Aluminum

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During 2008, domestic primary smelters produced 2.66 million metric tons (Mt) of aluminum metal, 4% more than that in 2007, valued at $7.06 billion, 3% greater than the value of the production in the prior year. At yearend, 6 companies were operating 13 domestic primary aluminum smelters in 10 States. Smelters east of the Mississippi River accounted for about 70% of the production. At yearend, an additional five were idle, including one that was closed during the year. Early in 2009, plans to close two additional smelters were announced. At yearend 2008, about 34% [1.23 million metric tons per year (Mt/yr)] of domestic primary aluminum smelting capacity, including idle potlines at operating smelters, was not being utilized.

Aluminum recovered from purchased scrap decreased to 3.32 Mt. Of this recovered metal, 60% came from new (manufacturing) scrap, and 40% came from old (discarded aluminum products) scrap. Aluminum used beverage cans (UBCs) accounted for 51% of the reported old scrap consumed in 2008.

The transportation and the container and packaging industries remained the leading markets for aluminum products in Canada and the United States in 2008. The transportation industry accounted for 33.0% of United States and Canadian metal shipments; containers and packaging, 26.1%; building and construction, 13.7%; electrical, 8.2%; machinery and equipment, 8.0%; consumer durables, 7.1%; and other uses, 3.9%.

The 2008 annual average U.S. market price of primary aluminum ingot decreased slightly to $1.205 per pound from $1.222 per pound in 2007. The monthly average price was $1.136 per pound in January and rose steadily until it peaked in July at $1.426 per pound, then declined sharply to $0.715 per pound in December.

At the end of 2008, total world inventories of aluminum, as reported by the International Aluminium Institute (IAI) (2009), were 4% higher than those at yearend 2007. Combined inventories of aluminum metal and alloys held by the London Metal Exchange Ltd. (LME) increased by 148%.

Primary aluminum was produced in 42 countries in 2008. China, Russia, Canada, and the United States, in decreasing order of metal produced, accounted for almost 60% of total world production. World primary metal production increased by 3% compared with that of 2007, primarily owing to a 600,000-metric-ton (t) increase in production in China and a 400,000-t increase in production in Iceland.

Production

Primary.—In response to tightened credit conditions in the latter part of 2008, Alcoa Inc. (Pittsburgh, PA) announced it would stop all noncritical capital spending to conserve cash in the face of the adverse economic environment. All projects were under review and would be decided upon on a case-by-case basis (Alcoa Inc., 2008g).

In September, Alcoa announced it would close the remaining capacity at its 267,000-metric-ton-per-year (t/yr) smelter at Rockdale, TX, owing to continued high electricity prices and low aluminum prices (Alcoa Inc., 2008j). In June, Alcoa had closed 120,000 t/yr of capacity as a result of the inability to get reliable power at competitive prices.

Alcoa partially shut down potlines at the 278,000-t/yr Ferndale, WA, smelter in November in response to low aluminum prices. The specific amount of production capacity affected was not disclosed (Alcoa Inc., 2008i). Alcoa signed a memorandum of understanding (MOU) with the Bonneville Power Administration (BPA) to obtain power sufficient to operate the Ferndale smelter at 50% capacity from 2011 through 2028. Alcoa also planned to upgrade equipment to reduce emissions as part of the agreement (Alcoa Inc., 2008h).

Alcoa announced a contract for the Chelan County Public Utility District to supply power to the 184,000-t/yr smelter at Wenatchee, WA. The 17-year contract will start in 2011 and enable the restart of a third potline in 2012, bringing production to approximately 142,000 t/yr from 100,000 t/yr (Alcoa Inc., 2008e).

Glencore International AG announced that its Columbia Falls, MT, smelter would shut all production by the end of February 2009. In addition to low aluminum prices, the company cited a court ruling nullifying a low-cost power contract with the BPA as a reason for the closure. The smelter had been operating at only 25% of its 168,000 t/yr capacity since shutting two potlines in July. A subsequent deal with the BPA enabled the smelter to operate at 10% capacity until July 2009 (Platts Metals Week, 2008b; Flathead Beacon, 2009).

In December, Century Aluminum Co. announced that it was immediately closing a 42,500-t/yr potline at its primary smelter in Ravenswood, WV. The company also announced that it would close the entire 170,000-t/yr smelter in February 2009 (Century Aluminum Co., 2008d).

Secondary.—Arkansas Aluminum Alloys Inc. closed its secondary smelter in Hot Springs, AR, at the end of November. A dramatic decline in demand for diecast aluminum alloys used in automobiles was the reason cited for the decision. No reopening date was projected (American Metal Market, 2008).

Aleris International Inc. closed its secondary smelter at Tipton, IN, in March and later announced that the closure would be permanent (Aleris International Inc., 2008b). Aleris also permanently closed its secondary smelter in Shelbyville, TN, in the second quarter of 2008 (Aleris International Inc., 2008a).

In November, Alexin LLC opened a greenfield extrusion billet casthouse in Bluffton, IN. The company planned to use 80% scrap to produce up to 98,000 t/yr of billet (Alexin LLC, 2008).
The Ohio Valley Aluminum Co. secondary smelter and billet casthouse in Boonville, IN, was closed in October owing to decreased orders from suppliers to the home construction and automobile manufacturing industries (Platts Metals Week, 2008d).

Logan Aluminum Inc. (a joint venture between Arco Aluminum Inc. and Novelis Inc.) commissioned a new furnace to recycle UBCs at its smelter and rolling mill in Russellville, KY. The new furnace has a stated capacity of 68,000 t/yr and is designed to not produce salt cake, a waste product commonly generated by scrap melting. The additional recycling capacity will replace deliveries of molten aluminum from an Aleris smelter at Morgantown, KY (Schaffer, 2008b).

The recycling rate of aluminum beverage cans in California increased to 85% in the first half of 2008 compared with 83% in the same period of 2007 continuing the increasing trend from a rate of 77% in the first 6 months of 2006. The increased recycling rate of UBCs was attributed to an increase in the deposit for beverage containers effective January 1, 2007 (Schaffer, 2008a).

Consumption

Apparent consumption of aluminum in the United States declined by 14% in 2008 compared with that in 2007. Shipments of aluminum by United States and Canadian producers to their combined domestic markets declined by 13% in 2008 compared with the amount shipped in 2007. Shipments of aluminum for containers and packaging in 2008 were unchanged from those in 2007, but shipments to all other major end use categories declined. Shipments fell to the transportation sector by 21%, building and construction by 16%, consumer durables by 9%, electrical by 8%, and the machinery sector by 7%.

The decline in shipments of aluminum to the transportation sector resulted primarily from a reduction in automobile production. Automobile manufacturing in North America declined by 16.1% in 2008 compared with production in 2007. Production in all months declined compared with production in the same month of the prior year, with production in the fourth quarter declining significantly (25.8%) compared with production in the fourth quarter of 2007 (Wards Automotive Inc., 2009).

Reduced aircraft production also accounted for part of the decline in aluminum shipments for use in transportation. The Boeing Co. (Chicago, IL) reported that deliveries of commercial aircraft were 15% lower than those in the previous year. A 2-month strike by the International Association of Machinists Union was cited as the reason for the decline in production and delivery of commercial aircraft (Boeing Co., The, 2009).

The decline in aluminum shipments for use in building and construction was mainly a result of reduced home construction. The U.S. Census Bureau and the U.S. Department of Housing and Urban Development jointly reported that housing starts were down by 36.2% in 2008 compared with starts in 2007. The number of houses completed during 2008 was 25.7% less than the number completed the prior year (U.S. Census Bureau, 2009b). These declines were partially offset by an 11.8% increase in spending on nonresidential construction during 2008 compared with this type of spending in the prior year (U.S. Census Bureau, 2009a).

General Motors Corp. announced that it would use aluminum instead of cast iron and steel for engine blocks, heads, wheels, and other parts in its light trucks and sport utility vehicles starting with the 2009 models. The changes would reduce the total vehicle weight by approximately 69 kilograms (153 pounds) and are intended to increase fuel efficiency (Cowden, 2008; General Motors Corp., 2008).

Stocks

According to data reported by the Aluminum Association, United States and Canadian producers’ combined inventories of aluminum ingot, mill products, and scrap declined by 13% to 1.22 Mt at yearend 2008 from 1.40 Mt at yearend 2007 (Aluminum Association Inc., 2009). The LME reported that primary aluminum metal ingot stocks at its U.S. warehouses nearly tripled to 1.05 Mt at yearend 2008 from 354,000 t at yearend 2007. At yearend 2008, LME warehouses in the United States also held about 104,000 t of North American special aluminum alloy contract (NASAAC) metal ingot, a 4% decrease from the 108,000 t held at yearend 2007 (London Metal Exchange Ltd., 2008). Primary smelters increased shipments to LME warehouses and shortened customer payment terms to 5 days from 30 days after delivery in response to concerns over customer’s ability to finance purchases (Jennemann, 2008b).

