



2013 Minerals Yearbook

ZINC [ADVANCE RELEASE]

ZINC

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In 2013, U.S. mine production of recoverable zinc was 758,000 metric tons (t), 6% more than that of 2012 (table 1). The value of domestic mine production was approximately \$1.60 billion. Alaska continued to be the dominant zinc-producing State, followed by, in descending order of quantity, Tennessee, Missouri, and Idaho. The United States exported most of its zinc mine production (669,000 t) to foreign smelters for processing. Leading destinations for domestic exports of zinc contained in concentrates were Canada (26%), the Republic of Korea (18%), Spain (14%), Belgium (11%), and Japan (10%) (table 6). Imports for consumption of zinc contained in concentrates were significantly less than exports and continued to trend downwardly, decreasing by 3,580 t (or 58%) to 2,550 t as the one remaining domestic primary zinc smelter increased its use of secondary materials and domestically sourced zinc concentrates in its feedstock (table 1). Estimated U.S. refined zinc production in 2013 decreased by 11% to 233,000 t owing mostly to a decline in secondary production (table 1). Imports of refined zinc in 2013 increased by 9% to 713,000 t (table 1) and were sourced primarily from Canada (67%), Mexico (14%), Peru (11%), and Australia (8%). Domestic exports of refined zinc decreased by 2,660 t (or 19%) to 11,500 t in 2013 (table 1). Apparent consumption of refined zinc was 935,000 t, a 5% increase from that of the prior year (table 1), reportedly owing to an increase in residential construction and vehicle production. Most reported refined zinc consumption was for galvanizing, and other major end uses were brass and bronze and zinc-base alloys (table 5). Global zinc mine production was essentially unchanged at 13.4 million metric tons (Mt); zinc metal production increased by 3% to 13.0 Mt (tables 9, 10). According to data from the International Lead and Zinc Study Group (ILZSG), zinc metal consumption increased by 5% in 2013 to 13.0 Mt, exceeding the Group's tabulated metal production of 12.9 Mt by about 100,000 t (International Lead and Zinc Study Group, 2014d, p. 44, 47).

Legislation and Government Programs

A U.S. Government stockpile of refined zinc has been maintained since 1967 for national defense purposes. In 1992, Public Law 102-484, which authorized the disposal of the entire inventory of zinc from the National Defense Stockpile (NDS), was signed. Sales of zinc from the NDS, however, have been suspended since August 2008 owing to concerns regarding domestic availability and access to various raw materials. At yearend 2013, the reported inventory of zinc remained at 7,250 t.

Production

Mine.—In 2013, zinc was produced in four States; Alaska was the leading zinc-producing State, followed by Tennessee, Missouri, and Idaho. Domestic mine production of recoverable zinc in 2013 was 758,000 t, a 6% increase from that of 2012 (table 1). Zinc mine production increased in all States with the most notable increases taking place in Alaska and Tennessee. Domestic mine production data were collected by the U.S. Geological Survey (USGS) from a voluntary survey of base-metal lode-mine production.

Alaska.—Teck Alaska Inc. (a subsidiary of Teck Resources Ltd., Vancouver, British Columbia, Canada) operated the open pit Red Dog zinc-lead mine in the Northwest Arctic Borough, the leading zinc-producing mine in the United States (table 3). Red Dog consists of several sedimentary-exhalative lead-zinc sulfide ore bodies. Zinc in concentrate production at Red Dog increased by 4% in 2013 from that of 2012 to 551,000 t owing to increased mill throughput, which took place as a result of processing softer ores from the recently developed Aqqaluk deposit. Approximately 30% of the zinc concentrates produced at Red Dog were refined at Teck's metallurgical complex at Trail, British Columbia, Canada. Remaining concentrates were sent to Asia and Europe. Most of Red Dog's concentrates were sold through long-term contracts with the balance sold in the spot market. Reported reserves at yearend 2013 contained 7.17 Mt of zinc. Teck projected that zinc in concentrate production at Red Dog would decline in 2014 to between 500,000 and 525,000 t (Teck Resources Ltd., 2014a, p. 33-35, 42; 2014b, p. 53).

Hecla Mining Co.'s (Coeur d'Alene, ID) underground Greens Creek Mine recovered metals from a polymetallic (gold-lead-silver-zinc) massive sulfide deposit on Admiralty Island in the Tongass National Forest near Juneau. The mine produced gold and silver dore, as well as bulk lead-zinc, lead, and zinc concentrates, which were sold globally to smelters. Although the mill achieved a record average throughput rate in 2013, zinc in concentrate production decreased by 10% from that of 2012 to 52,300 t owing to a lower average zinc ore grade. During the year, Hecla continued to progress through the regulatory permitting process in order to gain the permits needed to increase the tailings capacity at Greens Creek, which was only sufficient to meet the mine's needs until yearend 2016. The proposed expansion to the tailings impoundment would provide capacity for at least an additional 10 years of mining. Yearend reserves at Greens Creek contained 615,000 t of zinc (Hecla Mining Co., 2014a, p. 5, 14; 2014b, p. 14, 30).

