2017 Minerals Yearbook

SALT [ADVANCE RELEASE]

U.S. Department of the Interior
U.S. Geological Survey

July 2021

Salt

By Wallace P. Bolen

Domestic survey data and tables were prepared by Annie Hwang, statistical assistant.

The United States was the world's leading salt-producing nation until 2005, when China surpassed the United States to become the world leader. Total U.S. salt production in 2017 decreased by 5% to 39.6 million metric tons (Mt) compared with production in 2016 (table 1), making the United States the second-ranked salt-producing nation. Global salt production in 2017 was 286 Mt with 66.5 Mt produced in China (table 13).

Salt, also known as sodium chloride, consists of the elements sodium and chlorine. Sodium is a silver-colored metal that is so unstable that it reacts violently in the presence of water, and chlorine is a greenish-colored gas that is dangerous and may be lethal; yet combined, these two elements form sodium chloride, which is a white crystalline compound essential to life itself. Virtually every person in the world has some direct or indirect contact with salt daily. People routinely add salt to their food as a flavor enhancer or apply rock salt to walkways to remove ice in the winter. Salt is used as feedstock for chlorine and caustic soda manufacture. These two inorganic chemicals are used to make many consumer-related end-use products, such as polyvinyl chloride (PVC), a plastic made from chlorine, and paper-pulping chemicals manufactured from sodium hydroxide (caustic soda).

Production

U.S. production and sales data for salt were developed by the U.S. Geological Survey (USGS) from an annual survey of U.S. salt-producing sites and company operations (table 2). Production refers to the quantity of salt mined or manufactured that is available for sale. Salt sold or used is the quantity of salt that was sold directly to customers or used by the salt producer, which usually is a chloralkali (chlorine and sodium hydroxide) manufacturer. The data in table 2 are rated capacities for mines and refineries as of December 31, 2017. Rated capacity is defined as the maximum quantity of product that can be produced in a time period on a normally sustainable long-term operating rate, based on the physical equipment of the plant, and given acceptable routine operating procedures involving energy, labor, maintenance, and materials.

Five of the seven leading producing States were, in descending order of total salt sold or used, Louisiana with 31%; Texas, 19%; New York, 16%; Kansas, 6%; and Utah, 5%. Ohio and Michigan were among the top seven salt-producing States in total quantity of salt sold or used, but their rankings were withheld to avoid disclosing company proprietary data (table 5). The distribution of domestic and imported evaporated and rock salt to each State and the District of Columbia in 2017 is reported in table 7.

The USGS does not survey small-scale producers of culinary "sea salt" operating from several locations in the United States. Most of these operations are located along the Atlantic, gulf, or Pacific coasts, but some interior operations extract brine for specialty salt production. These boutique operations, in total, are thought to annually produce less than 100 metric tons (t) of sea salt.

Crestwood Equity Partners announced the sale of US Salt LLC (Watkins Glen, NY) to Kissner Group Holdings LP in November. US Salt was founded in 1893 and was purchased in August 2008 by Inergy Midstream LP, a predecessor of Crestwood (Shaw, 2017).

Morton Salt, Inc. disclosed plans to expand its Weeks Island, LA, salt mine to improve the mines processing abilities and modernize operating equipment. The expansion was completed in 2017 and increased capacity to 2.1 million metric tons per year (Mt/yr) (2.3 million short tons per year). The Weeks Island rock salt mine supplies salt for agricultural, chemical, and deicing uses (Morton Salt, Inc., 2017).

The four types of salt that were surveyed were classified according to the method of recovery as follows: vacuum pan salt, from mechanical evaporation of a purified brine feedstock; solar salt, from solar evaporation of seawater, landlocked bodies of saline water, or primary or byproduct brines; rock salt, from surface or underground mining of halite deposits; and salt brine, from solution mining of underground halite deposits. Data for brine production and consumption represent anhydrous salt content only and not the weight of the water (tables 3, 4).