Prices

The monthly average U.S. market price of primary aluminum metal, as reported by Platts Metals Week, increased from $1.107 per pound in December 2007 to a peak of $1.426 per pound in July. The monthly average price declined over the next several months and finished 2008 at $0.715 per pound. The annual average price in 2008 decreased to $1.205 per pound from $1.222 per pound in 2007.

The LME and COMEX (COMEX division of the New York Mercantile Exchange, Inc.) average monthly cash prices for primary aluminum ingot followed the same general trend as the U.S. market price. The average monthly COMEX spot settlement price decreased to $0.711 per pound in December 2008 from $1.079 per pound in December 2007 and averaged $1.183 per pound for the year compared with $1.176 per pound in 2007. The 2008 average annual LME cash price for high-grade primary aluminum ingot decreased to $1.167 per pound from $1.194 per pound in 2007.

The purchase prices for aluminum scrap, as quoted by American Metal Market, generally followed the same trend as primary ingot and were down by more than 50% at yearend 2008 from prices at yearend 2007. The 2008 yearend price ranges for selected types of aluminum scrap were mixed low-copper-content aluminum clips, 38 to 39 cents per pound; old sheet and cast aluminum, 34 to 35 cents per pound; and clean, dry aluminum turnings, 33 to 34 cents per pound. The aluminum producers’ buying price range for processed and delivered UBCs, as quoted by American Metal Market, began the year at 81 to 83 cents per pound and closed the year at 44 to 46 cents
per pound, averaging 83.5 cents per pound in 2008 compared with 85.6 cents per pound in 2007.

The indicator prices for selected secondary aluminum ingots, as published in American Metal Market, followed the same trend as primary ingot. The year-end prices for 2008 were alloy A380 (3% zinc content), $0.665 per pound; alloy B380 (1% zinc content), $0.678 per pound; alloy A360 (0.6% copper content), $0.715 per pound; alloy A413 (0.6% copper content), $0.715 per pound; and alloy A319 (3% copper content), $0.725 per pound. Platts Metals Week published an annual average U.S. price of $1.123 per pound for A380 alloy (3% zinc content). The average annual LME cash price for a similar A380 alloy was $1.021 per pound, and the annual average LME NASAAC spot price was $1.024 per pound.

Foreign Trade

In 2008, total net imports of aluminum-base materials declined by 40% compared with net imports in 2007. Imports for consumption of crude aluminum decreased by 5%, and imports of semifabricated aluminum materials decreased by 15% compared with those of 2007. Canada remained the leading source country accounting for 64% of the total imports in 2008, and Russia continued to be the second ranked supplier, accounting for 8% of total imports of aluminum (table 11).

Exports of crude aluminum decreased by 12% and exports of semifabricated aluminum materials (plates, sheet, and bars) increased by 5% compared with those of 2007. Net exports of 1.49 Mt of scrap increased by 38% compared with the amount in 2007. About 65% of total U.S. exports (crude, semifabricated, and scrap) in 2008 was shipped to China, Canada, and Mexico. Ninety-five percent of the aluminum shipped to China was scrap (table 9).

World Industry Structure

Production.—World primary aluminum production increased by 3% in 2008 compared with that of 2007, corresponding to an increase in smelter capacity. China, Russia, Canada, and the United States, in decreasing order of production, accounted for 58% of total world primary aluminum production.

Stocks.—Owing to the collapse of demand in the second half of the year, year-end global inventories of crude aluminum increased by 65% from the year-end 2007 level. Unwrought aluminum inventories held by member producers of the IAI increased by 8% to 1.68 Mt at year-end 2008 from 1.55 Mt at year-end 2007. Unwrought aluminum is defined by the IAI as aluminum in its basic form made from primary metal or from scrap and that is unworked in the metallurgical sense. Total IAI aluminum inventories increased by 4% to 2.96 Mt at year-end 2008 from 2.85 Mt at year-end 2007. Total aluminum includes unwrought aluminum plus unprocessed scrap, metal in process, and finished semifabricated (mill) products (International Aluminium Institute, 2009).

Year-end 2008 inventories of primary aluminum metal held by the LME increased by 152% to 2.34 Mt from 929,000 t at year-end 2007; aluminum alloy inventories increased by 127% to 104,000 t from 45,800 t; and NASAAC ingot inventories increased by 127% to 245,000 t from 108,000 t (London Metal Exchange Ltd., 2008).
capacity at the Pindamonhangaba secondary smelter to 150,000 t/yr from 80,000 t/yr (Novelis Inc., 2008).

In 2007, Brazil recycled 96.5% of all aluminum beverage cans sold during the year. Brazil collected and recycled 160,600 t of UBCs, the equivalent of 11.9 billion aluminum cans. The recycling rate was slightly higher than the rate of 94.4% in 2006 and was the highest rate on record. Brazil remained the world leader in aluminum can recycling rates among countries that do not have mandatory recycling laws for the seventh consecutive year (Associacao Brasileira do Aluminio, 2008).

**Brunei.**—Alcoa signed an MOU with the Brunei Economic Development Board for a study to construct an aluminum smelter and natural-gas-fired powerplant in Brunei. The initial capacity of the smelter would be 360,000 t/yr, but expansions could increase capacity to 700,000 t/yr. No schedule for completion was projected (Alcoa Inc., 2008a).

**Canada.**—Alcoa and Hydro Quebec signed power contracts for Hydro Quebec to produce 2,100 megawatts per year until 2040 to supply Alcoa’s three smelters at Baie Comeau, Becancour, and Deschambault in Quebec. Alcoa will also make upgrades to the Baie Comeau smelter that were expected to reduce emissions and increase capacity to 550,000 t/yr from 440,000 t/yr by 2014 (Alcoa Inc., 2008c). In order to complete the upgrades at Baie Comeau, the smelter was partially shut down in November; this move was also in response to declining aluminum prices (Alcoa Inc., 2008i).

In April, Rio Tinto Alcan Inc. announced that it would conduct a feasibility study for an expansion to the smelter in Alma, Quebec. The proposed project would increase capacity to 570,000 t/yr from 400,000 t/yr (Rio Tinto Alcan Inc., 2008h, p. 3).

Rio Tinto Alcan announced it would conduct a prefeasibility study for a pilot plant using a newly designed smelting pot at Saguenay, Quebec. The pilot smelter would have an initial capacity of 60,000 t/yr, with later expansion to 140,000 t/yr. A second study would consider the feasibility of expanding the smelter to 400,000 t/yr. The completion schedule was not announced (Rio Tinto Alcan Inc., 2008f).

In June, Rio Tinto Alcan commissioned a pilot plant for treating spent potlinings at Saguenay, Quebec. The facility has the capacity to treat 80,000 t/yr of spent potlinings (Rio Tinto Alcan Inc., 2008e).

Rio Tinto Alcan started modernization and expansion of the Kitimat, British Columbia, smelter after it secured all necessary environmental permits, labor contracts, and power supply agreements. The project would increase capacity to 400,000 t/yr from 245,000 t/yr with commissioning expected by 2011 (Rio Tinto Alcan Inc., 2008g).

**China.**—In February, the Government of China announced that it was eliminating preferential pricing of electricity to aluminum smelters and alumina refineries in response to electricity shortages (Interactive Investor, 2008). Snowstorms cut power to the Guizhou and Zunyi smelters in January. Production was restarted in February at the 400,000-t/yr Guizhou smelter, but the 110,000-t/yr Zunyi smelter was not able to restart until later (Platts Metals Week, 2008c). Production was reduced at the Sichuan Meishan smelter during the first quarter of 2008 owing to power shortages, but full production resumed in May (CRU Aluminium Monitor, 2008b).

Several smelters cut production in July and August to reduce electricity demand and pollution prior to the Olympic Games hosted by China. The cuts reduced production by about 83,000 metric tons per month (Alumina and Aluminium, 2008). In December, China’s State Reserve Bureau reportedly purchased 300,000 t of aluminum from Chinalco in an effort to remove surplus metal from the market and stabilize prices (Mason, 2008).

An earthquake in Sichuan Province on May 12 reportedly caused damage to the 100,000-t/yr Aba smelter, causing production capacity to be reduced to 50,000 t/yr. The Sichuan Guangyuan smelter reported that it lost power for several hours after the earthquake and that 5% of its 120,000-t/yr capacity was damaged by the power failure. Although little or no damage was reported at other smelters, concerns about damage to railroads that deliver alumina to the smelters and haul ingot to customers resulted in a spike in prices in Chinese markets and on the LME (CRU Aluminium Monitor, 2008b; Platts Metals Week, 2008a).