Idaho.—Hecla operated the Lucky Friday Mine, an underground silver-lead-zinc mine in the Coeur d'Alene mining district in northern Idaho, which produced silver-lead concentrate and zinc concentrate. The Lucky Friday Mine reopened in February 2013 after production and exploration activities at the mine were temporarily suspended for the previous 14 months as Hecla removed loose backfill material in the primary shaft. The mine reached full production by September and produced 3,440 t of zinc in concentrate by yearend. All concentrates were sent to Teck's metallurgical facility in Trail, British Columbia, Canada, for processing. During 2013, Hecla resumed construction of the #4 Shaft, which would increase production and mine life at Lucky Friday. The project was expected to be completed in 2016. At yearend, Hecla reported that reserves at Lucky Friday contained 141,000 t of zinc (Hecla Mining Co., 2014a, p. 15; 2014b, p. 20, 32, 44).

Missouri.—Doe Run Resources Corp. (St. Louis, MO) operated a series of production shafts that ran along the Viburnum Trend within the Mississippi Valley-type (MVT) lead-zinc-copper ore body in southeast Missouri. Doe Run processed ore from the Brushy Creek, Buick, Fletcher, Sweetwater, and Viburnum (#29 and #35) Mines at four mills to produce primarily lead concentrates and, to a lesser extent, zinc and copper concentrates.

Tennessee.—Nyrstar NV (Balen, Belgium) owned and operated the East Tennessee and Middle Tennessee zinc mine complexes that recovered ore from MVT zinc deposits. The two mine complexes produced zinc concentrates, of which the Middle Tennessee concentrates contained a recoverable amount of gallium and germanium. Zinc in concentrate production at the two complexes increased by 11% from that of 2012 to 121,000 t. Production at the East Tennessee mine complex (the Coy Mine, Immel Mine, and Young Mine and mill) increased by 16% to 71,000 t of zinc in concentrate owing mostly to a higher average ore grade. Production at the Middle Tennessee mine complex (the Cumberland Mine, Elmwood Mine, and Gordonsville Mine and mill) increased by 4% to 50,000 t owing to increased mill throughput, which more than offset a decline in average ore grade. Concentrates were sent to Nyrstar's Clarksville, TN, zinc refinery for processing. In 2013, Nyrstar commissioned regrinding equipment at the Middle Tennessee mine complex to reduce the grain size of the concentrates, which would facilitate byproduct gallium and germanium recovery at Clarksville. Total (proven and probable) zinc reserves at yearend were 179,000 t at East Tennessee and 145,000 t at Middle Tennessee (Nyrstar NV, 2014a, p. 22, 53–54; 2014c).

Smelter.—In 2013, refined zinc was mainly produced in two States—Pennsylvania (Horsehead Holding Corp.'s Monaca facility) and Tennessee (Nyrstar's Clarksville facility). Zinc metal was also produced to a lesser extent by U.S. Zinc's (owned by Votantim Metais, Sao Paulo, Brazil) recycling operations in Coldwater, MI, and Houston, TX. Refined zinc production in 2013 decreased by 11% from that of 2012 to 233,000 t owing primarily to a decline in secondary production (table 1).

Primary.—Nyrstar's Clarksville electrolytic zinc refinery [122,000-metric-ton per-year (t/yr) capacity] was the only primary zinc smelter in the United States. Clarksville's feed

mix was mostly zinc concentrate from its Tennessee mines, and the balance was imported zinc concentrates and domestically sourced secondary crude zinc oxide. Refined zinc production at Clarksville in 2013 decreased by 7% from that of 2012 to 106,000 t owing to a shutdown of the roaster and acid plant for planned maintenance during the first half of the year. Clarksville produced Special High Grade (SHG) and Continuous Galvanizing Grade (CGG) zinc. Byproducts included cadmium metal, copper cementate, copper sulfate, germanium leach product, synthetic gypsum, and sulfuric acid (Nyrstar NV, 2014a, p. 56; 2014b).

Secondary.—Horsehead produced zinc metal—primarily Prime Western (PW) Grade—and zinc oxide at its electrothermic zinc smelter (about 136,000 t/yr capacity) at Monaca. The zinc metal was sold in both jumbo ingot and slab form. The PW grade zinc was sold to general hot-dip galvanizers and brass manufacturers or consumed internally for the production of zinc oxide. Zinc production at Monaca in 2013 decreased by 14% from production in 2012 (Horsehead Holding Corp., 2014, p. 8, 10).

Feedstock for the metal production consisted entirely of secondary materials; 87% of the feedstock was from Horsehead's electric arc furnace (EAF) dust recycling operations, and the balance generally consisted of purchased galvanizing residues, such as dross and skimmings. EAF dust is a waste product recovered from the air flow exiting electric arc furnaces during the steel recycling process and typically contains 10% to 20% zinc. Horsehead's five EAF dust recycling operations were in Barnwell, SC; Beaumont, TX; Calumet, IL; Palmerton, PA; and Rockwood, TN; and its hydrometallurgical metals recovery facility was in Bartlesville, OK. In 2013, Horsehead recycled 571,000 t of EAF dust (Horsehead Holding Corp., 2014, p. 11–12).

By yearend 2013, Horsehead's new solvent extraction–electrowinning (SX–EW) zinc production facility in Mooresboro, NC, was in the final phases of construction and was expected to begin zinc production in the first quarter of 2014. The technology would generate SHG and CGG zinc in addition to PW grade zinc, and allow Horsehead to sell to new customers, including continuous galvanizers and diecasters. The metal would also be certified as deliverable against London Metal Exchange (LME) contracts. The plant was expected to produce about 140,000 t/yr of zinc and have a capacity of approximately 160,000 t/yr of zinc. According to Horsehead, the new SX–EW technology would reduce the company's manufacturing costs compared with the electrothermic technology employed at the Monaca facility owing to higher labor productivity, higher zinc recovery rates, lower energy usage, and lower maintenance costs (Horsehead Holding Corp., 2014, p. 2, 3, 9).

