter.²⁰

Nigeria.—The Government reported that Nigeria expected to export 2,000 tons of tin in 1995, about the same quantity as that in 1994. Decacia International, acting as the agent for Nigeria's Makeri Smelting Co., indicated that Makeri would be treating about 2,000 tons of tin-in-concentrate this year. Makeri was responsible for smelting all of Nigeria's official tin concentrate production. The smelter was designed to treat high-quality ore and had a capacity of 18,000 tons annually of tin-in-concentrate, but actual output was considerably lower, owing to a lack of domestic concentrate supplies. Reportedly, Makeri was also hampered by a shortage of other African tin concentrates. The tin metal produced by Makeri was the only African tin listed on the LME, following the closure of the Rooiberg tin operation in South Africa and the Kamativi operation in Zimbabwe.²¹

Peru.—Peru outranked both Bolivia and Brazil as the leading tin producer in South America. Minsur S.A. operated the country's only major tin mine. Minsur's 1995 production exceeded 22,000 tons of tin, the fourth consecutive increase in as many years. The sharp production increase owed much to continuing upgrades at Minsur's San Rafael mill, located near

the tin mine in the Puno highlands, about 800 kilometers southeast of Lima; the company planned to further increase tin ore processing at the mill from 1,000 tons per day to 1,500 tons per day by mid-1995. Another factor in the production increase was the continuing development of a major tin-copper deposit with proven reserves exceeding 5 million tons grading 5.20% tin and 0.25% copper. Officials claimed that total reserves at Minsur exceeded 8 million tons. Minsur was in the midst of a \$20 million investment campaign to bring a 30,000-ton-per-year tin smelter on-line at the Pacific Ocean port of Pisco, 200 kilometers south of Lima. The smelter was being built by Ausmelt Ltd. (Australia) and was being financed by a 6-year, \$120 million loan from a Peruvian bank. Minsur expected to have its new smelter operational by early 1996. Plans called for the smelter to produce only Grade A tin in 1996. Production for 1996 was expected to be about 6,000 tons, allowing for 3 to 6 months of trials. Smelter capacity was expected to be 15,000 tons of tin annually, which may later be upgraded to 20,000 tons by using oxygen enrichment. Minsur stated that while it was considering later production of low lead grades (50 to 100 parts per million), Grade A production was now the top priority. Minsur also was diversifying its exploration efforts with a \$3 million investment in copper and gold exploration, mostly in the Arequipa, Cuzco, and Puno regions of Peru.²²

Russia.—The Novosibirsk Tin Plant remained the country's only tin smelter. Novosibirsk shipped refined tin to the West only on a tolling basis, and that accounted for only about 20% of its 1994 output. Tolling partners included Britain's Anglo-Russian Metals and France's Transomin. The remaining Novosibirsk tin output was produced from concentrate shipped in from tin mines in Russia's Far East, notably from the Khrustalnensk Tin Co. But, in recent years, tin mining in that region has declined. The Iultinsk mining and enrichment plant in the Magadan region stopped production in 1994, and Khrustalnensk halved its output to about 2,000 tons of concentrates. Officials emphasized that Novosibirsk's biggest problem was supplies rather than sales. In 1994, Novosibirsk shipped nearly all the tin, solder, alloys, and babbitt metal produced from Russian concentrates to customers in Russia and the Commonwealth of Independent States. The smelter's biggest customers were the Karaganda Steel Plant in Kazakstan and the Magnitogorsk Steel Plant in the Urals. The smelter was seeking LME registration for its tin brand. Anglo-Russian Metals owned 14% of its shares, following an investment tender in 1993. Novosibirsk also sold shares to other companies and individuals in 1993 and 1994, with a 23% stake going to the local Sibelfin Co. and 12% to Novosibirsk investment funds; the remaining 51% was owned by individuals.²³

United Kingdom.—Amalgamated Metal Corp. (AMC), based in London, announced that it would acquire a controlling interest in the large Thaisarco tin smelter in Thailand. Thaisarco has experienced a shortage of tin concentrate supplies in recent years, with production declining from 20,000 tons of tin metal in 1989 to 7,600 tons in 1994. Although Thaisarco officials expected 1995 output to reach 8,200 tons, this was in marked contrast to Thaisarco's peak of 34,000 tons in 1980.²⁴