**France.**—Rio Tinto Alcan permanently closed its 50,000-t/yr Lannenmezan smelter in the first quarter of 2008 (Rio Tinto Alcan Inc., 2008h, p. 3).

**Germany.**—Norsk Hydro ASA (Oslo, Norway) and Novelis announced plans to construct a secondary aluminum smelter adjacent to the Alunorf rolling mill in Neuss. The smelter would have a production capacity of 50,000 t/yr and was expected to start up in 2010 (Norsk Hydro ASA, 2008c).

**Ghana.**—Alcoa sold its 10% share of the 200,000-t/yr Volta Aluminum Co. (VALCO) smelter to the Government of Ghana in June. The smelter had been closed since March 2007 owing to low water levels at the Volta Dam, the power source for the smelter (Kpodo and Thomson, 2008). The Government planned to restart the smelter using power generated by the Volta Dam and a powerplant using natural gas from Nigeria. The Government also planned to construct a bauxite mine and alumina refinery to supply the smelter in the future; however, no construction plans were detailed (Mineprocessing, 2008).

**Greenland.**—Studies by Alcoa on the construction of a 340,000-t/yr smelter at Maniitsoq and a hydroelectric power station progressed. Pending final approval by the Government, the smelter could be in production by 2014 or 2015 (Alcoa Inc., 2008k).

**Iceland.**—Alcoa’s 346,000-t/yr smelter at Fjardal, which opened in April 2007, reached full production in the second quarter of 2008. Alcoa and the national power company, Landsvirkjun, were conducting a study on the geothermal potential for a powerplant. Alcoa proposed constructing a 250,000-t/yr smelter near Bakki if the geothermal powerplant proved to be feasible (Alcoa Inc., 2008f; Jennemann, 2008a).

Century started construction of a 250,000-t/yr smelter at Helguvik in March. The first 150,000 t/yr of capacity was expected to be operational by late 2010 (Century Aluminum Co., 2008a). In October, the company stated that the collapse of Iceland’s banking system would not affect the financing of the project, but construction was nearly halted during the fourth quarter as Century was reportedly conserving cash (Century Aluminum Co., 2008b, c).
Aluminum—2008

India. — Capacity at the National Aluminum Co. of India Ltd. (Nalco) Angul smelter was expanded to 460,000 t/yr from 345,000 t/yr, and production from the new capacity was expected in early 2009. Nalco planned for another expansion project to increase capacity to 580,000 t/yr, but no project schedule was announced. Nalco also planned to construct a 500,000-t/yr smelter with a captive powerplant in Jharsuguda. A project schedule was not announced (National Aluminum Co. of India Ltd., 2008b).

Hindalco Industries Inc. moved forward with expansion plans on several projects. Expansion of the Hirakud smelter to 143,000 t/yr from 100,000 t/yr was completed in August. Further expansion to increase capacity to 151,000 t/yr was underway and scheduled for completion by August 2009. Work progressed on the Mahan smelter and captive powerplant, with production from the 359,000-t/yr smelter anticipated by July 2011. Work progressed on the Aditya aluminum complex that included an alumina refinery with a capacity of 1 to 1.5 Mt/yr, an aluminum smelter with a capacity of 260,000 to 359,000 t/yr, and a captive powerplant. Initial smelter production was scheduled for October 2011, and initial production from the refinery was expected by January 2013. Planning for the Jharkhand smelter and captive powerplant continued. The proposed capacity of the smelter would be 359,000 t/yr, with initial production planned for June 2012 (Hindalco Industries Ltd., 2008).

Vedanta Resources plc began production at the 250,000-t/yr Jharsuguda smelter at midyear. An additional 250,000 t/yr of capacity was under construction, although a completion date was not available (Vedanta Resources plc, 2008, p. 27).

Indonesia. — Nalco and the Government of Indonesia signed an MOU to construct a smelter and captive powerplant. Rak Minerals and Metals Investments Ltd. would also be a partner in the project, which would have an initial capacity of 250,000 t/yr, and a second phase would increase capacity to 500,000 t/yr. No projected completion date was announced (National Aluminum Co. of India Ltd., 2008a).

Iran. — Nalco and a consortium lead by Kerman Development Organization signed an MOU to construct a smelter and captive powerplant. The project would have a capacity of 330,000 t/yr. No projected completion date was announced (National Aluminum Co. of India Ltd., 2008b).

Kazakhstan. — Eurasian Natural Resource Corp. attained full production from the 125,000-t/yr Pavlodar smelter in the second quarter of the year. Further expansion was underway that would bring capacity to 250,000 t/yr in 2010 (Eurasian Natural Resource Corp., 2009).

Libya. — United Company RUSAL (Rusal) signed an MOU with the Libyan State Economic and Social Development Fund to develop an aluminum smelter and natural-gas-fired powerplant. The proposed smelter would have a capacity of 600,000 t/yr, and construction would begin in 2010 if proven to be feasible (United Company RUSAL, 2008d).

Klesch signed an agreement with Libya Africa Investment Portfolio to build a 725,000-t/yr smelter to be completed by 2011. The site of the smelter was not detailed (Klesch & Co. Ltd., 2008).

Malaysia. — Rio Tinto Alcan and partner Cahya Mata Sarawak Berhad received a permit to build a 550,000-t/yr smelter in Sarawak with expansion potential to 1.5 Mt/yr. A construction schedule was not announced (Rio Tinto Alcan Inc., 2008b).

Mozambique. — In March, BHP Billiton announced that the production rate was reduced at its 265,000-t/yr Mozal smelter by approximately 12,000 t/yr because of power shortages (BHP Billiton Ltd., 2008a).

New Zealand. — Production in 2008 declined by about 38,000 t principally because low rainfall forced Rio Tinto Alcan to cut production at the Tiwai Point smelter by about 10% for much of the year. The 281,000-t/yr smelter is powered by a hydroelectric powerplant (Rio Tinto Alcan Inc., 2008i, p. 5).

Nigeria. — Rusal restarted production at the Alscon smelter in February, although production was halted in October owing to a power failure. The 197,000-t/yr smelter had been closed since 1999. A modernization project to increase efficiency and restore full production was expected to be completed in 2010 (Helmer, 2008; United Company RUSAL, 2008b).

Norway. — Norsk Hydro closed 24,000 t/yr of capacity from Soderberg pots at the Karmoy smelter in November and announced that the remaining 96,000 t/yr of Soderberg pots would be closed permanently by the end of the first quarter of 2009. Low aluminum prices were cited as the reason for the closure, although all Soderberg pots had been scheduled for permanent closure by yearend 2009 to comply with environmental regulations (Norsk Hydro ASA, 2008b, d). Norsk Hydro said that proposed legislation to transfer ownership of hydroelectric generation from the company to the Government would make it unlikely that the Soderberg pots would be replaced as Norsk Hydro could not be assured of stable and competitively priced electricity (Norsk Hydro ASA, 2008a).

Oman. — Rio Tinto Alcan and its partners, Oman Oil Company S.A.O.C. and the Abu Dhabi Water and Electricity Authority, completed construction of the 360,000-t/yr Sohar smelter and started production in June (Rio Tinto Alcan Inc., 2008h, p. 4).

Qatar. — Construction of the 585,000-t/yr Qatalum smelter at Mesaieed was progressing to the scheduled startup by early 2010. Norsk Hydro and Qatar Petroleum Co. Ltd. were partners in the smelter (Norsk Hydro ASA, 2008e, 2009).

Romania. — Vimetco NV announced it would close 65,000 t/yr of capacity at the 270,000-t/yr Arlo Slatina smelter in November owing to high electricity costs and low aluminum prices (Vimetco VN, 2008).

Russia. — In February, Rusal completed an expansion to the Irkutsk smelter, increasing capacity to 460,000 t/yr from 290,000 t/yr (United Company RUSAL, 2008c).

Work progressed on Rusal’s 750,000-t/yr Taishet and 600,000-t/yr Boguchansky smelters. Initial production at Taishet was planned for yearend 2009, and full production by yearend 2011; initial production at Boguchansky was planned for yearend 2010, and full production, in 2012 (United Company RUSAL, 2008a, e).

Saudi Arabia. — Rio Tinto Alcan withdrew its plan to invest in a joint venture with Saudi Arabian Mining Co. to build an aluminum complex that included a 3-Mt/yr bauxite mine, a
1.6-Mt/yr alumina refinery, and a 720,000-t/yr smelter at Az Zabirah. Plans for the complex were being revised in light of global economic conditions, with completion projected for 2012 (Rio Tinto Alcan Inc., 2008c).