Vacuum Pan Salt.—Vacuum pan salt production was 4.12 Mt in 2016, a slight increase compared with the 2016 total of 4.05 Mt (table 1). Mechanical evaporation of salt by the vacuum pan process is dependent on the number and size of the vacuum crystallizers operating in series. Rated capacities in table 2 were established by using proven design performance of the equipment.

Although rock salt, solar salt, and salt brine may be used to make vacuum pan salt, virtually all domestic vacuum pan salt is obtained from solution mining of underground salt formations. Vacuum pan salt is obtained by dehydrating brine using heat alone or in combination with a vacuum. The grainer or open-pan process uses open, rectangular pans with steam-heated immersion coils to evaporate the water in the brine. The final product is usually flake shaped rather than the typical cubic form. Flake salt is preferred for the production of baked goods, butter, and cheese.

Solar Salt.—Solar salt production was 3.34 Mt in 2017, an 15% increase from the 2016 total of 2.9 Mt (table 1). Because evaporation rates must exceed precipitation rates, the climatic conditions and geographic locations of solar evaporation facilities are critical to the successful production and harvesting of solar salt. Therefore, rated capacities in table 2 generally are based on the historical evaporation patterns within a region and differ depending on the location and the surface acres of the evaporation ponds. Only unpredictable seasonal precipitation and market conditions usually affect the production rates of the facilities.

Rock Salt.—In 2017, rock salt production was 16.5 Mt, an 8% decrease compared with the 2016 total of 17.9 Mt (table 1). Rock salt is mined by the room-and-pillar method, which is similar to that used in coal and trona mining. Rock salt producers operated at lower rates in 2017 because of decreased demand from road salt consumers.

Because most rock salt is used for deicing, the operating rate of rock salt facilities fluctuates with the demand for deicing salt, which is dependent on the severity of winter weather conditions. During periods of strong demand, production levels often achieve, or exceed in certain situations, the rated capacities. Full mine capacity generally is a function of the hoisting capabilities of the mine. For the production capacities of domestic rock salt operations listed in table 2, it was assumed that the workweek is 5 days (250 workdays per year) with two working shifts, one maintenance shift per day, and at least one short-term planned turnaround for the mine and mill per year.

Salt Brine.—U.S. salt brine production in 2017 was 15.6 Mt, 7% less than that of 2016 (table 1). Brine production capacities are difficult to derive because they are based on the variabilities of the injection rate of the solvent and the dissolution rates of the underground salt bodies, both of which determine the quantity of brine produced. In turn, these production levels are usually dependent on the demand for the products that the brine is being used to manufacture.

Solution mining is used to obtain a sodium chloride feedstock for vacuum pan salt production and for chlorine, caustic soda, and synthetic soda ash manufacture. Synthetic soda ash, however, is not produced in the United States. The quantity of underground salt dissolved and recovered as brine to make vacuum pan salt usually is not reported as primary salt production; only the quantity of vacuum pan salt manufactured is reported. The quantity of brine used to make chloralkali chemicals is reported as either the amount of captive brine used or brine sold. The chemical industry is the leading consumer of salt brine worldwide.

Consumption

Direct and indirect uses of salt number about 14,000, according to industry sources. The USGS annually surveys eight major categories comprising 29 end uses. The 2017 reported consumption (sales or use as reported by the salt companies, including their exports and imports) was 45.5 Mt, and the distribution of salt by major end use was ice control, 43%; chemicals, 37%; distributors (grocery and other wholesalers and retailers and so forth), 9%; food processing, 3.8%; agricultural, 2.8%; general industrial, 1.5%; other uses combined with exports, 1.3%; and primary water treatment, 1% (table 6).

In 2017, apparent consumption (salt sold or used plus imports minus exports) was 49.7 Mt (table 1). Reported consumption statistics are those reported only by domestic salt-producing companies. Apparent consumption normally is greater than reported consumption because apparent consumption includes additional quantities of salt imported and exported by non-salt-producing companies, such as some chloralkali operations and salt distributors, especially importers along the northeastern coast of the United States, primarily for snow and ice control.