British Steel Corp. announced plans to close its No. 2 tinplate coating line at its Ebbw Vale works in South Wales. British Steel's tinplate production has long been based at several sites in Wales. Its future tinplate-related production would now be concentrated at its four modernized tinplate lines; two at Ebbw Vale, in Gwent, Wales, and two at Trostre, in Dyfed, Wales. Trostre's No. 5 line produced wider tinplate than the other lines, specifically for the beverage can market, while its No. 4 facility produced tin-free steel intended for the tops of cans. Ebbw Vale, with the closure of one line, now ran three tinning lines whose output was used mostly in the food canning and aerosol markets. Since 1989, British Steel has invested \$180 million in upgrading its tinplate production. In 1994, it produced 750,000 tons of tin mill products. Despite the closure of Ebbw Vale's No. 2 line (the only one of the firm's lines that did not benefit from this investment), British Steel had 50,000 tons more annual capacity than last year's output. For comparison purposes, British Steel's 800,000 tons in annual tin mill production can be compared with the 1.1 million tons in annual tin mill production of another large European producer, Rasselstein Hoesch of Germany.

Continental Can Europe, which was owned by the Viag Group in Germany, announced that it would switch its 1.5-billion annual capacity beverage can plant at Wrexham, England, back to using tinplate for its can bodies instead of aluminum late in 1995. Lids for the cans would still be made of aluminum. Company officials stated that recent steep increases in aluminum prices and the general price volatility of the metal caused the decision to switch, although they stressed that there were no current plans to change from aluminum to steel at Continental Can's second British plant at Rugby. From the start of the year to midyear 1995, aluminum can sheet prices reportedly rose 20% in Europe and 50% in the United States following a decision by producers to replace long-term contracts with a pricing formula based upon LME prices plus a location premium and a rolling fee.²⁵

Current Research

The International Tin Research Institute (ITRI), based in Uxbridge, United Kingdom, the world's foremost laboratory for tin scientific research and new tin applications, completed its first full year under its new structure. The ITRI was now privatized, with funding now supplied by several major tin producer firms rather than by the ATPC. The Institute was now called ITRI Ltd. Among the initial firms funding ITRI were Renison Goldfields Consolidated Ltd. of Australia; P.T. Tambang Timah and P.T. Koba Tin of Indonesia; Malaysia Mining Corp. of Malaysia; Minsur S.A. of Peru; and Somincor of Portugal. ITRI, in operation since the 1930's, was primarily a research organization that focused its efforts on expanding the consumption of tin.

ITRI announced that two new member firms had joined in 1995. Australia's Norminco became the 10th member. Norminco operated the Leichhardt Creek tin mine in north Queensland, Australia. Belgium's Metallo-Chimique became

the 11th member of the ITRI and its first smelter member. Metallo-Chimique produced LME-listed high-grade tin entirely from secondary feedstock material, including tinplate and copper-brass automotive radiators.

Among the areas of current interest for the ITRI were lead-free, tin-rich solder; tin chemicals for fire retardants in polyvinyl chloride, plastics, and paper; and tin-zinc alloys for corrosion-resistant coatings.

The Ames Laboratory, Iowa State University, Ames, IA, announced it had developed an ultrafine, lead-free solder powder that reportedly melted at 216° C, compared to 183° C for conventional tin-lead solders. This property gave the alloy the potential for many uses in applications involving high temperatures. The alloy was composed of tin, silver, and copper and was said to resist thermomechanical fatigue. According to Ames, the spherical particles of the new powder were blended with a fluxing agent that helped clean the surface to be soldered and improved flow characteristics.²⁶

Ametek-Specialty Metal Products Co., Eighty Four, PA, announced the role of tin in a new family of stainless steel powder metallurgy alloys it had developed to provide enhanced corrosion resistance. Ametek branded this new line as Ultra alloys. They were produced by alloying the conventional austenitic compositions with a small amount of tin, then blending this with a small amount of a copper-nickel-tin alloy. Ametek claimed its tests showed that the Ultra version of the alloy exhibited corrosion resistance markedly superior to standard powder metallurgy stainless steels, while the mechanical properties were comparable.²⁷

