



2016 Minerals Yearbook

TIN [ADVANCE RELEASE]

TIN

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Tin has not been mined in the United States since 1993; thus, the United States is reliant on imports and recycling for its tin needs. In 2016, the amount of primary tin metal consumed domestically was 22,500 metric tons (t) worth an estimated \$416 million. Approximately 11,300 t was recovered from the consumption of domestic scrap. Industry stocks were 10% less than those at yearend 2015 (tables 1, 5).

World tin mine production was 288,000 t, a 16% decrease from the revised production total in 2015 (table 9). Of the 18 countries in which tin was mined, 6 countries accounted for 90% of the total production. China was the leading producer (32% of world output), followed by Burma (19%), Indonesia (18%), Brazil (9%), Peru (7%), and Bolivia (6%). World primary tin smelter production was 306,000 t (table 10), a 7% decrease from the revised total of 2015. According to CRU International Ltd., world refined tin consumption for 2016 was 346,000 t, a slight increase from the previous year (CRU Tin Monitor, 2018).

The annual average New York dealer price for Grade A tin in 2016 was 11% more than that in 2015 at \$8.39 per pound, and the annual average London Metal Exchange Ltd. (LME) cash price was \$8.15 per pound, 12% more than that in 2015 (table 1). World tin reserves were estimated to be 4.8 million metric tons, about 16 times the estimated 2016 world primary tin production. The majority of tin reserves were in Asia and South America.

Legislation and Government Programs

Conflict Minerals.—The U.S. Securities and Exchange Commission was responsible for implementing Section 1502 of the Dodd-Frank Wall Street Reform and Consumer Protection Act, which is related to the use of minerals determined to be financing conflict in Congo (Kinshasa) or an adjoining country. Cassiterite, one of two principal minerals mined for tin, was included in the list of “conflict minerals,” defined as cassiterite, columbite-tantalite, gold, wolframite, or their derivatives. Section 1502 required companies for which conflict minerals or their derivatives were necessary to the functionality or manufacture of their products to disclose annually whether any of those minerals originated in Congo (Kinshasa) or an adjoining country (U.S. Securities and Exchange Commission, 2012, p. 56274–56275).

In 2016, 1,230 companies filed conflict minerals disclosures for 2015 (1,281 companies filed disclosures in 2015 for 2014). The ability of reporting companies to identify the country of origin of conflict minerals was hindered when there were multiple tiers of suppliers between the reporting company and the upstream concentrate-processing facility. After conducting due diligence on the source and chain of custody of the conflict minerals in their products, an estimated 55% of the companies reported that they could not confirm the source of the conflict minerals and about 99% reported that they could not determine

whether the minerals financed or benefited armed groups. Although reporting companies were not required to identify which conflict minerals they used, of those that did, 61% reported using tin. Tin concentrate production from Congo (Kinshasa) and adjoining countries has only been 2% to 4% of world production in the past 5 years (table 9) (U.S. Government Accountability Office, 2017, p. 3–7).

Production

Tin has not been mined in the United States since 1993, when it was mined in Alaska. In 2016, tin recovered from new and old scrap was estimated to be 11,300 t, slightly more than that of 2015 (table 5). A significant quantity of alloy tin scrap was generated during manufacturing processes and recycled within those same industries (new scrap).

Secondary tin recovered from obsolete fabricated parts (old scrap) was used in many types of products and was a particularly important source of tin for the manufacture of brass, bronze, and solder. In 2016, 10,300 t of tin was recovered from old scrap, with 8,540 t from lead-base scrap and 1,740 t from directly melted copper-base scrap at brass mills, ingot makers, and foundries (table 5).

Consumption

Tin in the United States was used, in descending order by weight, in chemicals, 21%; tinplate, 18%; solder, 17%; alloys, 10%; babbitt, bronze or brass, and tinning, 9%; and other, 24% (table 3). Tin-based chemicals are commonly used in polyvinyl chloride (PVC) production and curing, biocides, and catalysts. Tinplate is a layer of tin adhered to steel or wrought iron substrate for corrosion protection. Tin is used in this case to inhibit rust and is commonly used in food-grade cans. Tin alloys are used in brass and bronze products, solders, and low-friction metals. Solder is commonly used in electronic devices for connections on circuit boards.

In 2016, U.S. reported tin consumption was 22,500 t of primary tin and 2,920 t of secondary tin. Domestic consumption data for tin were developed by the U.S. Geological Survey from a voluntary survey of tin consumers. Of the 116 firms to which a survey form was sent, 56 responded, accounting for 48% of estimated reported consumption. Data for the nonrespondents were estimated based on prior-year reporting.