Distributors represented a substantial share of salt sales by the salt industry; all of this salt was ultimately resold to a variety of end users. For a more complete analysis of end-use markets, specific sectors of distribution listed in table 6 can be combined, such as agricultural and water treatment quantities reported by salt producers and those supplied by distributors. Aside from the various types of salt, there are distinctions in packaging and applications of salt. Salt for human consumption is packaged in various sized containers for several specialized purposes.

Ice Control and Road Stabilization.—In 2017, U.S. consumption of salt for this application was 19.6 Mt, which was about 4% less than that of 2016. After relatively high consumption for this use from 2013 through 2015, consumption began to decrease in late 2015 and remained at this lower level throughout 2017.

The use of salt brine for road deicing has been increasing during the past several years. Regular rock salt can be dissolved to create a salt brine solution, which is used as pretreatment prior to ice or snow accumulation.

Salt is an inexpensive, widely available, and effective ice-control agent. It does, however, become less effective as temperatures decrease below about 9.5 °C to 6.5 °C (15 °F to 20 °F). At lower temperatures, more salt must be applied to maintain higher brine concentrations to provide the same degree of melting. Most winter snowstorms and ice storms happen when temperatures are between 4 °C and 0 °C (25 °F and 32 °F), the range in which salt is most effective.

In highway deicing, salt has been associated with corrosion of bridge decks, motor vehicles, reinforcement bar and wire, and unprotected steel structures used in road construction. Surface runoff, vehicle spraying, and windblown actions also affect soil, roadside vegetation, and local surface water and groundwater supplies. Although evidence of environmental loading of salt has been found during peak use, spring rains and thaws usually dilute the concentrations of sodium in the area where salt was applied. However, when the salt leaches from the immediate environment adjacent to roads, it sometimes collects in lakes and other inland freshwater bodies, potentially changing water chemistry and affecting ecosystems and communities that use this water.

The quantity of salt consumed for road deicing each year is directly related to the severity of the winter weather conditions. Long-range forecasting of salt consumption in this application is extremely difficult because of the complexities in long-range forecasting of the weather.

Severe winter weather began in December 2016 for the 2016–17 season, and road crews were active throughout the United States in the East and Midwest (Illinois, Indiana, Missouri, New York, Pennsylvania, Wisconsin) and in the West (Colorado, Idaho, Oregon, Utah, Washington). Compared with that of the previous year, December 2016 had much colder weather and stronger demand for road clearing salts and brines, but most users were well stocked with salt, which was delivered at lower unit prices than those of the previous year (Barrett, 2016; Eherts, 2016; Hermiston, 2016; Parkinson, 2016; Payerchin, 2016).

Severe cold and icy conditions continued into early January, followed by a period of mild weather in late January. Some northern Midwest areas reported higher salt use compared

with the previous year's below average use; consumption rose to average levels amid concerns about decreasing stockpiles (Alexander, 2017; Legge, 2017). Other areas of the Midwest, particularly Illinois and Indiana reported low usage of salt and extensive stockpiles (Brumfield, 2017). Substantial salt use was reported in the States of Washington and Connecticut in early February, but many of the States in between were consuming lower than average quantities of salt (Meyers, 2017; Skalka, 2017).

By early April, many locales reported that the winter was milder than average, resulting in less salt being used and surpluses to carry into the next season. The winter of 2016–17 concluded 2 consecutive years of below average salt use, which led to lower demand for the subsequent 2017–18 season. In the fall of 2017, unit prices for salt were lower than the previous year, according to Government agencies in many locations, including Michigan, Pennsylvania, and Wisconsin. Early season snow was reported in the Mohawk River valley of New York in mid-November and the mountains of North Carolina in mid-December. Late December brought frigid temperatures and slick roads to parts of the Midwest and snow in Montana and Oregon. A large snowfall at yearend in Erie, PA, blanketed the area with 60 inches of snow, setting snowfall records. Lake effect snow affected the Rochester, NY, region, requiring more salt in late December than was used the entire previous winter.

In addition to use on highways during winter weather, salt can be added to soil to stabilize it and to provide firmness to the foundation upon which highways are built. The salt also acts to minimize the effects of changes in humidity and traffic load, which can cause shifting in the subsurface.