Teledyne Wah Chang, Albany, OR, announced the development of a new niobium-copper-tin superconducting wire using a "modified jelly roll" (MJR) technique. The MJR process involved wrapping alternating layers of copper sheet and niobium expanded metal sheet around a tin rod. This "jelly roll" rod was then inserted into a copper tube and extruded into a hex-shaped wire known as an element. These elements were bundled into another copper tube and extruded into superconducting wire. Teledyne reported that the new wire has shown a current density 20% higher than was possible with conventional superconductors. Wire that has higher current density requires less material to generate a given magnetic field.²⁸

The Copper Development Association (CDA) and the International Copper Association announced the development of a copper and brass radiator that can be brazed in the same temperature range used for aluminum radiators. CDA officials state that this new copper-brass radiator contains no tin except for some tin in the brazing material. In most existing automotive radiators, tin in the form of solder is used as a sealant, making this application a significant one for tin.²⁹

Federal-Mogul Corp., Detroit, MI, announced that it had developed an aluminum-tin-silicon engine-bearing alloy that reportedly demonstrated excellent resistance to seizure, wear, fatigue, and corrosion. The alloy was designed to achieve the low wear rate of aluminum-lead-silicon alloys without their associated manufacturing difficulties. The composition of the

alloy was 8% tin, 2.5% silicon, 2% lead, 0.8% copper, and 0.2% chromium, with the balance aluminum. The alloy was claimed to have been extensively tested in car engines, including an overhead cam V-8 and a pushrod 60° V-6.³⁰

Texas Instruments Inc., Metallurgical Materials Div., Attleboro, MA, announced the development of a cadmium-free electrical contact material that was reported to resist corrosion, changes in conductivity, and weld forces as well as cadmium-containing materials do. The new material consisted of silver, tin, and indium oxides in a silver matrix. The firm embarked on the development program in response to indications that the industry may eventually be required to eliminate cadmium because of its toxicity.³¹

In Japan, Osaka N.E.D. Machinery Corp. announced the development of a new system for automatically sorting and crushing empty aluminum and steel cans. Empty food and beverage cans are fed into the system on a conveyor where the different metallic containers are separated by built-in magnets. When a specific weight of aluminum and steel cans are gathered in their respective bins, an iron plate crushes each of the accumulations. The crushed cans are then bundled into blocks.³²

In the United Kingdom, British Steel Corp. announced that the "Ecotop" steel easy-open end for beverage cans had been fully developed and would now go into full commercial production by yearend at a new \$5 million facility on the site of the Carnaud Metalbox (CMB) Foodcan Components Plant at Neath, South Wales. CMB would run the operation, which is a joint venture between steelmakers British Steel, Rasselstein (Germany), Hoogovens (Holland), and Sollac (France), and was scheduled to produce 220 million ends per year. Reportedly, several soft drink and beer companies were quite interested in using "Ecotop" for major brands. Market research into consumer preferences placed the two-button "Ecotop" ahead of stay-on ring-pull tops. British Steel was hopeful that steel would account for more than 60% of the European beverage can market in 1997, compared with 51% in 1994.

Outlook

U.S. demand for primary tin is expected to grow slowly in the next few years, at a rate of perhaps 1% per year. However, new applications, especially those in which tin is substituted for toxic materials, could double that rate by the late 1990's.

With the tin price rise over the past 2 years, there appears to be increasing evidence of interest in exploration and investment to develop world tin reserves. It seems likely that U.S. requirements for primary tin will continue to be met by imports and Government stockpile sales.

¹American Metal Market. Hoogovens Joins Forces With AMG in Detinning Deal. V. 103, No. 112, June 12, 1995, p. 8.

²Can Manufacturers Institute. Metal Can Shipment Report 1995. Washington, DC, 1995, pp. 1-2.

³American Metal Market. Construction Starts on New Tinplate Mill. V. 103, No. 96, May 18, 1995, p. 3.

⁴_____. Crown Cork Bids \$5.2B for French Aluminum Can Firm. V. 103, No. 100, May 24, 1995, p. 2.

⁵Platt's Metals Week. ATPC Keeps Tin Export Quotas Until Mid-1996. V. 66, No. 39, Sept. 25, 1995, p. 1.

⁶American Metal Market. Sunshine Buys Argentine Silver-Tin Deposit. V. 103, No. 244, Dec. 20, 1995, p. 7.

⁷Metal Bulletin. BHP Places Tinplate Expansion Order. No. 8000, July 27, 1995, p. 16.

⁸_____. Strikers At Bolivia's Huanuni Tin Mine Return to Work. No. 7998, July 20, 1995, p. 6.