Prices

The Platts Metals Week annual average New York dealer price for Grade A tin metal was \$8.39 per pound in 2016, 11% more than that in 2015. The LME remained the principal commodity exchange for trading tin and in 2016, the annual average LME cash price for tin was \$8.15 per pound, an increase of 12% from the 2015 average LME price of \$7.29 per pound (table 1).

Foreign Trade

U.S. imports for consumption of refined tin, which supplied most domestic tin requirements, totaled 32,200 t in 2016, 4% less than those of 2015 (table 8). Imports of tin in all forms (metal, ore and concentrate, scrap, and waste) remained duty free. Foreign-owned trading firms operating in the United States tended to dominate the marketing of imports. United States imports of tin came from Indonesia (27%), Malaysia (23%), Peru (20%), Bolivia (19%), Brazil (7%), and other countries (4%). Refined tin exports in 2016 were 1,150 t, about a 340-t increase from 2015 (table 6).

World Review

According to a survey by the International Tin Association Ltd. (formerly International Tin Research Association Ltd.), the world's 10 leading refined tin producers and their production in 2016 were, in descending order of production, Yunnan Tin Group Co. Ltd. (China), 76,000 t; Malaysia Smelting Corp. Bhd. (Malaysia), 26,802 t; PT Timah (Persero) Tbk. (Indonesia), 23,756 t; Yunnan Chengfeng Co. Ltd. (China), 20,100 t; Minsur S.A. (Peru), 19,573 t; Empresa Metalúrgica Vinto S.A. (Bolivia), 13,038 t; Thailand Smelting and Refining Co. Ltd. (Thailand), 11,088 t; Guangxi China Tin Group Co. Ltd. (China), 10,984 t; Metallo Chimique International N.V. (Belgium), 8,541 t; and Gejiu Zi-Li Mining and Smelting Co. Ltd. (China), 8,200 t; (International Tin Association Ltd., 2017b).

Australia.—In August, AusTin Mining Ltd. recommenced production at the Granville tin processing plant in Tasmania. The plant initially retreated the existing tailings at the site and then began processing stockpiled ore later in the year. AusTin Mining was also in the process of obtaining the necessary regulatory approval for an expansion project at Granville, which included resuming mining at the site and increasing tin-in-concentrate production to about 550 metric tons per year (t/yr) (AusTin Mining Ltd., 2016).

On December 13, the Federal Court of Australia rejected the merger proposal between Kasbah Resources Ltd. and Asian Mineral Resources Ltd. The merger had the approval of the Kasbah board of directors and 90% of the shareholders, but the minority shareholders objected, citing an error in the valuation of their shares. The court ordered Kasbah to pay the minority shareholders reasonable costs, including at least 50% of the previous court hearing costs. Kasbah Resources owned the Achmmach deposit in Morocco, which has been projected to produce up to 7,000 t/yr (Garvey, 2016). When the merger failed, Pala Investments Ltd. purchased a 19.9% stake in Kasbah for \$2.7 million (3.23 million Australian dollars), allowing Pala Investments to appoint two representatives to the Kasbah board (Pala Investments Ltd., 2016).

Brazil.—Brasil Manganês Corporation Mineração S.A. (BMC) (a subsidiary of Meridian Mining S.E.) signed an agreement with Cooperativa de Garimpeiros de Santa Cruz Ltda. and Cooperativa Metalúrgica de Rondônia Ltda. to reprocess tailings from the Bom Futuro Mine in the Ariquemes District, Rondonia State. BMC also gained the first right of refusal on either the acquisition of the mineral rights or the provision of underground mining services in the area and could secure up to 80% of the unexplored area surrounding the mines (Metal-Pages, 2016b).

Minsur announced that the Pitinga Mine produced 6,875 t of tin in concentrate in 2016, a 20% increase from 5,744 t in 2015 and the highest level of production since the company acquired the mine in 2008. Minsur attributed the production increase to the completion of several debottlenecking projects and repairing the hydroelectric power unit at the mine. All concentrates were sent to the company's Pirapora refinery in Sao Paulo, which produced 5,873 t of refined tin in 2016, 6% more than that in 2015 (Minsur S.A., 2017a, p. 8, 42; 2017b).