**South Africa.**—Power shortages in the country led to BHP Billiton closing 92,000 t/yr of aluminum capacity at the 194,000-t/yr Bayside smelter and 12,000 t/yr at the 704,000-t/yr Hillside smelter (BHP Billiton Ltd., 2008a).

Rio Tinto Alcan was in discussions with the South African Government and state power company Eskom on the timing of construction of the proposed Coega smelter. The smelter, to be built in two phases, would have a capacity of 720,000 t/yr when completed. A feasibility study was underway with a revised construction schedule to be announced pending the outcome of the discussions (Rio Tinto Alcan Inc., 2008d).

**Trinidad and Tobago.**—Construction began on a smelter near Pitch Lake with funding from a Chinese company and was to be completed by 2011. Power for the smelter would come from natural gas produced in Trinidad and Tobago. Initial capacity would be 125,000 t/yr, with the option to expand capacity to 250,000 t/yr (Fraser, 2008; Gumbs-Sandiford, 2008).

**United Arab Emirates.**—An expansion of Dubai Aluminium Co. Ltd.’s (Dubai) Jebel Ali smelter to increase capacity to 950,000 t/yr from 910,000 t/yr was commissioned in February (Dubai Aluminium Co. Ltd., 2008a).

Construction on Dubai’s Emirates Aluminum smelter progressed on schedule toward completion of the first phase with a capacity of 700,000 t/yr; initial production was scheduled to begin in 2011. An additional 700,000 t/yr of capacity would be constructed at a later date. The project is a joint venture between Dubai and Mubadala Development Co. (Dubai Aluminium Co. Ltd., 2008b).

Rio Tinto Alcan announced that it would put on hold plans to build a 700,000-t/yr smelter in Abu Dhabi after the Government of the United Arab Emirates declined a request for a contract for natural gas. The Government stated that it would prefer to use the gas for more profitable uses, such as chemicals, fertilizer, or export in liquefied form, rather than sell it to generate electricity for aluminum smelters (Jennemann, 2008c).

**United Kingdom.**—In June, a fire resulted in a power loss at the 150,000-t/yr Anglesey smelter, and two of the three potlines were shut down. One of the potlines was restarted in July, and the other potline restarted in August, with full production achieved by the end of 2008. The smelter, jointly owned by Rio Tinto Alcan and Kaiser Aluminum Ltd. (Foothill Ranch, CA), was scheduled to close permanently in September 2009 with the expiration of its power contract (Kaiser Aluminum Ltd., 2008; Rio Tinto Alcan Inc., 2008i, p. 5).

Rio Tinto Alcan announced that modernization of the hydroelectric powerplant supplying power to its Lochaber, Scotland, United Kingdom, smelter would enable smelting capacity to be increased to 50,000 t/yr from 43,000 t/yr. The powerplant was constructed in 1929 and has been in continuous use to power the smelter (Rio Tinto Alcan Inc., 2008a).

**Venezuela.**—Alcasa was planning an expansion to its smelter at Puerto Ordaz that would increase capacity to 450,000 t/yr from 240,000 t/yr. Construction would take about 3 years, but a schedule had not been determined (Beltran, 2008).

**Outlook**

During the fourth quarter of 2008 and early in 2009, numerous smelter closures were announced as aluminum prices continued to decline. By June 1, 2009, about 54% (1.94 Mt/yr) of domestic primary aluminum smelting capacity was not being used. World demand for aluminum in 2009 was expected to remain at levels lower than in prior years owing to declines in automobile manufacturing and home construction. Consumer credit issues in the United States and Western Europe were expected to continue for the coming year. Decreased consumption of aluminum in developed economies resulting from the economic events of 2008 could keep aluminum production below the 2008 production rate for the next several years. The impact of the global recession was also expected to reduce demand for aluminum in emerging economies as manufacturers that sell goods to the United States and other developed economies reduce output. Credit constraints on construction in emerging economies also threaten to reduce consumption of aluminum for infrastructure projects. Lack of credit to aluminum companies was expected to cause delays in expansion projects in many parts of the world, although projects in places with low power costs were still expected to move forward. Relatively higher electricity prices in the United States compared with power prices in other nations diminished the likelihood of domestic smelters reopening in the near-term. New smelters constructed where power costs are relatively low were expected to replace production at high-cost smelters in the United States and other locations.

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### TABLE 1
**SALIENT ALUMINUM STATISTICS**

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>United States:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Primary production:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantity (thousand metric tons)</td>
<td>2,516</td>
<td>2,481</td>
<td>2,284</td>
<td>2,554</td>
<td>2,658</td>
</tr>
<tr>
<td>Value (millions)</td>
<td>$4,660</td>
<td>$4,980</td>
<td>$6,110</td>
<td>$6,880</td>
<td>$7,060</td>
</tr>
<tr>
<td>Price, average, U.S. market, spot (cents per pound)</td>
<td>84.0</td>
<td>91.0</td>
<td>121.4</td>
<td>122.2</td>
<td>120.5</td>
</tr>
<tr>
<td>Inventories (December 31):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum industry</td>
<td>1,470</td>
<td>1,430</td>
<td>1,410</td>
<td>1,400</td>
<td>1,220</td>
</tr>
<tr>
<td>London Metal Exchange, U.S. warehouses</td>
<td>116</td>
<td>209</td>
<td>228</td>
<td>463</td>
<td>1,290</td>
</tr>
<tr>
<td><strong>Secondary recovery:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New scrap</td>
<td>1,160</td>
<td>1,080</td>
<td>1,250</td>
<td>1,530</td>
<td>1,340</td>
</tr>
<tr>
<td>Old scrap</td>
<td>1,820</td>
<td>2,370</td>
<td>2,820</td>
<td>2,840</td>
<td>3,280</td>
</tr>
<tr>
<td>Total</td>
<td>3,030</td>
<td>3,030</td>
<td>3,540</td>
<td>3,750</td>
<td>3,320</td>
</tr>
<tr>
<td>Exports, crude and semicrude</td>
<td>4,720</td>
<td>5,330</td>
<td>5,180</td>
<td>4,490</td>
<td>4,200</td>
</tr>
<tr>
<td>Imports for consumption, crude and semicrude</td>
<td>8,440</td>
<td>8,480</td>
<td>8,180</td>
<td>7,950</td>
<td>6,900</td>
</tr>
<tr>
<td>Supply, apparent</td>
<td>6,570</td>
<td>6,530</td>
<td>5,900</td>
<td>7,370</td>
<td>4,920</td>
</tr>
<tr>
<td>World, production</td>
<td>29,900</td>
<td>31,900</td>
<td>33,900</td>
<td>38,000</td>
<td>39,000</td>
</tr>
</tbody>
</table>

---

2. Data are rounded to no more than three significant digits except “Primary production: Quantity” and “Price, average, U.S. market, spot.”
3. Data from the Aluminum Association Inc.; includes ingot, semifabricated material, and scrap. Includes inventory levels for both United States and Canadian producers.
4. Includes aluminum alloyed material.
5. Metallic recovery from purchased, tolled, or imported new and old scrap expanded for full industry coverage.
6. Defined as domestic primary metal production plus secondary recovery plus imports minus exports plus adjustments for government and industry stock changes.
7. Apparent supply less recovery from purchased new scrap.

### TABLE 2
**PRIMARY ANNUAL ALUMINUM PRODUCTION CAPACITY IN THE UNITED STATES, BY COMPANY**

<table>
<thead>
<tr>
<th>Company and location</th>
<th>Yearend capacity (thousand metric tons)</th>
<th>Ownership in 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alcoa Inc.</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Alcoa, TN | 215 | 215 | Alcoa Inc., 100%.
| Badin, NC | 120 | 120 | Do.
| Evansville, IN (Warrick) | 309 | 309 | Do.
| Ferndale, WA (Intalco) | 278 | 278 | Do.
| Frederick, MD (Eastalco) | 195 | 195 | Do.
| Massena, NY (St. Lawrence) | 125 | 125 | Do.
| Massena, NY | 130 | 130 | Do.
| Mount Holly, SC | 224 | 224 | Alcoa Inc., 50.3%; Century Aluminum Co., 49.7%.
| Rockdale, TX | 267 | 267 | Alcoa Inc., 100%.
| Wenatchee, WA | 184 | 184 | Do.
| **Total** | 2,050 | 2,050 | |
| **Century Aluminum Co.** | | |
| Hawesville, KY | 244 | 244 | Century Aluminum Co., 100%.
| Ravenswood, WV | 170 | 170 | Do.
| **Total** | 414 | 414 | |
| **Columbia Falls Aluminum Co., Columbia Falls, MT** | | |
| Glencore International AG, 100%. |
| **Goldendale Aluminum Co., Goldendale, WA** | | |
| Private interest, 60%; employees, 40%. |
| **Noranda Aluminum Inc., New Madrid, MO** | | |
| Apollo Management LP, 100%. |
| **Ormet Primary Aluminum Corp., Hannibal, OH** | | |
| Ormet Corp., 100%. |
| **Río Tinto Alcan Ltd., Sebree, KY** | | |
| Río Tinto Alcan Ltd., 100%. |
| **Vanralco Inc., Vancouver, WA** | | |
| Glencore International AG, 100%. |
| **Grand total** | 3,620 | 3,620 | |

Do. Ditto.