⁹Platt's Metals Week. Three Prequalify For Comibol Properties. V. 66, No. 47, Nov. 20, 1995, p. 3.

¹⁰Mining Journal. Brazilian Tin Exports Slump. V. 325, No. 8351, Nov. 3, 1995, p. 326.

¹¹Metal Bulletin. Brazil's Corumbatai Files For Bankruptcy. No. 7999, July 24, 1995, p. 9.

¹²Platt's Metals Week. CNNC and Koreans in Tinplate Project. V. 66, No. 29, July 17, 1995, p. 10.

¹³Metal Bulletin. Usinor Aims to Cut Debt on Privatization. No. 7981, May 22, 1995, p. 19.

¹⁴Mining Journal. Pechiney Goes on Sale. V. 325, No. 8353, Nov. 17, 1995, p. 377.

¹⁵Metal Bulletin. Hamco Mining Increases Tin Production. No. 8025, Oct. 30, 1995, p. 7.

¹⁶_____. P.T. Timah Looks Toward Share Offering. No. 8015, Sept. 25, 1995, p. 7.

¹⁷American Metal Market. Moving Idled Tin Mill to China. V. 103, No. 250, Dec. 29, 1995, p. 3.

¹⁸Platt's Metals Week. Kara Balta to Develop Sary Dzhaz. V. 66, No. 43, Oct. 23, 1995, p. 5.

¹⁹Metal Bulletin. Malaysian Tin Falls On High Costs, Low Prices. No. 7983, May 29, 1995, p. 17.

²⁰_____. MSC Completes Electrolytic Tin Plant. No. 8038, Dec. 14, 1995, p. 6.

²¹_____. Nigerian Tin Exports Remain Steady. No. 8014, Sept. 21, 1995, p. 7.

²²Platt's Metals Week. Minsur Boosts Output By 45 Percent. V. 66, No. 7, Feb. 20, 1995, p. 4.

²³_____. Novosibirsk Will Not Boost Exports This Year. Feb. 27, 1995, p. 10.

²⁴Metal Bulletin. Thaisarco Smelter is Sold to Amalgamated Metal Corp. No. 7998, July 20, 1995, p. 5.

²⁵_____. Continental Can Changes Back to Steel. No. 7987, June 12, 1995.

²⁶Advanced Materials and Processes. Ultrafine Lead-Free Powder for Solder Melts at High Heat. V. 148, No. 2, Aug. 1995, p. 17.

²⁷_____. Stainless Steel P/M Alloys Improve Corrosion Resistance. V. 148, No. 1, July 1995, p. 10.

²⁸_____. Current Density of Wire for Superconducting Rises by 20 Percent. V. 148, No. 1, July 1995, p. 23.

²⁹New Steel. The Comeback of Automotive Copper and Brass. V. 11, No. 10, Oct. 1995, p. 26.

³⁰Materials Progress. Bearing Alloy Resists Wear, Fatigue, Corrosion, Seizure. V. 147, No. 6, June 1995, p. 8.

³¹Advanced Materials and Processes. Cadmium-Free Electrical Contacts Resist Erosion. V. 148, No. 6, Dec. 1995, p. 10.

³²American Metal Market. Japan Firm Marketing Can-Crushing System. V. 103, No. 191, Oct. 4, 1995, p. 10.

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TABLE 1
SALIENT TIN STATISTICS 1/

(Metric tons of contained tin unless otherwise specified)

	1991	1992	1993	1994	1995
United States:					
Production:					
Mine	(2/)	(2/)	(2/)	--	--
Secondary e/	13,100	13,700	12,000	11,700	11,100
Exports, refined tin	970	1,890	2,600	2,560	2,790
Imports for consumption, refined tin	29,100	27,300	33,700	32,400	33,200
Consumption:					
Primary	35,100	35,000	34,600	33,700 r/	35,100
Secondary	9,670	10,100	11,900	8,530 r/	10,700
Stocks, yearend, U.S. industry	13,800	10,700	10,800	10,400 r/	11,400
Prices, average cents per pound:					
New York market	258.75	282.58	239.17	254.93	294.54
Metals Week composite	362.85	402.40	349.80	369.14	415.61
London	254.00	277.00	233.00	248.00	282.00
Kuala Lumpur	248.42	271.85	231.58	244.76	277.50
World: Production:					
Mine	201,000	192,000 r/	195,000 r/	182,000 r/	187,000 e/
Smelter:					
Primary	190,000	194,000 r/	193,000 r/	198,000 r/	201,000 e/
Secondary	13,200	8,820	7,740	7,450	7,490 e/
Undifferentiated	1,720	2,150	1,320 r/	1,220 r/	1,220 e/

e/ Estimated. r/ Revised.