Chemical.—Since 1941, when the U.S. Bureau of Mines began collecting end-use data for salt, the leading consumer of salt, primarily as salt brine, has been the chemical industry, except for 2011 and 2013–17 when salt for road deicing led. Salt brine is extracted from natural underground saline sources or solution-mined halite deposits (salt beds or salt domes) or produced through the dissolution of solar salt. Within this industry, the chloralkali sector remains the major consumer of salt for manufacturing chlorine, coproduct sodium hydroxide (caustic soda), and synthetic soda ash. Since 1986, when the last domestic synthetic soda ash plant was closed because of high production costs and its inability to compete with less expensive natural soda ash, no synthetic soda ash has been manufactured in the United States; many countries, however, continue to produce synthetic soda ash and use vast quantities of salt brine as feedstock. Total salt sold or used by the chemical industry was 17 Mt in 2017 (table 6).

Salt is used as the primary raw material in chlorine manufacture because it is an inexpensive and widely available source of chlorine ions. For sodium hydroxide production, salt is the main source of sodium ions. Chlorine and caustic soda are classified as the first generation of products made from salt. These two chemicals are used to manufacture other materials, such as household cleaners, plastics, and solvents for dry cleaning, which are classified as the second generation of products made from salt. Although most salt brine is produced by the same companies that use it, many chloralkali manufacturers now purchase brine from independent brine supply companies. In certain cases, brine is produced by a chemical company that uses some of it and sells the excess to neighboring competitors. According to industry sources, about 48% of the salt used to manufacture chlorine was captive (produced by the chloralkali companies), and 31% was purchased brine; domestically purchased solar salt and rock salt accounted for 12% of the supply, and imported rock, solar, and vacuum pan salt, combined, accounted for 9%.

The industry average ratio is that 1.75 t of salt is required to produce 1.0 t of chlorine and 1.1 t of joint-product sodium hydroxide. Reported consumption of total domestic and imported salt for chlorine manufacture was 17 Mt (table 6); however, the data do not include salt imported directly by the chlorine producers or captive brine produced by them.

In August, Tropical Storm Harvey floodwaters had a severe effect on chloralkali production in the gulf coast, disrupting about 37% of U.S. production for an extended period (Kaskey, 2017). In the aftermath of the damage to facilities, pricing of chloroalkali products increased, and higher prices stayed in place through yearend.

Salt is also used as a feedstock in chemical plants that make sodium chlorate, metallic sodium, and other downstream chemical products. In powdered soaps and detergents, salt is used as a bulking agent and a coagulant for colloidal dispersion after saponification. In pharmaceuticals, salt is a chemical reagent and is used as the electrolyte in saline solutions. It is used with sulfuric acid to produce sodium sulfate and hydrochloric acid. The "Other chemical" subsector is relatively small, representing about 10% of domestic salt sales for the entire chemical sector and only 4% of total domestic salt consumption. The amount of salt consumed in this category decreased by 6% in 2017 compared with the level in 2016.

The consumption of salt for metallic sodium has declined during the past several years. The Chemours Co. was the sole manufacturer of metallic sodium in the United States in 2017. The domestic market for metallic sodium decreased because sodium metal was no longer needed to produce leaded gasolines. The leading use of sodium metal was for sodium borohydride production, the feedstock for sodium dithionite, which was used as a reductive bleaching agent by the pulp and paper industry. Sodium metal also is used to manufacture sodium azide, which is used in automotive air bags and as a power-reducing agent in the alternative polysilicon manufacturing processes. Other potential uses of sodium metal are in the remediation of chemical weapons, chlorofluorocarbons, pesticides, and polychlorinated biphenyls.

Distributors.—A large quantity of salt is marketed through distributors, some of which specialize in agricultural and water treatment services—two sectors in which the salt companies also have direct sales (table 6). Distributor sales also include grocery wholesalers and (or) retailers, institutional wholesalers, U.S. Government resale, and other wholesalers and retailers. Total salt sold to distributors was 4.1 Mt in 2017.