---

1. Data are rounded to no more than three significant digits; may not add to totals shown.
### TABLE 3

U.S. CONSUMPTION OF AND RECOVERY FROM PURCHASED NEW AND OLD ALUMINUM SCRAP, BY CLASS

(Metric tons)

<table>
<thead>
<tr>
<th>Class</th>
<th>Consumption</th>
<th>Calculated recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Aluminum</td>
</tr>
<tr>
<td>2007:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary smelters</td>
<td>1,770,000</td>
<td>1,210,000</td>
</tr>
<tr>
<td>Independent mill fabricators</td>
<td>2,400,000</td>
<td>2,000,000</td>
</tr>
<tr>
<td>Foundries</td>
<td>79,000</td>
<td>64,900</td>
</tr>
<tr>
<td>Other consumers</td>
<td>7,950</td>
<td>6,890</td>
</tr>
<tr>
<td>Total</td>
<td>4,250,000</td>
<td>3,270,000</td>
</tr>
<tr>
<td>Estimated full industry coverage</td>
<td>4,580,000</td>
<td>3,520,000</td>
</tr>
<tr>
<td>2008:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary smelters</td>
<td>1,580,000</td>
<td>1,030,000</td>
</tr>
<tr>
<td>Independent mill fabricators</td>
<td>2,180,000</td>
<td>1,800,000</td>
</tr>
<tr>
<td>Foundries</td>
<td>77,300</td>
<td>63,300</td>
</tr>
<tr>
<td>Other consumers</td>
<td>8,760</td>
<td>7,770</td>
</tr>
<tr>
<td>Total</td>
<td>3,850,000</td>
<td>2,900,000</td>
</tr>
<tr>
<td>Estimated full industry coverage</td>
<td>4,140,000</td>
<td>3,120,000</td>
</tr>
</tbody>
</table>

1Revised.

1Excludes recovery from other than aluminum-base scrap.

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

1Includes plants previously categorized as “Integrated aluminum companies.”
<table>
<thead>
<tr>
<th>Class of consumer and type of scrap</th>
<th>Stocks, January 1</th>
<th>Net receipts&lt;sup&gt;3&lt;/sup&gt;</th>
<th>Consumption</th>
<th>Stocks, December 31</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Secondary smelters:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New scrap:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extrusion</td>
<td>18,200&lt;sup&gt;†&lt;/sup&gt;</td>
<td>352,000</td>
<td>354,000</td>
<td>16,600</td>
</tr>
<tr>
<td>Can stock clippings</td>
<td>2,370&lt;sup&gt;†&lt;/sup&gt;</td>
<td>87,300</td>
<td>86,900</td>
<td>2,800</td>
</tr>
<tr>
<td>Other wrought sheet and clippings</td>
<td>1,260&lt;sup&gt;†&lt;/sup&gt;</td>
<td>139,000</td>
<td>139,000</td>
<td>1,340</td>
</tr>
<tr>
<td>Casting</td>
<td>1,060&lt;sup&gt;†&lt;/sup&gt;</td>
<td>33,600</td>
<td>34,000</td>
<td>711</td>
</tr>
<tr>
<td>Borings and turnings</td>
<td>2,420&lt;sup&gt;†&lt;/sup&gt;</td>
<td>103,000</td>
<td>105,000</td>
<td>1,180</td>
</tr>
<tr>
<td>Dross and skimmings</td>
<td>1,290&lt;sup&gt;†&lt;/sup&gt;</td>
<td>534,000</td>
<td>535,000</td>
<td>667</td>
</tr>
<tr>
<td>Other</td>
<td>--</td>
<td>7,380</td>
<td>7,380</td>
<td>--</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>26,600&lt;sup&gt;†&lt;/sup&gt;</td>
<td>1,260,000</td>
<td>1,260,000</td>
<td>23,300</td>
</tr>
<tr>
<td><strong>Old scrap:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Castings</td>
<td>2,670&lt;sup&gt;†&lt;/sup&gt;</td>
<td>50,000</td>
<td>51,000</td>
<td>1,720</td>
</tr>
<tr>
<td>Extrusion</td>
<td>1,880&lt;sup&gt;†&lt;/sup&gt;</td>
<td>45,700</td>
<td>45,800</td>
<td>1,820</td>
</tr>
<tr>
<td>Aluminum cans&lt;sup&gt;4&lt;/sup&gt;</td>
<td>68&lt;sup&gt;†&lt;/sup&gt;</td>
<td>41,000</td>
<td>41,100</td>
<td>--</td>
</tr>
<tr>
<td>Other wrought products</td>
<td>1,590&lt;sup&gt;†&lt;/sup&gt;</td>
<td>82,800</td>
<td>82,700</td>
<td>1,650</td>
</tr>
<tr>
<td>Auto shredder scrap</td>
<td>2,570&lt;sup&gt;†&lt;/sup&gt;</td>
<td>70,800</td>
<td>72,300</td>
<td>1,010</td>
</tr>
<tr>
<td>Other</td>
<td>--</td>
<td>20,400</td>
<td>20,400</td>
<td>--</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>8,780&lt;sup&gt;†&lt;/sup&gt;</td>
<td>311,000</td>
<td>313,000</td>
<td>6,200</td>
</tr>
<tr>
<td><strong>Sweated pig</strong></td>
<td>96</td>
<td>1,720</td>
<td>1,820</td>
<td>1</td>
</tr>
<tr>
<td><strong>Grand total secondary smelters</strong></td>
<td>35,500&lt;sup&gt;†&lt;/sup&gt;</td>
<td>1,570,000</td>
<td>1,580,000</td>
<td>29,500</td>
</tr>
<tr>
<td><strong>Integrated aluminum companies, foundries, independent mill fabricators, other consumers:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New scrap:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extrusion</td>
<td>6,230&lt;sup&gt;†&lt;/sup&gt;</td>
<td>599,000</td>
<td>599,000</td>
<td>7,100</td>
</tr>
<tr>
<td>Can stock clippings</td>
<td>2,700&lt;sup&gt;†&lt;/sup&gt;</td>
<td>156,000</td>
<td>158,000</td>
<td>982</td>
</tr>
<tr>
<td>Other wrought sheet and clippings</td>
<td>3,230&lt;sup&gt;†&lt;/sup&gt;</td>
<td>170,000</td>
<td>169,000</td>
<td>4,620</td>
</tr>
<tr>
<td>Casting</td>
<td>512&lt;sup&gt;†&lt;/sup&gt;</td>
<td>34,000</td>
<td>34,300</td>
<td>243</td>
</tr>
<tr>
<td>Borings and turnings</td>
<td>903&lt;sup&gt;†&lt;/sup&gt;</td>
<td>31,300</td>
<td>31,800</td>
<td>473</td>
</tr>
<tr>
<td>Dross and skimmings</td>
<td>5,510&lt;sup&gt;†&lt;/sup&gt;</td>
<td>131,000</td>
<td>135,000</td>
<td>1,670</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>19,100</td>
<td>1,120,000</td>
<td>1,130,000</td>
<td>15,100</td>
</tr>
<tr>
<td><strong>Old scrap:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Castings</td>
<td>2,710&lt;sup&gt;†&lt;/sup&gt;</td>
<td>128,000</td>
<td>121,000</td>
<td>8,780</td>
</tr>
<tr>
<td>Extrusion</td>
<td>1,240&lt;sup&gt;†&lt;/sup&gt;</td>
<td>32,200</td>
<td>31,900</td>
<td>1,530</td>
</tr>
<tr>
<td>Aluminum cans&lt;sup&gt;4&lt;/sup&gt;</td>
<td>8,150&lt;sup&gt;†&lt;/sup&gt;</td>
<td>704,000</td>
<td>704,000</td>
<td>8,150</td>
</tr>
<tr>
<td>Other wrought products</td>
<td>5,370&lt;sup&gt;†&lt;/sup&gt;</td>
<td>160,000</td>
<td>162,000</td>
<td>3,590</td>
</tr>
<tr>
<td>Auto shredder scrap</td>
<td>82&lt;sup&gt;†&lt;/sup&gt;</td>
<td>593</td>
<td>593</td>
<td>82</td>
</tr>
<tr>
<td>Other</td>
<td>--</td>
<td>124,000</td>
<td>124,000</td>
<td>--</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>17,600&lt;sup&gt;†&lt;/sup&gt;</td>
<td>1,150,000</td>
<td>1,140,000</td>
<td>22,100</td>
</tr>
<tr>
<td><strong>Sweated pig</strong></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Grand total integrated aluminum companies, etc.</strong></td>
<td>36,600&lt;sup&gt;†&lt;/sup&gt;</td>
<td>2,270,000</td>
<td>2,270,000</td>
<td>37,200</td>
</tr>
<tr>
<td><strong>All scrap consumed:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New scrap:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extrusion</td>
<td>24,400&lt;sup&gt;†&lt;/sup&gt;</td>
<td>951,000</td>
<td>952,000</td>
<td>23,700</td>
</tr>
<tr>
<td>Can stock clippings</td>
<td>5,070&lt;sup&gt;†&lt;/sup&gt;</td>
<td>243,000</td>
<td>245,000</td>
<td>3,780</td>
</tr>
<tr>
<td>Other wrought sheet and clippings</td>
<td>4,490&lt;sup&gt;†&lt;/sup&gt;</td>
<td>310,000</td>
<td>308,000</td>
<td>5,960</td>
</tr>
<tr>
<td>Casting</td>
<td>1,580&lt;sup&gt;†&lt;/sup&gt;</td>
<td>67,700</td>
<td>68,300</td>
<td>954</td>
</tr>
<tr>
<td>Borings and turnings</td>
<td>3,320&lt;sup&gt;†&lt;/sup&gt;</td>
<td>135,000</td>
<td>136,000</td>
<td>1,660</td>
</tr>
<tr>
<td>Dross and skimmings</td>
<td>6,800&lt;sup&gt;†&lt;/sup&gt;</td>
<td>665,000</td>
<td>670,000</td>
<td>2,340</td>
</tr>
<tr>
<td>Other</td>
<td>--</td>
<td>7,380</td>
<td>7,380</td>
<td>--</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>45,700&lt;sup&gt;†&lt;/sup&gt;</td>
<td>2,380,000</td>
<td>2,390,000</td>
<td>38,400</td>
</tr>
</tbody>
</table>