On December 23, Horsehead shut down the zinc oxide operations and high-purity metal refinery at Monaca; by yearend, five of the seven electrothermic smelting furnaces at the plant were left operating to process remaining feedstock into PW grade metal. Horsehead expected to close the smelting operations at Monaca a few weeks after the Mooresboro plant began production in 2014 (Horsehead Holding Corp., 2014, p. 8).

Consumption

Changes in zinc consumption generally follow trends in industrial production or, more generally, economic growth. Domestic apparent consumption of zinc in 2013 was 935,000 t, a 5% increase from apparent consumption in 2012 (table 1), owing to a recovery in residential construction and an increase in vehicle production.

According to reported data, most of the zinc consumed domestically in 2013 was for the production of galvanized (zinc-coated) steel (table 5). Reported zinc consumption data were collected by the USGS from a voluntary survey on consumption of zinc by grade and end use. Galvanized steel is used extensively in the automotive and construction industries. Most of the zinc consumed domestically for galvanizing was at continuous galvanizing plants, where steel sheet passes through a molten zinc bath at high speeds. There were an estimated 46 continuous galvanizing plants operated by 21 companies in the United States. The balance of zinc consumed for galvanizing was at general galvanizing plants, where fabricated steel shapes (for example, structural beams or fasteners) were immersed in a molten zinc bath individually or by batch. There were about 180 general galvanizing plants operated by 80 companies in the United States in 2013. The American Iron and Steel Institute (AISI, 2014, p. 25) reported that, in 2013, domestic shipments of galvanized steel sheet decreased for the first time in 5 years by 4% from those of the previous year to 14.7 Mt and accounted for 17% of all steel mill products shipped. The decrease in galvanized steel sheet shipments was thought to have been offset by an increase in production and shipments of galvanized steel shapes produced at general galvanizing plants.

Other major end uses of zinc included brass and bronze, chemicals, semimanufactures, and zinc-base alloys. According to the Copper Development Association Inc. (2014), about 202,000 t of zinc was consumed for the production of brass (copper-zinc alloy) and bronze (copper-tin alloy with a small amount of zinc) in 2013, a 3% increase from the amount consumed in 2012. Leading zinc chemicals, by production volume, included zinc oxide, which is used extensively in the tire manufacturing industry as an activator in the vulcanization chemical process, and zinc sulfate, which is used as a micronutrient additive in animal feed and fertilizers. Zinc semimanufactures included mainly zinc sheet, also known as rolled zinc, which is used in architectural applications and for the production of the U.S. one-cent coin. Zinc-base alloys were produced at an estimated nine facilities operated by six companies and were predominantly used to make die-cast parts and components.

Stocks

Commodity exchange inventories [LME and the Shanghai Futures Exchange (SHFE)] totaled 1.17 Mt of zinc at yearend. Stocks of SHG zinc in global LME warehouses totaled 931,000 t at the end of 2013, a 24% decrease (290,000 t) from the yearend 2012 stock level. Some analysts thought that many of the LME zinc stocks were held under arrangements that allowed financial institutions and traders to profit from the ongoing gap between current and futures prices, the contango, and the lower cost of

carry (the actual cost of insuring, financing, and storing zinc). At yearend 2013, warehouses in New Orleans, LA, held 68% (636,000 t) of global LME zinc stocks. LME warehouses in New Orleans were primarily owned by Pacorini Metals AG (a subsidiary of Glencore International AG) and Metro International Trade Services (a subsidiary of Goldman Sachs Group, Inc.). About 12% (109,000 t) of LME zinc stocks were held in warehouses in Detroit, MI. At yearend 2013, the SHFE held 239,000 t of zinc, a 23% decrease (72,000 t) from that of 2012 (International Lead and Zinc Study Group, 2014d, p. 55).

Aside from the United States, China was the only other country to hold Government stockpiles of zinc. China's State Reserve Bureau manages its stockpiles, which at yearend 2013, contained 254,000 t of zinc, an increase of 45,000 t from the stock level at yearend 2012 (International Lead and Zinc Study Group, 2014d, p. 55).

Prices

The annual average LME cash price for SHG zinc in 2013 decreased slightly from that of 2012 to \$1,910.04 per metric ton (86.6 cents per pound). The annual average Platts North American price for SHG zinc in 2013, which was based on the LME cash price plus a regional North American premium, was 95.6 cents per pound, essentially unchanged from that of 2012 (table 1). Monthly average North American SHG premiums generally increased during the year, averaging 8 cents per pound in January and reaching almost 9.5 cents per pound in December. Increasing premiums are generally indicative of a tightening supply of zinc in a regional market.