Food Processing.—Nearly every person uses some quantity of salt in food. Aside from table salt, sodium is found in many processed foods. Salt is added to food by the food processor or by the consumer as a flavor enhancer, preservative, binder, fermentation-control additive, texture-control agent, and color

developer. Table salt may contain 0.01% potassium iodide as an additive to provide a source of iodine, which is essential to the oxidation processes in the human body. Kosher salt, sea salt, condiment salt, and salt tablets are varieties of salt, which are mostly used for human consumption.

The food-processing category is subdivided, in descending order of salt consumption, into other food processing, meat packers, canning, baking, dairy, and grain mill products. Total salt sold for food processing was 1.73 Mt in 2017, slightly less than that of 2016 (table 6).

In meat packing, salt is added to processed meats to promote color development in bacon, ham, and other processed meat products. As a preservative, salt inhibits the growth of bacteria, which leads to spoilage of the product. Salt in sausages forms a binding gel made up of meat, fat, and moisture. Salt also acts as a flavor enhancer and as a tenderizer.

In canning, salt is primarily added as a flavor enhancer and preservative. It also is used as a carrier for other ingredients, dehydrating agent, enzyme inhibitor, and tenderizer.

In the dairy industry, salt is added to cheese as a color-, fermentation-, and texture-control agent. The dairy subsector includes companies that manufacture creamery butter, condensed and evaporated milk, frozen dairy desserts, ice cream, natural and processed cheese, and specialty dairy products.

In baking, salt is added to control the rate of fermentation in bread dough. It also is used to strengthen the gluten (the elastic protein-water complex in certain doughs) and as a flavor enhancer, including as a topping on baked goods.

The food-processing category also contains grain mill products. These products consist of milling flour and rice, manufactured cereal breakfast food, and blended or prepared flour.

In the "Other food processing" category, salt is used mainly as a seasoning agent. This category includes miscellaneous establishments that make food for human consumption (such as potato chips and pretzels) and for domestic pet consumption (such as cat and dog food).

Agricultural.—Barnyard and grazing livestock need supplementary salt rations to maintain proper nutrition. In 2017, 1.28 Mt of salt was sold to the agricultural industry (table 6). Animal feed and water conditioning salt are pressed into 22.7-kilogram (50-pound) blocks. Iodine, sulfur, trace elements, and vitamins are occasionally added to salt blocks to provide nutrients not found naturally in the diet of certain livestock.

General Industrial.—The industrial uses of salt are diverse. They include, in descending order of quantity consumed, oil and gas exploration, other industrial applications, pulp and paper, metal processing, tanning and leather treatment, textiles and dyeing, and rubber manufacture. Total salt sold to these sectors declined by 19% to 674,000 t in 2017 compared with 832,000 t in 2016 (table 6).

In oil and gas exploration, salt is an important component of drilling fluids used in well drilling. It is used to flocculate and increase the density of the drilling fluid to overcome high downwell gas pressures. When a drill hits a salt formation, salt is added to the drilling fluid to saturate the solution and to minimize the dissolution within the salt stratum. Salt is also used to increase the set rate of concrete in cemented casings.

In the pulp and paper industry, salt is used to bleach wood pulp. It also is used to make sodium chlorate, which is added along with sulfuric acid and water to manufacture chlorine dioxide, a strong oxygen-based bleaching chemical. The chlorine dioxide process, which originated in Germany after World War I, has become more popular because of efforts to reduce or eliminate other bleaching compounds containing chlorine.

In metal processing, salt is used in concentrating uranium ore into uranium oxide (yellow cake). It also is used in aluminum, beryllium, copper, steel, and vanadium processing.

In tanning and leather treatment, salt is added to animal hides to inhibit microbial activity on the underside of the hides and to attract moisture back into the hides. In rubber manufacture, salt is used to make buna, neoprene, and white type rubbers. Salt brine and sulfuric acid are used to coagulate an emulsified latex made from chlorinated butadiene.

In textiles and dyeing, salt is used as a brine rinse to separate organic contaminants, to promote "salting out" of dyestuff precipitates, and to blend with concentrated dyes to standardize them. One of its main roles is to provide the positive ion charge to promote the absorption of negatively charged ions of dyes.