See footnotes at end of table.
### TABLE 4—Continued

**U.S. STOCKS, RECEIPTS, AND CONSUMPTION OF PURCHASED NEW AND OLD ALUMINUM SCRAP AND SWEATED PIG IN 2008**\(^1,2\)

(Metric tons)

<table>
<thead>
<tr>
<th>Class of consumer and type of scrap</th>
<th>Stocks, January 1</th>
<th>Net receipts(^3)</th>
<th>Consumption</th>
<th>Stocks, December 31</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All scrap consumed—Continued:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Old scrap:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Castings</td>
<td>5,380 (\text{t})</td>
<td>178,000</td>
<td>172,000</td>
<td>10,500</td>
</tr>
<tr>
<td>Extrusion</td>
<td>3,120 (\text{t})</td>
<td>77,900</td>
<td>77,700</td>
<td>3,350</td>
</tr>
<tr>
<td>Aluminum cans</td>
<td>8,220 (\text{t})</td>
<td>745,000</td>
<td>745,000</td>
<td>8,150</td>
</tr>
<tr>
<td>Other wrought products</td>
<td>6,970 (\text{t})</td>
<td>243,000</td>
<td>244,000</td>
<td>5,230</td>
</tr>
<tr>
<td>Auto shredder scrap</td>
<td>2,650 (\text{t})</td>
<td>71,400</td>
<td>72,900</td>
<td>1,090</td>
</tr>
<tr>
<td>Other</td>
<td>�</td>
<td>144,000</td>
<td>144,000</td>
<td>�</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>26,300 (\text{t})</td>
<td>1,460,000</td>
<td>1,460,000</td>
<td>28,300</td>
</tr>
<tr>
<td><strong>Sweated pig</strong></td>
<td>96 (\text{t})</td>
<td>1,720</td>
<td>1,820</td>
<td>1</td>
</tr>
<tr>
<td><strong>Grand total of all scrap consumed</strong></td>
<td>72,100 (\text{t})</td>
<td>3,840,000</td>
<td>3,850,000</td>
<td>66,700</td>
</tr>
</tbody>
</table>

\(^1\)Revised. — Zero.

\(^2\)Includes imported scrap. According to reporting companies, 6.44% of total receipts of aluminum-base scrap, or 249,000 metric tons, was received on toll arrangements.

\(^3\)Data are rounded to no more than three significant digits; may not add to totals shown.

\(^3\)Includes inventory adjustment.

\(^4\)Used beverage cans toll treated for primary producers are included in secondary smelter tabulation.
### TABLE 5
**PRODUCTION AND SHIPMENTS OF SECONDARY ALUMINUM ALLOYS BY INDEPENDENT SMELTERS IN THE UNITED STATES**

(Metric tons)

<table>
<thead>
<tr>
<th>Diecast alloys:</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>13% Si, 360, etc. (0.6% Cu, maximum)</td>
<td>26,000</td>
<td>23,200</td>
</tr>
<tr>
<td>380 and variations</td>
<td>224,000</td>
<td>209,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sand and permanent mold:</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>95/5 Al-Si, 356, etc. (0.6% Cu, maximum)</td>
<td>32,900</td>
<td>29,500</td>
</tr>
<tr>
<td>No. 12 and variations</td>
<td>2,270</td>
<td>2,020</td>
</tr>
<tr>
<td>No. 319 and variations</td>
<td>74,900</td>
<td>66,600</td>
</tr>
<tr>
<td>F-132 alloy and variations</td>
<td>20,000</td>
<td>19,000</td>
</tr>
<tr>
<td>Al-Mg alloys</td>
<td>9,940</td>
<td>8,850</td>
</tr>
<tr>
<td>Al-Zn alloys</td>
<td>1,720</td>
<td>1,650</td>
</tr>
<tr>
<td>Al-Si alloys (0.6% to 2.0% Cu)</td>
<td>20,000</td>
<td>17,800</td>
</tr>
<tr>
<td>Al-Cu alloys (1.5% Si, maximum)</td>
<td>399</td>
<td>521</td>
</tr>
<tr>
<td>Al-Si-Cu-Ni alloys</td>
<td>9,680</td>
<td>8,610</td>
</tr>
<tr>
<td>Other</td>
<td>401</td>
<td>162</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wrought alloys, extrusion billets</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel deoxidation</td>
<td>42,900</td>
<td>39,900</td>
</tr>
<tr>
<td>Pure (97.0% Al)</td>
<td>W</td>
<td>W</td>
</tr>
<tr>
<td>Aluminum-base hardeners</td>
<td>W</td>
<td>W</td>
</tr>
<tr>
<td>Other</td>
<td>60,500</td>
<td>53,900</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Miscellaneous:</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Containers and packaging</td>
<td>2,230</td>
<td>2,230</td>
</tr>
<tr>
<td>Building and construction</td>
<td>1,410</td>
<td>1,180</td>
</tr>
<tr>
<td>Transportation</td>
<td>3,580</td>
<td>2,830</td>
</tr>
<tr>
<td>Electrical</td>
<td>762</td>
<td>700</td>
</tr>
<tr>
<td>Consumer durables</td>
<td>664</td>
<td>607</td>
</tr>
<tr>
<td>Machinery and equipment</td>
<td>736</td>
<td>688</td>
</tr>
<tr>
<td>Other markets</td>
<td>359</td>
<td>334</td>
</tr>
<tr>
<td>Total</td>
<td>9,730</td>
<td>8,560</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Less consumption of materials other than scrap:</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary aluminum</td>
<td>302,000</td>
<td>230,000</td>
</tr>
<tr>
<td>Primary silicon</td>
<td>29,500</td>
<td>9,720</td>
</tr>
<tr>
<td>Other</td>
<td>15,000</td>
<td>7,310</td>
</tr>
<tr>
<td>Net metallic recovery from aluminum scrap and sweated pig consumed in production of secondary aluminum ingot</td>
<td>882,000</td>
<td>916,000</td>
</tr>
</tbody>
</table>

| Revised. W Withheld to avoid disclosing company proprietary data; included with “miscellaneous, other.” XX Not applicable.
| Data are rounded to no more than three significant digits; may not add to totals shown.
| Includes inventory adjustment.
| Includes other diecast alloys.
| No allowance made for melt loss of primary aluminum and alloying ingredients.