Burma.—Burma accounted for most of China's tin concentrate imports in 2016, supplying 472,506 t of tin ore and concentrates containing an estimated 57,000 t of tin. Approximately 18% of this was believed to be from Wa County government stocks. Burma's ore continued to be produced predominantly in Wa County, or Wa Special Region 2 in northern Shan State, close to the border with China (International Tin Association Ltd., 2017a).

China.—In January, nine of China's tin producers agreed to cut production by a combined 17,000 t for the year, citing low prices. Participants in this production cut included Yunnan Tin, China Tin, and Chengfeng. The total tin production of all participating companies was around 140,000 t, equivalent to 80% of China's tin production, or 40% of global tin production in 2015 (International Tin Association Ltd., 2016a).

In July, tin smelters in Guangxi Zhuang Autonomous Region and Jiangxi and Yunnan Provinces suspended or scaled back production, reportedly for Government-mandated special environmental inspections. Inspection teams were sent to eight Provinces where most of the country's nonferrous metals production took place, and inspections were mostly completed by the end of August. Smelters gradually built their production levels back up to previous levels when the inspections had been successfully completed. In September, only four smelters remained closed, which represented 18% of China's annual refined tin production (International Tin Association Ltd., 2016b, c).

Indonesia.—In February, PT Refined Bangka Tin closed its smelting and refining facility and stopped tin production, citing low tin prices and stringent environmental regulations. The company announced that the refinery would be dismantled and the site would be turned into a conservation area. PT Refined Bangka Tin typically exported about 5,000 t/yr of tin (Metal-Pages Ltd., 2016).

According to the results of an audit carried out by Indonesia's Ministry of Energy and Mineral Resources, only 29 out of 47 tin smelters in the Bangka-Belitung Islands Province were operating in 2015. The tin smelting capacity utilization rate in the Province, which accounted for approximately 90% of Indonesia's tin production, was only around 20%. The audit also showed that of the 755 companies that held a license to operate, only 498 had a "clean and clear" certification. The "clean and clear" certification had been required since November 1, 2015 (International Tin Association Ltd., 2015, 2016d; Metal-Pages, 2016a).

Outlook

World tin reserves appeared to be adequate to meet short-term demand. Secondary sources of tin are likely to become an increasingly important component of supply, especially in the United States. Domestic tin requirements are expected to continue to be met primarily through imports.

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GENERAL SOURCES OF INFORMATION

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TABLE 3
U.S. CONSUMPTION OF TIN, BY FINISHED PRODUCT¹

(Metric tons, contained tin)

Product	2015			2016		
	Primary	Secondary	Total	Primary	Secondary	Total
Alloys, miscellaneous ²	2,550 ^r	W	2,550 ^r	2,640	W	2,640
Babbitt	275 ^r	37	312 ^r	253	36	289
Bar tin	W	W	W	W	W	W
Bronze and brass	691 ^r	1,060	1,750 ^r	676	1,040	1,710
Chemicals	5,410 ^r	W	5,410 ^r	5,320	W	5,320
Solder	2,660 ^r	1,740	4,400 ^r	2,560	1,670	4,220
Tinning	463 ^r	--	463 ^r	405	--	405
Tinplate ³	5,880 ^r	W	5,880 ^r	4,660	W	4,660
Other ⁴	5,990 ^r	104	6,090 ^r	6,020	175	6,190
Total	23,900 ^r	2,940	26,800 ^r	22,500	2,920	25,400

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

¹Table includes data available through March 27, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes terne metal.

³Includes secondary pig tin and tin acquired in chemicals.

⁴Includes britannia metal, collapsible tubes and foil, jewelers' metal, pewter, tin powder, type metal, and white metal.

TABLE 4
U.S. INDUSTRY YEAREND TIN STOCKS¹

(Metric tons)

Stocks	2015	2016
Plant raw materials:		
Pig tin:		
Primary ²	4,830	4,710
Secondary	105	111
In process ³	465	469
Total	5,400	5,290
Additional pig tin:		
Jobbers-importers	1,470	864
Afloat to United States	211	211
Total	1,680	1,080
Grand total	7,090	6,370

¹Table includes data available through March 27, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes tin in transit in the United States.

³Data only include tin content of scrap.