Water Treatment.—Many areas of the United States have hard water, which contains excessive calcium and magnesium ions that contribute to the buildup of a scale or film of alkaline mineral deposits in household and industrial equipment and pipes. Many commercial and residential water-softening units use salt to remove the ions that cause the hardness. Salt is compressed into pellets that are used for water conditioning. The sodium ions captured on a resin bed are exchanged for the calcium and magnesium ions. Periodically, the water-softening units must be recharged because the sodium ions become depleted. Salt is added and dissolved, and brine replenishes the lost sodium ions. In 2017, 471,000 t of salt was sold for primary water treatment, and an additional 447,000 t was sold for water conditioning by distributors (table 6).

Transportation

Because the locations of the salt supplies often are not near consumers, transportation costs significantly add to the price of salt. In some cases, shipping costs are higher than the actual value of the salt. Pumping salt brine through pipelines is an economic means of transportation but cannot be used for dry salt. Large bulk shipments of dry salt in ocean freighters or river barges are low in cost but are restricted in points of origin and consumption. River and lake movement of salt in winter is often severely curtailed because of frozen waterways.

Transoceanic imports of salt have been increasing in some areas of the United States because they are cost competitive with purchasing salt from domestic suppliers and transporting it using barge, rail, or truck. One important factor that often determines the quantity of salt that can be imported is the depth of the channels and the ports; many ports are not deep enough to accommodate larger ships. When salt is packaged, handled, and shipped in smaller units, the costs increase and are reflected in higher selling prices.

Prices

The four types of salt that are produced have unique production, processing, and packaging factors that determine the selling prices. Generally, salt sold in bulk is less expensive than salt that has been packaged, pelletized, or pressed into blocks. Salt in brine is the least expensive salt sold because mining and processing costs are lower. Vacuum pan salt is the most expensive because of its purity and the higher energy costs involved in processing.

Price quotations are not synonymous with average unit values reported to the USGS. The quotations do not necessarily represent prices at which transactions actually took place, or bid and asked prices. The annual average unit values, as collected by the USGS and listed in table 8, represent a national average unit value for each of the types of salt and the various product forms.

Foreign Trade

In the Harmonized Tariff Schedule of the United States (HTS), imports are aggregated under one category named "Salt (including table and denatured salt) and pure sodium chloride, whether or not in aqueous solution, seawater." The HTS code for salt is 2501.00.0000. The same classification also applies to exports. Although several other HTS codes pertain to various salt classifications, the United States aggregates shipments under one code because the sums of individual subclassifications fail to meet the minimum dollar requirements necessary for individual listings.

Based on U.S. Census Bureau data for 2017, the United States exported 1.12 Mt of salt; this was a 53% increase compared with that of 2016 (table 9). In 2017, most exports (85%) were to Canada. Salt was shipped to 115 countries through 36 customs districts; the Cleveland, OH, customs district exported the most by tonnage and represented 36% of the U.S. total. No other customs district exported more than 10% of the U.S. total (table 10). Large percentage increases in exports and imports are normally in response to increased demand for rock salt for deicing related to the frequency and severity of winter storms in Canada and the United States.

The United States imported 12.6 Mt of salt from 60 countries in 2017, which was 4% more than was imported during 2016 (table 1, 11). Chile was the leading source of imports, supplying about 34% of the total, followed by Canada (29%). Table 12 lists the imports of salt by customs district. Of the 40 customs districts that imported salt in 2017, the New York City, NY, customs district led in terms of tonnage, accounting for about 16% of the total, followed by Boston, MA (14%); and Detroit, MI, and Milwaukee, WI (9% each).

The quantity of salt imports was about 11 times that of exports. Net salt imports also represented about 23% of U.S. apparent consumption, indicating the magnitude of the U.S. reliance on salt imports. Most imported salt was brought into the country by foreign subsidiaries of major U.S. salt producers. Generally, imported salt can be purchased and delivered to many U.S. customers at prices lower than the comparable domestic product because production costs are lower abroad, currency exchange rates may cause the price of imported salt to be lower than the price of domestic salt, and ocean freight rates are less expensive than overland rail or truck rates.