World Review

Mine production.—Global zinc mine production in 2013 experienced its slowest rate of increase in the past 5 years, increasing nominally from that of 2012 to 13.4 Mt, as increased production in several countries was mostly offset by decreases in other countries (table 9). China (37% share of global production), Australia (11%), and Peru (10%) continued to be the three leading producers of zinc in concentrate in 2013. China had the most significant year-on-year increase in mine production (by 140,000 t) in 2013; however, this was a substantially smaller year-on-year increase than the 810,000-t increase in 2012. Outside of China, zinc mine production increased notably in Burkina Faso (by 32,200 t), India (by 63,000 t), Peru (by 70,000 t), Portugal (by 23,400 t), and the United States (by 45,900 t). Zinc mine production commenced in Burkina Faso in 2013 with the start up of the Perkoa zinc-lead-silver mine (a joint venture between Blackthorn Resources Ltd., Glencore plc, and the Government of Burkina Faso) in May, and by yearend, the mine had produced 32,200 t of zinc in concentrate. At full production, Perkoa could produce zinc at a rate of 90,000 t/yr (Blackthorn Resources Ltd., 2013, p. 14; 2014, p. 9). Peru's rise in production was attributed mostly to production increases at Compañía Minera Milpo S.A.A.'s Cerro Lindo Mine and at the jointly owned Antamina Mine (BHP Billiton Ltd., 33.75%; Glencore, 33.75%; Teck Resources Ltd., 22.5%; and Mitsubishi Corp., 10%). At Cerro Lindo, production increased by 44% (47,200 t) to 155,000 t in 2013 owing to the

completion of a mill expansion project in December 2012 that increased mill throughput capacity by 50%. At Antamina, zinc production increased by 19% (41,400 t) to 260,000 t owing to the mining of higher grade ore during the year (MinerAndina, 2012; Compañía Minera Milpo S.A.A., 2014; Teck Resources Ltd., 2014c, p. 13–14). In Portugal, zinc production at Lundin Mining Corp.'s Neves-Corvo copper-zinc mine increased by 23,400 t from that of the prior year to 53,400 t as a result of a mill expansion and the mining of a higher grade deposit at the mine site. Zinc production at Neves-Corvo was expected to increase further in 2014 to around 60,000 to 65,000 t (Lundin Mining Corp., 2014). After declining in 2012, India's production increased by 9% in 2013 owing to increased output at Hindustan Zinc Ltd.'s Rampura Agucha Mine (International Lead and Zinc Study Group, 2013).

In 2013, around 430,000 t/yr of global zinc mine capacity closed or was suspended. Most of this capacity was concentrated in Canada with the closure of the Brunswick and Perseverance Mines in June owing to resource depletion, resulting in a 215,000-t decrease in Canada's zinc mine production from that in 2012 (Glencore plc, 2014, p. 8). Other closures included the suspension of operations at Nyrstar's Coricancha polymetallic mine in Peru owing to low precious metals prices (Nyrstar NV, 2014a, p. 53), the closure of the Angas zinc mine in Australia due to resource depletion, the indefinite suspension of operations at the Talvivaara nickel-zinc mine in Finland owing to corporate financing issues (Talvivaara Mining Company plc, 2014, p. 4), and the suspension of operations at Alexco Resource Corp.'s Bellekeno silver mine in Canada as a result of low silver prices and high fixed costs (Alexco Resource Corp., 2013).

Partially offsetting these closures was the addition of about 350,000 t/yr of zinc mine capacity. Aside from the opening of Perkoa in Burkina Faso and the expansion of Cerro Lindo in Peru, significant capacity additions took place in Canada and Mexico. In Canada, Glencore's Bracemac-McLeod copper-zinc mine in Quebec commenced production in May and had the capacity to produce 90,000 t/yr of zinc. Ore production from the mine was sent to Glencore's Matagami mill for processing. At capacity, production would offset about one-half of the zinc production lost from the closure of the Perseverance Mine, which was also part of the Matagami mine and mill complex. Glencore was assessing options for potential new deposits in the region as well (Glencore plc, 2014, p. 8). In Mexico, Industrias Peñoles S.A.B. de C.V. restarted the Velardena Mine in the second quarter. The mine was expected to average about 75,000 t/yr of zinc in concentrate over a projected mine life of 15 years (Industrias Peñoles S.A.B. de C.V., 2014, p. 23). Small-scale zinc mine capacity additions included the commissioning of the Del Toro and Escobal Mines in Mexico and Guatemala, respectively, and the restart of the Santander Mine in Peru.

Metal production.—Global zinc metal production increased slightly in 2013 from that of the prior year to 13.0 Mt (table 10). China (41% share of global production), the Republic of Korea (7%), India (6%), and Canada (5%) were the leading producers of refined zinc metal in 2013. Production increased most notably in China (by 410,000 t), India (by 49,000 t), and Peru (by 27,000 t). According to the China Nonferrous Metals Industry Association, China's production of refined zinc increased most

significantly in Guangdong Province, by 145,000 t (Lead, Zinc & Tin Monthly, 2014, p. 6), owing possibly to increased production at Shenzhen Zhongjin Lingnan Nonfermet Co. Ltd.'s Shaoguan and Danxia zinc smelters. In India, production recovered in 2013 after decreasing in 2012 owing to increased raw material availability and operational efficiency at Hindustan Zinc Ltd.'s smelters (Hindustan Zinc Ltd., 2013). In Peru, production increased as a result of increased production at Doe Run Peru S.R.L.'s La Oroya metallurgical complex, which reopened its zinc smelting operations in July 2012 after being closed for 3 years, and at Votorantim Metais' Cajamarquilla zinc refinery (Ministerio de Energía y Minas del Perú, 2014).