1/ Data are rounded to three significant digits.

2/ Negligible.

TABLE 2
U.S. CONSUMPTION OF PRIMARY AND SECONDARY TIN 1/

(Metric tons, of contained tin)

	1994	1995
Stocks, Jan. 1 2/	9,540 r/	8,480
Net receipts during year:		
Primary	35,400 r/	39,300
Secondary	4,210 r/	4,100
Scrap	4,940 r/	6,230
Total receipts	44,500 r/	49,600
Total available	54,100 r/	58,100
Tin consumed in manufactured products:		
Primary	33,700 r/	35,100
Secondary	8,530 r/	10,700
Total	42,200 r/	45,800
Intercompany transactions in scrap	214	123
Total processed	42,500 r/	45,900
Stocks, Dec. 31 (total available less total processed)	11,600 r/	12,100

r/ Revised.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes tin in transit in the United States.

TABLE 3
U.S. CONSUMPTION OF TIN, BY FINISHED PRODUCT 1/

(Metric tons of contained tin)

Product	1994			1995		
	Primary	Secondary	Total	Primary	Secondary	Total
Alloys (miscellaneous) 2/	W	W	W	W	W	W
Babbitt	513 r/	318 r/	831 r/	589	282	871
Bar tin	1,190 r/	W	1,190 r/	1,200	W	1,200
Bronze and brass	1,160	1,920	3,080	1,080	1,750	2,830
Chemicals	5,740 r/	W	5,740 r/	7,060	W	7,060
Collapsible tubes and foil	W	W	W	W	W	W
Solder	10,700 r/	4,370	15,100 r/	10,600	6,900	17,500
Tinning	1,230	W	1,230	1,120	W	1,120
Tinplate 3/	9,480	W	9,480	9,670	W	9,670
Tin powder	625	W	625	W	W	W
Type metal	W	W	W	W	W	W
White metal 4/	992 r/	W	992 r/	965	W	965
Other	2,070 r/	1,920	3,990 r/	2,770	1,790	4,560
Total	33,700 r/	8,530 r/	42,200 r/	35,100	10,700	45,800

r/ Revised. W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes terne metal.

3/ Includes secondary pig tin and tin acquired in chemicals.

4/ Includes pewter, britannia metal, and jewelers' metal.

TABLE 4
U.S. INDUSTRY YEAREND TIN STOCKS 1/

(Metric tons)

	1994	1995
Plant raw materials:		
Pig tin:		
Virgin 2/	6,660 r/	7,630
Secondary	715 r/	510
In process 3/	1,520 r/	1,010
Total	8,900 r/	9,160
Additional pig tin:		
Jobbers-importers	373	1,240
Afloat to United States	1,110	1,040
Total	1,480	2,270
Grand total	10,400 r/	11,400

r/ Revised.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes tin in transit in the United States.

3/ Data represent scrap only, tin content.

TABLE 5
U.S. EXPORTS OF TIN IN VARIOUS FORMS 1/

Year	Tinplate and terneplate		Ingots and pigs		Tin scrap and other tin bearing material except tinplate scrap 2/	
	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)
1994	213,000	\$123,000	2,560	\$13,900	68,000	\$52,800
1995	307,000	185,000	2,790	17,300	57,600	56,600

1/ Data are rounded to three significant digits.

2/ Includes rods, profiles, wire, powders, flakes, tubes, and pipes.

Source: Bureau of the Census.

TABLE 6
U.S. IMPORTS FOR CONSUMPTION OF TIN IN VARIOUS FORMS 1/

Year	Miscellaneous 2/	Dross, skimmings, scrap, residues, tin alloys, n.s.p.f.		Tinplate and terneplate		Tin compounds		Tinplate scrap	
	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)
1994	\$2,840	9,150	\$39,300	337,000	\$216,000	744	\$4,740	8,950	\$1,410
1995	5,050	24,800	58,900	272,000	180,000	986	7,270	16,000	2,390

1/ Data are rounded to three significant digits.