TABLE 5
U.S. STOCKS, RECEIPTS, AND CONSUMPTION OF NEW AND OLD SCRAP AND TIN RECOVERED, BY TYPE OF SCRAP¹

(Metric tons)

Type of scrap	Gross weight of scrap								
	Stocks, January 1	Receipts	Consumption			Stocks, December 31	Tin recovered ^c		
			New	Old	Total		New	Old	Total
2015:									
Copper-base scrap: ^c									
Ingot makers	3,630	47,200	6,060	41,300	47,400	3,470	196	1,830	2,030
Brass mills ²	W	W	W	W	W	W	253	W	253
Foundries and other plants	1,540	15,400	13,800	1,820	15,600	1,380	W	72	72
Total	XX	XX	XX	XX	XX	XX	449	1,900	2,350
Lead-base scrap	27,700 ^r	874,000	25,500	845,000	870,000	31,800	671	8,150	8,820
Tin-base scrap ³	W	W	W	W	W	W	W	W	W
Grand total ^c	XX	XX	XX	XX	XX	XX	1,120	10,100	11,200
2016:									
Copper-base scrap: ^c									
Ingot makers	3,470	43,200	5,900	37,100	43,000	3,460	189	1,660	1,850
Brass mills ²	W	W	W	W	W	W	248	W	248
Foundries and other plants	1,380	15,300	13,700	2,290	16,000	686	W	77	77
Total	XX	XX	XX	XX	XX	XX	437	1,740	2,170
Lead-base scrap	31,800	926,000	23,400	900,000	923,000	27,800	613	8,540	9,150
Tin-base scrap ³	W	W	W	W	W	W	W	W	W
Grand total ^c	XX	XX	XX	XX	XX	XX	1,050	10,300	11,300

^cEstimated. ^rRevised. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

¹Table includes data available through March 27, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

²Consumption is assumed to be equal to receipts.

³Includes tinsplate and other scrap recovered at detinning plants.

TABLE 6
U.S. EXPORTS OF TIN IN VARIOUS FORMS¹

Form	2015		2016	
	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)
Unwrought:				
Refined tin	807	\$14,900	1,150	\$21,600
Tin alloys	2,540	19,400	1,040	17,400
Wrought:				
Tin bars, rods, profiles, and wire	5,180	40,700	4,620	39,700
Tin foil	33	563	41	622
Tin plates, sheet, and strip	300	2,280	725	2,950
Tin tubes, pipes, and tube and pipe fittings	114	1,630	141	2,120
Tin waste and scrap	2,530	7,360 ^r	4,570	11,200
Tin flakes and powders	110	2,470	124	2,290
Tinplate and terneplate	110,000 ^r	84,300 ^r	110,000	72,500

^rRevised.

¹Table includes data available through March 27, 2018. Data are rounded to no more than three significant digits.

Source: U.S. Census Bureau.

TABLE 7
U.S. IMPORTS FOR CONSUMPTION OF TIN IN VARIOUS FORMS¹

Form	2015		2016	
	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)
Unwrought:				
Refined tin	33,600	\$546,000	32,200	\$540,000
Tin alloys	2,720	43,400	1,910	30,000
Wrought:				
Tin bars, rods, profiles, and wire	1,220	63,800 ^r	1,200	63,800
Tin foil	96	3,400	86	2,150
Tin plates, sheet, and strip	90	502	94	500
Tin tubes, pipes, and tube and pipe fittings	12	149	1	32
Tin waste and scrap	32,700	12,300	27,200	5,460
Tin flakes and powders	238	5,400	219	5,160
Tin oxides	417	7,340	383	6,270
Tinplate and terneplate	700,000	729,000	805,000	726,000

^rRevised.

¹Table includes data available through March 27, 2018. Data are rounded to no more than three significant digits.

Source: U.S. Census Bureau.

TABLE 8
U.S. IMPORTS FOR CONSUMPTION OF REFINED TIN,
BY COUNTRY OR LOCALITY¹

Country or locality	2015		2016	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Belgium	917	\$17,200	309	\$4,740
Bolivia	6,260	97,000	6,170	107,000
Brazil	2,950	48,800	2,120	37,800
Canada	32	560	48	877
China	1,230	21,200	229	3,800
Hong Kong	125	2,530	--	--
Indonesia	5,210	72,000	8,580	128,000
Japan	5	105	4	55
Malaysia	9,990	169,000	7,560	130,000
Netherlands	35	387	33	450
Peru	6,600	112,000	6,590	118,000
Singapore	225	4,020	176	3,160
Thailand	20	331	392	7,260
United Kingdom	2	17	--	--
Other	(2)	2	1	26
Total	33,600	546,000	32,200	540,000

-- Zero.