Partially offsetting these increases were production decreases in Russia (by 30,000 t), the United States (by 28,000 t), Namibia (by 20,400 t), and Thailand (by 19,000 t). Production decreased in Russia owing to the temporary closure of Ural Mining and Metallurgical Co.'s Electro zinc smelter from June until September while the facility underwent planned maintenance to improve environmental compliance and operational stability (OAO Electro zinc, 2013). In Namibia, metal production decreased at Vedanta plc's Namzinc refinery as a result of a decline in the grade of the treated zinc ore extracted from the nearby Skorpion Mine and a temporary closure of the facility's electrowinning circuit for repairs (Chamber of Mines of Namibia, 2014, p. 56). In Thailand, production declined at Padaeng Industry Public Co. Ltd.'s Tak zinc smelter owing to initiatives taken to increase the profitability of the smelter, which included reducing the production rate during times of high electricity costs and maximizing the use of secondary raw materials (Padaeng Industry Public Co. Ltd., 2014, p. 40–41).

Net zinc smelter capacity increased by 140,000 t/yr in 2013. Capacity increases included a 40,000-t/yr capacity expansion at Glencore's Portovesme smelter in Italy and the commissioning of Chihong Zinc and Germanium Co. Ltd.'s 100,000-t/yr zinc smelter in Huize, Yunnan Province, China, in September. Chihong's other zinc smelting project (140,000-t/yr zinc production capacity) in Hulunbeier, Nei Mongol Autonomous Region, was expected to begin production in 2013 as well, but commissioning was delayed until the second quarter of 2014. There were no smelter closures during the year (International Lead and Zinc Study Group, 2014c, p. 40; Lead, Zinc & Tin Monthly, 2013).

Metal consumption.—After decreasing slightly in 2012, global zinc metal consumption increased by 5% in 2013 to 13.0 Mt, owing chiefly to an 8% (405,000-t) increase in apparent consumption in China, according to the International Lead and Zinc Study Group (2014d). China's increase was attributed to a significant rise in galvanized steel production; the country's galvanizing industry has been expanding rapidly in the past few years, supported by infrastructure development and increased home appliance and vehicle production (Lead, Zinc & Tin Monthly, 2014). Outside of China, India and Turkey also experienced notable increases in consumption, rising by 12% (by 69,000 t) and 19% (by 38,000 t), respectively, from that of the prior year. Leading zinc-consuming countries included China, 44%; the United States, 7%; India, 5%; and the Republic of Korea, 4%. The European Union member countries accounted for 15% of consumption, which remained essentially

flat in 2013. ILZSG's data indicated that the zinc metal market fell into deficit in 2013 with consumption exceeding production by 97,000 t in 2013, compared with a 244,000-t surplus in 2012 (International Lead and Zinc Study Group, 2014d, p. 44–47).

Outlook

ILZSG forecast global zinc consumption in 2014 to increase by 5% from that in 2013 to 13.7 Mt, again supported by a significant increase in Chinese consumption with other notable increases forecast in India, Mexico, the Republic of Korea, Turkey, and the United States. Consumption was projected to increase slightly in Europe and remain flat in Japan (International Lead and Zinc Study Group, 2014b).

On the supply side, ILZSG forecast global mine production to increase slightly to 13.3 Mt in 2014 owing primarily to a significant production increase in China. Outside of China, mine production is expected to decrease slightly owing mostly to a decline in production in India at the Rampura Agucha Mine and in Peru at the Antamina Mine. Hindustan Zinc was in the process of transitioning Rampura Agucha from an open pit mine into an underground operation and planned to excavate more waste than ore during part of 2014. Zinc production at Antamina was projected to decline by about 60,000 to 80,000 t as mining was to take place in an area of lower ore grades; ore grades can vary significantly from year to year owing to the deposit geology (Teck Resources Ltd., 2014c, p. 13–14). Metal production was forecast to increase by 3% to 13.3 Mt in 2014 owing also to increased production in China. Outside of China, production would remain essentially unchanged as increases in Belgium, France, Italy, Norway, the Republic of Korea, and Russia would be balanced by reductions in Brazil, India, and the United States. Overall, zinc metal consumption is expected to exceed production by 403,000 t in 2014 (International Lead and Zinc Study Group, 2014a).

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TABLE 1
SALIENT ZINC STATISTICS¹

		2009	2010	2011	2012	2013
United States:						
Production:						
Domestic ores, contained zinc	metric tons	736,000	748,000	769,000	738,000	784,000
Domestic ores, recoverable zinc	do.	710,000	723,000	743,000	713,000	758,000
Value, recoverable zinc	thousands	\$1,220,000	\$1,620,000	\$1,740,000	\$1,510,000	\$1,600,000
Refined zinc:						
At primary smelters	metric tons	94,000	120,000	110,000	114,000	106,000
At secondary smelters ^e	do.	109,000	129,000	138,000	147,000	127,000
Total	do.	203,000	249,000	248,000	261,000	233,000
Exports:						
Ores and concentrates, zinc content	do.	785,000	752,000	653,000 ^r	591,000 ^r	669,000
Refined zinc	do.	2,960	4,200	18,400 ^r	14,200 ^r	11,500
Imports for consumption:						
Ores and concentrates, zinc content	do.	74,200	32,200	26,600 ^r	6,140	2,550
Refined zinc	do.	686,000	671,000	716,000	655,000	713,000
Reported stocks of refined zinc, December 31:						
Producer and consumer	do.	84,800	108,000	145,000	156,000 ^r	75,400
Government stockpile	do.	7,490	7,490	7,250 ²	7,250	7,250
Consumption, refined zinc:						
Reported	do.	NA	NA	NA	NA	428,000
Apparent ³	do.	893,000	907,000	939,000	891,000	935,000
Price ⁴						
North American	cents per pound	77.91	101.98	106.24	95.76	95.57
London Metal Exchange, cash	do.	75.06	97.99	99.47	88.35	86.64
World production:						
Mine	thousands metric tons	11,600	12,300 ^r	12,500 ^r	13,300 ^r	13,400
Smelter	do.	11,400	12,800	13,100 ^r	12,600 ^r	13,000

^eEstimated. ^rRevised. do. Ditto. NA Not Available.