World Review

Table 13 lists world salt production statistics for 93 countries or localities based on reported and estimated information. In 2017, the total world production increased slightly to about 286 Mt. The United States remained the second-ranked salt-producing country, representing 14% of total world output. China has rapidly increased its production in the 21st century from 37 Mt in 2004 to 66.5 Mt in 2017, making it the leading salt producer in the world.

Australia.—Exports of salt, mainly to China, continued to grow as new and expanded salt production projects were proposed or reported throughout the year. BC Iron Ltd., in association with Kalium Lakes, Ltd, worked to become the first sulfate of potash producer in Australia. The two companies were considering expanded cooperation to develop the Mardie project in Western Australia to produce 3 Mt/yr of solar salt (East, 2017).

Bahamas, The.—The Morton Salt facility on Great Inagua island of the Bahamas, which supplies salt to the United States market, was damaged by a hurricane in September (Wells, 2017). The plant resumed limited operations near the end of October (McKenzie, 2017).

Canada.—Compass Minerals International, Inc. reduced operations at its Goderich, Ontario, salt mine in the fall. The mine experienced "geologic movements" which led to a ceiling fall at the mine. The reduction in operations reduced supply options for some consumers of this salt in the United States and put upward pressure on unit pricing for road salt (de la Paz, 2017).

China.—Salt consumption in China remained the prime reason for world salt production growth, and imports of salt, especially from Australia and India increased significantly in 2017 compared with those of the previous year. Demand from the chloralkali industry increased following increased output after production cutbacks in 2016 (Roskill Information Services Ltd., 2017a).

Ethiopia.—Danakil Industrial planned to open a salt processing facility in Berhale. The 600,000-metric-ton-per-year (t/yr) plant was expected to produce industrial salt, table salt, salt for animal feed, and salt for export (Roskill Information Services Ltd., 2017c).

Indonesia.—Although salt production recovered in 2017 after rain hindered production in 2016, domestic supplies were not able to meet all the demand. The Government announced plans to facilitate imports, but the Indonesian Salt Farmers Association was concerned that the quantities allowed were excessive and would hurt domestic salt producers (Jakarta Post, 2018a, b).

Kazakhstan.—Salt derived from the Aral Sea was exported to Azerbaijan and Georgia in the second half of the year. Araltuz JSC, Kyzylorda Region, produced the salt and announced plans to export salt to China and countries in Eastern Europe (AzerNews, 2017).

Namibia.—Gecko Salt announced a plan to increase production capacity to 1 Mt/yr at its 200,000-t/yr Cape Cross plant in November. Gecko made its first shipment of 25,000 t to North America in August (Roskill Information Services Ltd., 2017b).

Peru.—GrowMax Resources Corp. announced a pilot study at its Bayovar potash property to extract potash and salt by solution mining. Salt production was expected to be about 185,000 t/yr (GrowMax Resources Corp., 2017).

Spain.—Akzo Nobel N.V. completed a packaging facility for high-purity vacuum salt in Suria, near Barcelona. The new 750,000-t/yr operation was part of a joint venture using coproduct salt from partner ICL Iberia's production of potash (Akzo Nobel N.V., 2017).

Outlook

The United States continues to be one of the leaders in salt production, consumption, and world trade. Solar salt and vacuum pan salt production and consumption have been constant and are expected to remain stable. Rock salt production and consumption are heavily dependent on the severity of winter weather. The more severe winter weather in some areas of the United States during the 2017–18 winter season will likely increase salt consumption and production in 2018, compared with that of the previous year.

Because salt is a relatively low-value commodity, the shipping cost for oceanic, rail, or truck transportation can be an important determining factor when attempting to secure supply sources from either domestic or foreign locations. As energy prices change, one mode of transportation may be more cost effective than others. Excluding deicing salt, domestic salt consumption may fluctuate but is likely to continue to increase with population growth.

China and the United States are both net importers of salt, and the leading exporters of salt are Australia, Chile, India, and Mexico. Most growth in consumption is projected to come from the chemicals sector as production of chloralkali products increase.