¹Table includes data available through March 27, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

²Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 9
TIN: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY¹

(Metric tons, tin content)

Country or locality	2012	2013	2014	2015	2016
Australia	6,158	6,472	6,898 ^r	7,158 ^r	6,635
Bolivia	19,702	19,287 ^r	19,791 ^r	20,135 ^r	17,000
Brazil	13,667	16,830	25,534	18,824 ^r	25,000 ^e
Burma ^{e, 2}	2,100 ^r	20,000 ^r	35,000 ^r	50,000 ^r	54,000
Burundi ^e	50 ^r	13	21 ^r	30 ^r	67
China	91,000 ^r	101,200 ^r	102,100 ^r	110,156	92,000 ^e
Congo (Kinshasa) ^e	4,800	4,500	6,500	5,300 ^r	5,500
Indonesia	49,300 ^r	45,800 ^r	51,801	93,180 ^r	52,000 ^e
Laos	762	579	866	900	1,300
Malaysia	3,725	3,697	3,777	4,158 ^r	4,000
Nigeria ^{e, 3}	340	2,600	2,800	2,500	2,290
Peru	26,105	23,688	23,105	19,511	18,789
Portugal	42	84	75 ^e	42 ^r	45 ^e
Russia	249 ^r	156 ^r	321 ^{r, e}	578 ^r	1,100
Rwanda ^e	2,900	3,100	3,700 ^r	2,420 ^r	2,200
Thailand	199	132	156	72 ^r	100
Uganda	--	18	31	135 ^r	130 ^e
Vietnam	5,400 ^e	5,400 ^e	5,400 ^e	5,400 ^e	5,500
Total	226,000 ^r	254,000 ^r	288,000 ^r	341,000 ^r	288,000

^eEstimated. ^rRevised. -- Zero.

¹Table includes data available through August 23, 2017. All data are reported unless otherwise noted. Totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Includes content of tin-tungsten concentrate.

³Tin content is estimated as 62% of reported gross weight concentrate.

TABLE 10
TIN: WORLD SMELTER PRODUCTION, BY COUNTRY OR LOCALITY^{1,2}

(Metric tons, tin content)

Country or locality	2012	2013	2014	2015	2016
Australia, secondary ^c	400	400	400	400	400
Belgium, secondary	11,400 ^e	12,000 ^e	9,810 ^r	8,860 ^r	8,541
Bolivia, primary	14,626	14,862	15,439	15,700 ^r	16,800 ^e
Brazil:					
Primary	11,955	14,721 ^r	25,534 ^r	26,000	26,000 ^e
Secondary	250 ^e	250 ^e	250 ^e	250	--
Total	12,205	14,971 ^r	25,784	26,250	26,000
Burma, primary ^c	30	30	30	30	30
China, primary	148,000 ^e	159,000 ^{r,e}	187,000	166,900	166,000
Denmark, secondary ^c	50	50	50	50	50
Greece, secondary ^e	50	50	50	50	--
India:					
Primary	16	21	12	12 ^e	9
Secondary	3,600	3,600	3,800	3,800	3,800 ^e
Total	3,616	3,621	3,812	3,812	3,809
Indonesia, primary	51,400	48,800	58,233	48,000	45,000 ^e
Japan, primary	1,133	1,786	1,746	1,700	1,620
Malaysia, primary	37,823	32,633	35,018	30,260	26,849
Norway, secondary ^c	50	50	50	50	50
Peru, primary	24,811	24,181	24,462	20,396	19,390
Rwanda, primary	-- ^{r,e}	-- ^{r,e}	-- ^{r,e}	-- ^r	-- ^e
Spain, secondary ^c	10	10	10	10	10
Thailand, primary	19,996	19,088	16,929	16,500	11,088
United States, secondary	11,200	10,600	10,100 ^r	10,100 ^r	10,300 ^e
Vietnam, primary	4,000	4,000	4,000 ^e	4,000 ^e	4,000 ^e
Grand total	342,000 ^r	346,000 ^r	394,000 ^r	354,000 ^r	341,000
Of which:					
Primary	314,000	319,000 ^r	369,000	330,000 ^r	306,000
Secondary	27,200 ^r	27,000 ^r	25,000 ^r	24,000 ^r	24,000

^eEstimated. ^rRevised. -- Zero.

¹Table includes data available through August 23, 2017. All data are reported unless otherwise noted. Grand totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Whenever possible, total output has been separated into primary from ores and concentrates and secondary tin metal recovered from old scrap. Data reflect metal production at the first measurable stage of metal output.