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

²Government stocks decreased from prior year owing to an inventory adjustment.

³Domestic production plus net imports, plus adjustments for Government and industry stock changes. Apparent consumption from 2009 through 2013 does not reflect reported stock changes. Stock increases from 2009 through 2012 result from an increased response from industry.

⁴Special High Grade. Source: Platts Metals Week.

TABLE 2
MINE PRODUCTION OF RECOVERABLE ZINC
IN THE UNITED STATES, BY STATE¹

(Metric tons)

State	2012	2013
Alaska ²	583,000	609,000
Other ³	130,000	149,000
Total	713,000	758,000

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

²Data based, in part, on publicly available information.

³Includes production from Idaho (2012), Missouri, and Tennessee.

TABLE 3
LEADING ZINC-PRODUCING MINES IN THE UNITED STATES IN 2013, IN ORDER OF OUTPUT¹

Rank	Mine	County and State ²	Operator	Source of zinc
1	Red Dog	Northern Region, AK	Teck Alaska Inc.	Zinc-lead ore.
2	East Tennessee Zinc Complex ³	Jefferson and Knox, TN	Nyrstar NV	Zinc ore.
3	Greens Creek	Southeastern Region, AK	Hecla Mining Co.	Zinc-silver ore.
4	Middle Tennessee Zinc Complex ⁴	Smith, TN	Nyrstar NV	Zinc ore.
5	Brushy Creek	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
6	Buick	Iron, MO	do.	Do.
7	Viburnum (#29 and #35)	Washington and Iron, MO	do.	Do.
8	Fletcher	Reynolds, MO	do.	Do.
9	Lucky Friday	Shoshone, ID	Hecla Mining Co.	Silver ore.
10	Sweetwater	Reynolds, MO	Doe Run Resources Corp.	Lead ore.

Do., do. Ditto.

¹The mines listed accounted for 100% of recoverable U.S. zinc mine production in 2013.

²For Alaska, mines are located by geographic region, as delineated by the Alaska Division of Geological & Geophysical Surveys in its Special Report 67, Alaska's mineral industry 2012—Exploration activity.

³Includes the Coy, Immel, and Young Mines.

⁴Includes the Cumberland, Elmwood, and Gordonsville Mines.

TABLE 4
ZINC RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES, BY TYPE OF SCRAP¹

(Metric tons)

	2012	2013
Type of scrap:		
New scrap:		
Zinc-base	85,400	35,300
Copper-base	120,000	118,000
Magnesium-base	183	196
Total	205,000	153,000
Old scrap:		
Zinc-base	120,000	105,000
Copper-base	8,680 ^r	7,450
Aluminum-base	908	516
Magnesium-base	14	7
Total	129,000	113,000
Grand total	335,000	267,000

^rRevised.

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

TABLE 5
U.S. REPORTED CONSUMPTION OF ZINC IN 2013, BY INDUSTRY USE AND GRADE¹

(Metric tons)

Industry use	Special	High	Continuous	Controlled	Prime	Remelt	Total
	High Grade	Grade	Galvanizing Grade	Lead Grade	Western Grade	and other grades	
Galvanizing	51,500	84,600	208,000	16	25,600	22	369,000
Zinc-base alloys	24,100	82	--	--	--	--	24,200
Brass and bronze	24,300	449	--	--	98	--	24,900
Other	5,090	--	--	--	4,580	--	9,660
Total	105,000	85,200	208,000	16	30,300	22	428,000

-- Zero.

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

TABLE 6
U.S. EXPORTS OF ZINC ORES AND CONCENTRATES, BY COUNTRY¹

	2012		2013	
	Quantity (metric tons, zinc content)	Value (thousands)	Quantity (metric tons, zinc content)	Value (thousands)
Australia	76,600	\$101,000	48,800	\$58,800
Belgium	58,700	68,400	75,800	89,500
Canada	113,000	192,000	181,000	257,000
China	17,100	17,400	72	199
Costa Rica	3	6	29	98
El Salvador	37	110	31	90
Finland	34,900	42,700	34,400	41,000
Germany	28,500	34,900	32,900	39,200
India	53	91	51	102
Israel	38	75	--	--
Japan	29,000 ^r	52,300 ^r	72,000	114,000
Korea, Republic of	134,000 ^r	183,000 ^r	123,000	148,000
Mexico	47	163	--	--
Panama	6	20	6	20
Spain	99,200	119,000	101,000	120,000
Total	591,000	811,000	669,000	868,000

^rRevised. -- Zero.

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

Source: U.S. Census Bureau.