2/ Includes tinfoil, tin powder, fitters, metallics, manufactures, n.s.p.f.

Source: Bureau of the Census.

TABLE 7
U.S. IMPORTS FOR CONSUMPTION OF UNWROUGHT TIN METAL,
BY COUNTRY 1/

Country	1994		1995	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Bolivia	7,260	\$38,600	6,630	\$40,300
Brazil	9,990	50,900	8,070	50,500
Canada	176	987	185	1,270
Chile	667	3,510	469	2,840
China	3,230	16,500	5,610	34,200
Hong Kong	1,210	6,460	134	1,260
India	120	647	146	844
Indonesia	6,620	35,100	7,230	44,600
Japan	76	659	--	--
Korea, Republic of	100	535	219	1,090
Malaysia	1,390	8,220	3,810	23,200
Netherlands	281	1,550	60	411
Russia	325	1,710	149	926
Singapore	142	836	40	385
United Kingdom	666	3,480	97	632
Other	158 r/	858 r/	306	2,000
Total	32,400	171,000	33,200	204,000

r/ Revised.

1/ Data are rounded to three significant digits; may not add to totals shown.

Source: Bureau of the Census.

TABLE 8
TIN: WORLD MINE PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1991	1992	1993	1994	1995 e/
Australia 3/	5,700	6,609	8,057	7,100 r/	8,175 4/
Bolivia	16,830	16,516	18,634	16,027 r/	14,419 4/
Brazil	29,253	27,500	26,500	16,800 r/	16,800
Burma 5/	438	649	689	814 r/	747 4/
Burundi e/	74	110	50	50	50
Cameroon e/	3	3	3	2 r/	2
Canada	4,455	--	--	--	--
China e/	42,100	43,800	49,100	54,100 r/	52,000
Czechoslovakia 6/	15	XX	XX	XX	XX
Germany	118	--	--	--	--
Indonesia	30,061	29,400	29,000 e/	30,610 r/	38,378 4/
Kazakstan e/	XX	75 r/	50 r/	24 r/	15
Laos e/	300	300	300	200	200
Malaysia	20,710	14,339	10,384	6,458	6,402 4/
Mexico	12	1	3	3 e/	1
Mongolia e/	250	190	150	100 r/	150
Namibia	11	11	4	1 r/	2 4/
Niger e/	20 4/	20	20	20	20
Nigeria 7/	217	415 r/	400 r/	185 r/	185
Peru	6,558 r/	10,044 r/	14,310 r/	20,075 r/	22,331 4/
Portugal	8,333	6,560	10,100	7,637 r/	8,000
Russia	XX	15,160 r/	13,100 r/	10,460 r/	9,000
Rwanda e/	730	500	400	50	--
South Africa	1,042	582	450 e/	--	--
Spain	12	7	2	4 r/	2
Tanzania e/	6	8 r/	11 r/	4 r/ 4/	--
Thailand	14,937	11,484	6,363 r/	3,926 r/	3,000
Uganda e/	25	30 4/	30	30	30
U.S.S.R. e/ 8/	13,500	XX	XX	XX	XX
United Kingdom	2,326	2,044	2,232	1,922 r/	2,000
United States	W	W	W	--	--
Vietnam e/	800	3,400	3,500	4,000	4,500
Zaire	1,522	1,020	700 e/	1,000 r/	1,000
Zambia	6	2	2 e/	--	--
Zimbabwe e/	1,060	950	800	82 r/ 4/	--
Total	201,000	192,000 r/	195,000 r/	182,000 r/	187,000

e/ Estimated. r/ Revised. W Witheld to avoid disclosing company proprietary data; not included in "Total." XX Not applicable.

1/ World totals and estimated data are rounded to three significant digits; may not add to totals shown.

2/ Contained tin basis. Data derived in part from the Monthly Statistical Bulletin of the International Tin Council, London. Table includes data available through July 26, 1996.

3/ Excludes tin content of copper-tin and tin-tungsten concentrates.

4/ Reported figure.

5// Includes content of tin-tungsten concentrate.

6/ Dissolved Dec. 31, 1992.

7/ Concentrate gross weight reported, estimated 62% Sn content.

8/ Dissolved in Dec. 1991.