### TABLE 6
**DISTRIBUTION OF END-USE SHIPMENTS OF ALUMINUM PRODUCTS IN THE UNITED STATES AND CANADA, BY INDUSTRY**

<table>
<thead>
<tr>
<th>Industry</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Containers and packaging</td>
<td>2,230</td>
<td>2,230</td>
</tr>
<tr>
<td>Building and construction</td>
<td>1,410</td>
<td>1,180</td>
</tr>
<tr>
<td>Transportation</td>
<td>3,580</td>
<td>2,830</td>
</tr>
<tr>
<td>Electrical</td>
<td>762</td>
<td>700</td>
</tr>
<tr>
<td>Consumer durables</td>
<td>664</td>
<td>607</td>
</tr>
<tr>
<td>Machinery and equipment</td>
<td>736</td>
<td>688</td>
</tr>
<tr>
<td>Other markets</td>
<td>359</td>
<td>334</td>
</tr>
<tr>
<td>Total</td>
<td>9,730</td>
<td>8,560</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exports</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Export</td>
<td>1,450</td>
<td>1,490</td>
</tr>
<tr>
<td>Grand total</td>
<td>11,200</td>
<td>10,000</td>
</tr>
</tbody>
</table>

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

Source: The Aluminum Association Inc.
### TABLE 7

**U.S. NET SHIPMENTS OF ALUMINUM WROUGHT AND CAST PRODUCTS, BY PRODUCERS**

(Thousand metric tons)

<table>
<thead>
<tr>
<th>Class</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wrought products:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheet, plate, foil</td>
<td>4,690</td>
<td>4,420</td>
<td>4,250</td>
</tr>
<tr>
<td>Pipe, tube, extruded shapes</td>
<td>1,920</td>
<td>1,640</td>
<td>1,430</td>
</tr>
<tr>
<td>Rod, bar, wire, cable</td>
<td>420</td>
<td>401</td>
<td>350</td>
</tr>
<tr>
<td>Forgings (including impacts)</td>
<td>134</td>
<td>126</td>
<td>97</td>
</tr>
<tr>
<td>Powder, flake, paste</td>
<td>54</td>
<td>56</td>
<td>49</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>7,220</td>
<td>6,640</td>
<td>6,180</td>
</tr>
<tr>
<td><strong>Castings:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td>335</td>
<td>315</td>
<td>254</td>
</tr>
<tr>
<td>Permanent and semipermanent mold</td>
<td>754</td>
<td>615</td>
<td>570</td>
</tr>
<tr>
<td>Die</td>
<td>1,170</td>
<td>1,260</td>
<td>1,030</td>
</tr>
<tr>
<td>Other</td>
<td>53</td>
<td>35</td>
<td>44</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2,310</td>
<td>2,230</td>
<td>1,900</td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td>9,530</td>
<td>8,860</td>
<td>8,070</td>
</tr>
</tbody>
</table>


1 Net shipments derived by subtracting the sum of producers’ domestic receipts of each mill shape from the domestic industry’s gross shipments of that shape.

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

3 Wrought products data series includes net shipments in the United States and Canada.

Source: The Aluminum Association Inc.

### TABLE 8

**U.S. EXPORTS OF ALUMINUM, BY CLASS**

<table>
<thead>
<tr>
<th>Class</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quantity (metric tons)</td>
<td>Value (thousands)</td>
</tr>
<tr>
<td>Crude and semicrude:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metals and alloys, crude</td>
<td>349,000</td>
<td>953,000</td>
</tr>
<tr>
<td>Scrap</td>
<td>1,550,000</td>
<td>3,050,000</td>
</tr>
<tr>
<td>Plates, sheets, bars, strip, etc.</td>
<td>887,000</td>
<td>3,730,000</td>
</tr>
<tr>
<td>Castings and forgings</td>
<td>21,100</td>
<td>263,000</td>
</tr>
<tr>
<td>Semifabricated forms, n.e.c.</td>
<td>39,200</td>
<td>287,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2,840,000</td>
<td>8,280,000</td>
</tr>
<tr>
<td>Manufactures:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foil and leaf</td>
<td>88,700</td>
<td>408,000</td>
</tr>
<tr>
<td>Powders and flakes</td>
<td>6,600</td>
<td>36,600</td>
</tr>
<tr>
<td>Wire and cable</td>
<td>45,700</td>
<td>179,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>141,000</td>
<td>623,000</td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td>2,980,000</td>
<td>8,910,000</td>
</tr>
</tbody>
</table>

*Revised.

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

Source: U.S. Census Bureau.
<table>
<thead>
<tr>
<th>Country</th>
<th>Quantity</th>
<th>Value</th>
<th>Quantity</th>
<th>Value</th>
<th>Quantity</th>
<th>Value</th>
<th>Quantity</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(metric tons)</td>
<td>(thousands)</td>
<td>(metric tons)</td>
<td>(thousands)</td>
<td>(metric tons)</td>
<td>(thousands)</td>
<td>(metric tons)</td>
<td>(thousands)</td>
</tr>
<tr>
<td>Brazil</td>
<td>1,930</td>
<td>$4,270</td>
<td>12,200</td>
<td>$70,800</td>
<td>4,690</td>
<td>$19,100</td>
<td>18,800</td>
<td>$94,100</td>
</tr>
<tr>
<td>Canada</td>
<td>116,000</td>
<td>315,000</td>
<td>422,000</td>
<td>1,660,000</td>
<td>158,000</td>
<td>327,000</td>
<td>696,000</td>
<td>2,310,000</td>
</tr>
<tr>
<td>China</td>
<td>1,310</td>
<td>3,660</td>
<td>23,900</td>
<td>157,000</td>
<td>803,000</td>
<td>1,590,000</td>
<td>828,000</td>
<td>1,750,000</td>
</tr>
<tr>
<td>France</td>
<td>869</td>
<td>3,590</td>
<td>10,800</td>
<td>85,600</td>
<td>203</td>
<td>563</td>
<td>13,200</td>
<td>87,200</td>
</tr>
<tr>
<td>Germany</td>
<td>2,810</td>
<td>10,900</td>
<td>9,820</td>
<td>73,300</td>
<td>1,200</td>
<td>3,060</td>
<td>13,800</td>
<td>87,200</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>668</td>
<td>1,560</td>
<td>20,400</td>
<td>101,000</td>
<td>39,900</td>
<td>92,500</td>
<td>61,000</td>
<td>195,000</td>
</tr>
<tr>
<td>Italy</td>
<td>5,800</td>
<td>5,890</td>
<td>3,850</td>
<td>39,400</td>
<td>3,570</td>
<td>18,500</td>
<td>3,570</td>
<td>18,500</td>
</tr>
<tr>
<td>Japan</td>
<td>15,000</td>
<td>37,600</td>
<td>19,100</td>
<td>191,000</td>
<td>45,900</td>
<td>111,000</td>
<td>80,000</td>
<td>195,000</td>
</tr>
<tr>
<td>Korea, Republic of</td>
<td>565</td>
<td>2,470</td>
<td>18,400</td>
<td>111,000</td>
<td>198,000</td>
<td>384,000</td>
<td>217,000</td>
<td>497,000</td>
</tr>
<tr>
<td>Mexico</td>
<td>190,000</td>
<td>516,000</td>
<td>247,000</td>
<td>988,000</td>
<td>82,400</td>
<td>166,000</td>
<td>519,000</td>
<td>1,670,000</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1,680</td>
<td>5,650</td>
<td>1,730</td>
<td>12,700</td>
<td>1,390</td>
<td>2,750</td>
<td>1,390</td>
<td>2,750</td>
</tr>
<tr>
<td>Russia</td>
<td>516</td>
<td>2,350</td>
<td>1,790</td>
<td>6,720</td>
<td>139</td>
<td>254</td>
<td>2,450</td>
<td>9,330</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>18</td>
<td>136</td>
<td>29,900</td>
<td>108,000</td>
<td>--</td>
<td>--</td>
<td>29,900</td>
<td>108,000</td>
</tr>
<tr>
<td>Singapore</td>
<td>352</td>
<td>1,260</td>
<td>6,310</td>
<td>33,600</td>
<td>134,000</td>
<td>212,000</td>
<td>181,000</td>
<td>212,000</td>
</tr>
<tr>
<td>Taiwan</td>
<td>526</td>
<td>514</td>
<td>12,200</td>
<td>47,700</td>
<td>24,800</td>
<td>38,900</td>
<td>37,600</td>
<td>87,100</td>
</tr>
<tr>
<td>Ukraine</td>
<td>573</td>
<td>4,830</td>
<td>322</td>
<td>1,310</td>
<td>--</td>
<td>--</td>
<td>895</td>
<td>6,140</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>234</td>
<td>2,240</td>
<td>21,000</td>
<td>147,000</td>
<td>1,820</td>
<td>4,100</td>
<td>23,000</td>
<td>153,000</td>
</tr>
<tr>
<td>Venezuela</td>
<td>113</td>
<td>350</td>
<td>3,050</td>
<td>14,400</td>
<td>80</td>
<td>127</td>
<td>3,250</td>
<td>14,900</td>
</tr>
<tr>
<td>Other</td>
<td>9,550</td>
<td>33,300</td>
<td>80,700</td>
<td>404,000</td>
<td>45,900</td>
<td>76,900</td>
<td>136,000</td>
<td>515,000</td>
</tr>
<tr>
<td>Total</td>
<td>349,000</td>
<td>953,000</td>
<td>947,000</td>
<td>4,280,000</td>
<td>1,550,000</td>
<td>3,050,000</td>
<td>2,840,000</td>
<td>8,280,000</td>
</tr>
</tbody>
</table>