TABLE 7
U.S. EXPORTS OF ZINC COMPOUNDS¹

	2012		2013	
	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)
Chromates of zinc or of lead	3	\$227	7	\$366
Lithopone	377	2,190	588	3,810
Zinc chloride	905 ^r	1,590	776	1,070
Zinc oxide	41,800	50,200	17,500	32,000
Zinc sulfate	774	1,160	525	660
Zinc sulfide	8,240 ^r	12,400 ^r	6,130	16,800

^rRevised.

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

Source: U.S. Census Bureau.

TABLE 8
U.S. IMPORTS FOR CONSUMPTION OF ZINC COMPOUNDS¹

	2012		2013	
	Quantity (metric tons, gross weight)	Value (thousands)	Quantity (metric tons, gross weight)	Value (thousands)
Chromates of zinc or of lead	69	\$351	83	\$389
Lithopone	845	2,400	1,030	2,740
Zinc chloride	189 ^r	1,470 ^r	278	1,900
Zinc oxide	82,800 ^r	158,000	97,400	192,000
Zinc sulfate	56,300	51,100	52,600	44,100
Zinc sulfide	2,540	7,710	2,200	8,640

^rRevised.

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

Source: U.S. Census Bureau.

TABLE 9
ZINC: WORLD MINE PRODUCTION, BY COUNTRY¹

(Metric tons, zinc content of concentrate and direct shipping ore, unless otherwise specified)

Country ²	2009	2010	2011	2012	2013
Argentina	31,869	32,566	33,975	39,602 ^r	40,000 ^e
Armenia	3,800 ^r	7,808 ^r	8,475 ^r	10,700 ^r	11,500 ^e
Australia	1,290,000	1,479,000	1,515,000	1,541,000 ^r	1,523,000
Bolivia	430,879	411,409	427,129	389,911 ^r	407,332
Bosnia and Herzegovina ^e	3,400	5,500	6,900	7,000	7,000
Brazil	172,688	211,203	197,840	164,258 ^r	152,414
Bulgaria	9,339	9,904	10,977	12,116	12,100 ^e
Burkina Faso	--	--	--	--	32,215
Burma	6,000	8,600 ^r	9,300 ^r	10,000 ^{r,e}	10,000 ^e
Canada	699,145	649,065	622,600	641,260	426,089
Chile	27,801	27,662	36,602	26,762	29,759
China ^e	3,330,000	3,700,000	4,050,000	4,860,000 ^r	5,000,000
Congo (Kinshasa)	19,636	9,223	14,758	10,572	12,114
Finland	30,233	55,562	64,115	51,504 ^r	38,930
Greece	18,126	19,976	19,564 ^r	20,912 ^r	21,000 ^e
Guatemala	--	--	--	--	1,221
Honduras	36,370	33,839	26,000	26,000	25,000
India	695,000	719,000 ^r	747,000 ^r	730,000 ^{r,e}	793,000 ^e
Iran ^e	72,048 ³	130,000 ^r	140,000 ^r	140,000 ^r	130,000
Ireland	385,670	342,434	344,000	337,500	326,700
Kazakhstan	398,400 ^r	405,300 ^r	376,700 ^r	369,700 ^r	361,500
Korea, North ^e	29,000 ^r	38,000 ^r	34,000 ^r	35,000 ^r	36,000
Korea, Republic of	2,221	355	743	1,434 ^r	1,750
Kosovo	5,600 ^r	6,400 ^r	6,600 ^r	6,600 ^{r,e}	7,100 ^e
Laos	3,000 ^r	2,500 ^r	2,660 ^r	2,625 ^r	2,750
Macedonia	29,000	29,000	28,000	29,000 ^{r,e}	29,000 ^e
Mexico	489,766	570,004	631,859	660,349	642,542
Mongolia	70,750 ^r	56,300	52,350 ^r	59,550 ^r	52,050
Morocco	44,200 ^r	43,700 ^r	45,050 ^r	45,800 ^r	46,000 ^e
Namibia	197,400	204,229	192,173	194,380	184,109
Nigeria ^e	5,000 ^r	10,000 ^r	5,000 ^r	15,000	10,000
Pakistan	1,000	10,000	15,000	12,000 ^{r,e}	10,024
Peru	1,512,931	1,470,450	1,256,383	1,281,230 ^r	1,351,273
Philippines	10,035	9,268	18,170	19,559	16,730
Poland	115,500	92,000	87,200 ^r	76,700 ^{r,e}	77,000 ^e
Portugal	501	6,421	4,227	30,008 ^r	53,382
Russia	241,700 ^r	186,900 ^r	176,300 ^r	180,000 ^{r,e}	191,000 ^e
Saudi Arabia ^e	4,952 ³	4,897 ³	5,000	15,000	20,000
South Africa	28,159	36,142	36,629	37,034 ^r	30,145
Spain	-- ^r	17,358 ^r	33,199 ^r	28,634 ^r	29,000 ^e
Sweden	192,538	198,686	194,429	188,209 ^r	176,366
Tajikistan	--	--	10,000 ^r	20,000 ^{r,e}	20,000 ^e
Thailand	34,000	25,529	18,252	31,000 ^e	30,000 ^e
Turkey	136,300 ^r	196,400 ^r	158,300 ^r	196,000 ^{r,e}	200,000 ^e
United States ⁴	736,000	748,000	769,000	738,000	784,000
Uzbekistan ^e	-- ³	-- ³	15,000	25,000	35,000
Vietnam ^e	40,000 ^r	40,000 ^r	30,000 ^r	30,000 ^r	20,000
World total	11,600,000	12,300,000 ^r	12,500,000 ^r	13,300,000 ^r	13,400,000

^eEstimated. ^rRevised. -- Zero.