TABLE 9
TIN: WORLD SMELTER PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1991	1992	1993	1994	1995 e/
Argentina: e/					
Primary	240 3/	140	145	100	100
Secondary	100	100	100	100	100
Total	340	240	245	200	200
Australia:					
Primary	268	240	222	315 r/	570 3/
Secondary e/	300	360	250	260	300
Total e/	568	600	472	575 r/	870
Belgium: Secondary e/	4,426 3/	5,260	5,000	5,000	5,000
Bolivia: Primary	14,663	14,393	14,541	15,285	17,709 3/
Brazil:					
Primary	25,776	27,000	26,900	20,400 r/	20,000
Secondary e/	250	250	250	250	250
Total e/	26,000	27,300	27,200	20,700 r/	20,300
Bulgaria: Primary and secondary	22	23	23 r/	22 r/	22
Burma: Primary	157	189	170	200 e/	200
Canada: Secondary e/	200	200	200	-- r/	--
China: Primary e/	36,400	39,600	52,000	67,800 r/	60,700
Czech Republic: Primary and secondary e/	XX	XX	115	100 r/	100
Czechoslovakia: 4/ Primary	118	115	XX	XX	XX
Denmark: Secondary e/	100	100	100	100	100
Germany: Primary and secondary	700	127	179	100 r/	100
Greece: Secondary e/	200	200	200	150	150
India: Secondary e/	200	200	200	200	100
Indonesia: Primary	30,415	31,915	30,415	31,100 e/	38,628 3/
Japan: Primary	716	821	804	706	630 3/
Korea, Republic of: Primary e/	600	400	400	300	300
Malaysia: Primary	42,722	45,598	39,984 r/	38,119 r/	39,454 3/
Mexico: Primary	2,262	2,590	1,640	768 r/	770 3/
Netherlands:					
Primary	4,800	--	--	--	--
Secondary e/	200	200	--	--	--
Total e/	5,000	200	--	--	--
Nigeria: Primary	246	370 r/	350 r/	173 r/	173
Norway: Secondary e/	90	90	90	90	90
Portugal: Primary and secondary e/	1,000	2,000	1,000	1,000	1,000
Russia: e/ 5/					
Primary	XX	15,200 r/	13,400 r/	11,500 r/	9,500
Secondary	XX	1,500	1,000	1,000 r/	1,000
Total	XX	16,700 r/	14,400 r/	12,500 r/	10,500
Singapore: Primary e/	600	--	--	--	--
South Africa:					
Primary	1,042	592	452	43 r/	40
Secondary e/	70	60	45	--	--
Total e/	1,110	652	497	43 r/	40
Spain: e/					
Primary	600	600	500	700	700
Secondary	200	200	200	200	300
Total	800	800	700	900	1,000
Thailand: Primary	11,255	10,679	8,099	7,759 r/	8,243 3/
U.S.S.R.: e/ 5/ 6/					
Primary	13,000	XX	XX	XX	XX
Secondary	3,300	XX	XX	XX	XX
Total	16,300	XX	XX	XX	XX
United Kingdom: e/					
Primary	1,661 3/	--	--	--	--
Secondary	3,575 3/	100	100	100	100
Total	5,236 3/	100	100	100	100
United States: Secondary	W	W	W	W	W

See footnotes at end of table.

TABLE 9--Continued
TIN: WORLD SMELTER PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1991	1992	1993	1994	1995 e/
Vietnam: Primary e/	1,700	2,400	2,500	2,500	2,800
Zaire: Primary e/	70	50	20	20	15
Zimbabwe: Primary	796	716	657	82	--
Grand total	205,000	205,000 r/	202,000 r/	207,000 r/	209,000
Of which:					
Total primary	190,000	194,000 r/	193,000 r/	198,000 r/	201,000
Total secondary	13,200	8,820	7,740	7,450	7,490
Total undifferentiated	1,720	2,150	1,320 r/	1,220 r/	1,220

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

1/ World totals and estimated data are rounded to three significant digits; may not add to totals shown.

2/ Wherever possible, total smelter output has been separated into primary (from ores and concentrates) and secondary (tin metal recovered from old scrap).

This table reflects metal production at the first measurable stage of metal output. Table includes data available through July 26, 1996.

3/ Reported figure.

4/ Dissolved Dec. 31, 1992. All production in Czechoslovakia for 1991-92 came from the Czech Republic.

5/ All production in the U.S.S.R. for 1991 came from Russia.

6/ Dissolved in Dec. 1991.