2008:
<table>
<thead>
<tr>
<th>Country</th>
<th>Quantity</th>
<th>Value</th>
<th>Quantity</th>
<th>Value</th>
<th>Quantity</th>
<th>Value</th>
<th>Quantity</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(metric tons)</td>
<td>(thousands)</td>
<td>(metric tons)</td>
<td>(thousands)</td>
<td>(metric tons)</td>
<td>(thousands)</td>
<td>(metric tons)</td>
<td>(thousands)</td>
</tr>
<tr>
<td>Brazil</td>
<td>400</td>
<td>1,120</td>
<td>9,820</td>
<td>63,800</td>
<td>3,400</td>
<td>10,200</td>
<td>14,500</td>
<td>75,100</td>
</tr>
<tr>
<td>Canada</td>
<td>103,000</td>
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<td>5,710</td>
<td>24,300</td>
<td>179,000</td>
<td>849</td>
<td>2,580</td>
<td>26,300</td>
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<td>182</td>
<td>772</td>
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<td>502</td>
<td>769</td>
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<td>86,100</td>
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<td>993,000</td>
<td>4,710,000</td>
<td>1,980,000</td>
<td>3,420,000</td>
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</tbody>
</table>

1Revised. — Zero.

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

2Includes castings, forgings, and unclassified semifabricated forms.

Source: U.S. Census Bureau.
### TABLE 10
U.S. IMPORTS FOR CONSUMPTION OF ALUMINUM, BY CLASS

<table>
<thead>
<tr>
<th>Class</th>
<th>Quantity (metric tons)</th>
<th>Value (thousands)</th>
<th>Quantity (metric tons)</th>
<th>Value (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007</td>
<td>2008</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crude and semicrude:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metals and alloys, crude</td>
<td>2,950,000</td>
<td>$8,290,000</td>
<td>2,790,000</td>
<td>$7,810,000</td>
</tr>
<tr>
<td>Plates, sheets, strip, etc., n.e.c.</td>
<td>801,000</td>
<td>3,070,000</td>
<td>693,000</td>
<td>2,770,000</td>
</tr>
<tr>
<td>Pipes, tubes, etc.</td>
<td>34,300</td>
<td>254,000</td>
<td>34,200</td>
<td>271,000</td>
</tr>
<tr>
<td>Rods and bars</td>
<td>235,000</td>
<td>985,000</td>
<td>186,000</td>
<td>825,000</td>
</tr>
<tr>
<td>Scrap</td>
<td>471,000</td>
<td>803,000</td>
<td>494,000</td>
<td>853,000</td>
</tr>
<tr>
<td>Total</td>
<td>4,490,000</td>
<td>13,400,000</td>
<td>4,200,000</td>
<td>12,500,000</td>
</tr>
<tr>
<td>Manufactures:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foil and leaf</td>
<td>127,000</td>
<td>586,000</td>
<td>130,000</td>
<td>590,000</td>
</tr>
<tr>
<td>Powders and flakes</td>
<td>9,480</td>
<td>42,600</td>
<td>9,150</td>
<td>43,000</td>
</tr>
<tr>
<td>Wire</td>
<td>194,000</td>
<td>598,000</td>
<td>185,000</td>
<td>574,000</td>
</tr>
<tr>
<td>Total</td>
<td>330,000</td>
<td>1,230,000</td>
<td>325,000</td>
<td>1,210,000</td>
</tr>
<tr>
<td>Grand total</td>
<td>4,820,000</td>
<td>14,600,000</td>
<td>4,530,000</td>
<td>13,700,000</td>
</tr>
</tbody>
</table>

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

2Includes circles, disks, plates, and sheets.

3Excludes etched capacitor foil.

Source: U.S. Census Bureau.
<table>
<thead>
<tr>
<th>Country</th>
<th>2007:</th>
<th>2008:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quantity (metric tons)</td>
<td>Value (thousands)</td>
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<td>$158,000</td>
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<td>Australia</td>
<td>55,700</td>
<td>159,000</td>
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<tr>
<td>Bahrain</td>
<td>36,100</td>
<td>106,000</td>
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<tr>
<td>Belgium</td>
<td>94</td>
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<tr>
<td>Brazil</td>
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<td>225,000</td>
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<tr>
<td>Canada</td>
<td>1,930,000</td>
<td>5,390,000</td>
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<td>China</td>
<td>37,700</td>
<td>107,000</td>
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<td>France</td>
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<td>894</td>
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<td>105,000</td>
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<td>16,600</td>
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<td>--</td>
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<tr>
<td>Venezuela</td>
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<tr>
<td>Other</td>
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<tr>
<td>Total</td>
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<td>8,290,000</td>
</tr>
</tbody>
</table>

1 Revised. -- Zero.

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

2 Includes circles, disks, pipes, rods, tubes, etc.

Source: U.S. Census Bureau.
### TABLE 12
ALUMINUM, PRIMARY: WORLD PRODUCTION, BY COUNTRY

* (Thousand metric tons)

<table>
<thead>
<tr>
<th>Country</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
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<td>273</td>
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<td>343</td>
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<td>1,900</td>
<td>1,930</td>
<td>1,960</td>
<td>1,970</td>
</tr>
<tr>
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<td>30</td>
<td>32</td>
<td>32</td>
<td>39</td>
<td>40</td>
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<tr>
<td>Bahrain</td>
<td>532</td>
<td>751</td>
<td>872</td>
<td>865</td>
<td>865</td>
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<td>131</td>
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<td>123</td>
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<td>1,660</td>
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<td>87</td>
<td>91</td>
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<td>2,890</td>
<td>3,050</td>
<td>3,080</td>
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<td>7,800</td>
<td>9,360</td>
<td>12,600</td>
<td>13,200</td>
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<td>551</td>
<td>550</td>
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<td>--</td>
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<td>286</td>
<td>290</td>
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<td>3,720</td>
<td>3,960</td>
<td>3,800</td>
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<td>910</td>
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<td>365</td>
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<td>615</td>
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<td>610</td>
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<td><strong>Total</strong></td>
<td>29,900</td>
<td>31,900</td>
<td>33,900</td>
<td>38,000</td>
<td>39,000</td>
</tr>
</tbody>
</table>

1 World totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.
2 Primary aluminum is defined as “The weight of liquid aluminum as tapped from pots, excluding the weight of any alloying materials as well that of any metal produced from either returned scrap or remelted materials.” International reporting practices vary from country to country, some nations conforming to the foregoing definition and others using different definitions. For those countries for which a different definition is given specifically in the source publication, that definition is provided in this table by footnote. Table includes data available through May 13, 2009.
3 Reported figure.
4 Primary ingot plus secondary ingot.
5 Ingot and rolling billet production.
TABLE 12—Continued
ALUMINUM, PRIMARY: WORLD PRODUCTION, BY COUNTRY\textsuperscript{1,2}

<table>
<thead>
<tr>
<th>Year</th>
<th>Production (metric tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>55,400</td>
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<tr>
<td>2005</td>
<td>45,400</td>
</tr>
<tr>
<td>2006</td>
<td>49,700</td>
</tr>
<tr>
<td>2007</td>
<td>55,000 (estimated)</td>
</tr>
<tr>
<td>2008</td>
<td>52,000 (estimated)</td>
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</tbody>
</table>

\textsuperscript{1}Primary ingot.
\textsuperscript{2}Excludes high purity aluminum containing 99.995\% or more as follows, in metric tons: 2004—55,400; 2005—45,400; 2006—49,700; 2007—55,000 (estimated); and 2008—52,000 (estimated).
\textsuperscript{3}Montenegro and Serbia formally declared independence in June 2006, from each other and dissolved their union.
\textsuperscript{4}Primary unalloyed ingot plus secondary unalloyed ingot.
\textsuperscript{5}Primary unalloyed metal plus primary alloyed metal, thus including weight of alloying material.