¹World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown. Includes data available through July 13, 2015.

²Serbia may have produced zinc, but available information is inadequate to make reliable estimates of output.

³Reported figure.

⁴Reported zinc content in both lead and zinc concentrates.

TABLE 10
ZINC: WORLD SMELTER PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country ³	2009	2010	2011	2012	2013 ^e
Algeria, primary ^e	30,000	30,000	30,000	30,000	30,000
Argentina:					
Primary	32,989	39,540	42,067 ^r	37,797 ^r	36,712 ⁵
Secondary	2,639	3,163	3,230	2,844 ^r	2,640
Total	35,628	42,703	45,297 ^r	40,641 ^r	39,400
Australia:					
Primary ⁴	525,000	499,000	507,000	498,000	498,000
Secondary ^e	6,000	6,000	6,000	6,000	6,200
Total ^e	531,000	505,000	513,000	504,000	504,000
Belgium, primary	14,000	260,000	282,000	250,000 ^e	252,000
Brazil, primary	242,136	288,107	284,770	246,526 ^r	242,000 ^{p,5}
Bulgaria, primary and secondary	92,676	91,372 ^r	90,083 ^r	73,558 ^r	75,830 ⁵
Canada, primary	685,504	691,221	662,151	648,614	651,634 ^{p,5}
China: ^e					
Primary	4,200,000 ^r	5,030,000 ^r	5,040,000 ^r	4,770,000 ^r	5,160,000
Secondary	90,000 ^r	175,000 ^r	173,000 ^r	120,000 ^r	140,000
Total	4,290,000 ^r	5,210,000 ^r	5,210,000	4,890,000 ^r	5,300,000
Finland, primary	295,049	307,144	307,352	314,742	311,686 ⁵
France, primary	161,000	163,000	164,000	161,000	152,000
Germany, primary and secondary ^e	153,000	165,000	170,000	169,000	162,000
India, primary and secondary	640,000 ^r	735,000 ^r	790,000 ^r	711,000 ^r	760,000
Iran ^e	115,000	120,000	132,000	148,000	140,000
Italy, primary and secondary ^e	100,000	105,000	100,000	100,000	110,000
Japan, primary and secondary	540,604	574,008	544,674	571,312	587,291 ⁵
Kazakhstan, primary and secondary	327,873	318,858	319,847 ^r	319,900 ^r	320,150 ⁵
Korea, North, primary and secondary ^e	26,000 ^r	26,000 ^r	30,000 ^r	31,000 ^r	35,000
Korea, Republic of, primary	751,179	717,100	828,735	875,000	885,000
Mexico, primary	385,400	328,100	322,100	323,500 ^r	322,800 ⁵
Namibia, primary	150,400	151,688	145,639	145,342	124,924 ⁵
Netherlands, primary	224,000	254,000	261,000	257,000 ^e	257,000
Norway, primary	138,973	148,862	153,200	152,647	143,444 ⁵
Peru, primary	149,494	223,112	313,714	319,280	346,362 ⁵
Poland, primary and secondary	139,100	135,100 ^r	144,100 ^r	138,000 ^r	154,379 ⁵
Romania, primary and secondary	4,000 ^e	--	--	--	--
Russia, primary and secondary	227,000 ^r	248,600 ^r	255,600 ^r	260,000 ^{r,e}	230,000
South Africa, primary	87,000	90,000	73,000	--	--
Spain, primary and secondary ^e	515,000 ^r	515,000 ^r	524,000 ^r	521,000 ^r	521,000
Thailand, primary	110,000 ^r	103,620 ^r	103,366 ^r	97,000	78,000 ⁵
United States:					
Primary	94,000	120,000	110,000	114,000	106,000
Secondary ^e	109,000	129,000	138,000	147,000	127,000
Total ^e	203,000	249,000	248,000	261,000	233,000
Uzbekistan, primary ^e	40,000	40,000	54,900 ⁵	61,100 ⁵	62,000
Vietnam, primary ^e	17,000	16,000	16,000	18,000	18,000
Grand total	11,400,000	12,800,000	13,100,000 ^r	12,600,000 ^r	13,000,000
Of which:					
Primary	8,330,000 ^r	9,500,000 ^r	9,700,000 ^r	9,320,000 ^r	9,680,000
Secondary	208,000 ^r	313,000 ^r	320,000 ^r	276,000 ^r	276,000
Undifferentiated	2,880,000 ^r	3,030,000 ^r	3,100,000 ^r	3,040,000 ^r	3,100,000

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

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

²Wherever possible, detailed information on raw material source of output (primary—directly from ores, and secondary—from scrap) has been provided. In cases where raw material source is unreported and insufficient data are available to estimate the distribution of the total, that total has been left undifferentiated (primary and secondary). To the extent possible, this table reflects metal production at the first measurable stage of metal output. Includes data available through June 24, 2015.

TABLE 10—Continued
ZINC: WORLD SMELTER PRODUCTION, BY COUNTRY^{1,2}

³Israel produces small amounts of secondary zinc, but available information is inadequate to make reliable estimates of output levels.

⁴Does not include zinc dust.

⁵Reported figure.