References Cited

Akzo Nobel N.V., 2017, Spanish salt venture opens new markets for AkzoNobel: Amsterdam, Netherlands, Akzo Nobel N.V. media release, June 6. (Accessed June 27, 2017, at https://www.akzonobel.com/en/for-media/media-releases-and-features/spanish-salt-venture-opens-new-markets-akzonobel.)

Alexander, Jeff, 2017, Road salt supplies dwindle: Cooperstown, WI, WBAY, January 25. (Accessed January 26, 2017, at http://wbay.com/2017/01/25/road-salt-supplies-dwindle/.)

AzerNews, 2017, Azerbaijan begins to import Aral salt: AzerNews [Baku, Azerbaijan], September 15. (Accessed September 18, 2017, at https://www.azernews.az/business/119059.html.)

Barrett, Rick, 2016, Salt and brine trucks hit the streets: Milwaukee [WI] Journal Sentinel, December 10. (Accessed December 16, 2016, at http://www.jsonline.com/story/news/local/2016/12/10/salt-and-brine-trucks-hit-streets/95269858/.)

Brumfield, Rebecca, 2017, Low demand, high supply of salt: Terre Haute, IN, WTWO-TV WAWV-TV, January 27. (Accessed January 28, 2017, at http://www.mywabashvalley.com/news/low-demand-high-supply-of-salt/646389757.)

de la Paz, Fabian D.M., 2017, Compass Minerals lowers full-year EPS outlook on reduced ops at Ontario mine: SNL.com, September 22. (Accessed September 26, 2017, via https://www.snl.com/web/client?auth=inherit#news/article?id=42053538&KeyProductLinkType=4.)

East, Angie, 2017, BC Iron strikes earn-in deal for Australian potash project: SNL.com, March 1. (Accessed March 5, 2017, via https://www.snl.com/web/client?auth=inherit#news/article?id=39658098&KeyProductLinkType=1.)

Eherts, Faith, 2016, Northwestern US snow to take aim at Salt Lake City, Denver at midweek: Accuweather, December 6. (Accessed December 15, 2016, at http://www.accuweather.com/en/weather-news/coastal-storm-to-drop-wintry-mix-from-seattle-to-portland-oregon-early-this-week/70000179).

GrowMax Resources Corp., 2017, GrowMax announces results of sulfate of potash study: Calgary, Alberta, Canada, GrowMax Resources Corp. press release, February 6. (Accessed February 9, 2017, at https://www.bloomberg.com/press-releases/2017-02-06/growmax-announces-results-of-sulfate-of-potash-study-iyu5hmg4.)

Hermiston, Lee, 2016, This season—Sand and salt supplies looking good ahead of winter: The Gazette [Cedar Rapids, IA], December 17. (Accessed December 21, 2016, at http://www.thegazette.com/subject/news/government/local/this-season-sand-and-salt-supplies-looking-good-ahead-of-winter-20161217.)

Jakarta Post, 2018a, Govt to facilitate salt imports: News Desk, Jakarta [Indonesia] Post, January 19. (Accessed January 19, 2018, at http://www.thejakartapost.com/news/2018/01/19/govt-to-facilitate-salt-imports.html.)

Jakarta Post, 2018b, Salt producer association rejects 3.7 million tons of salt: News Desk, Jakarta [Indonesia] Post, January 22. (Accessed January 31, 2018, at http://www.thejakartapost.com/news/2018/01/22/salt-producer-association-rejects-3-7-million-tons-of-salt.html.)

Kaskey, Jack, 2017, Harvey disrupts more than one third of U.S. chemical production: Bloomberg News, August 28. (Accessed August 29, 2017, at https://www.bloomberg.com/news/articles/2017-08-28/harvey-disrupts-more-than-one-third-of-u-s-chemical-production.)

Legge, Ed, 2017, Salt-sand shortage, conditions led to school closings: Mauston, WI, Wisconsin Dells Events, January 20. (Accessed January 22, 2017, at http://www.wiscnews.com/wisconsindellsevents/news/local/article_3347dc56-bd60-5349-8ec3-97c4e05580da.html.)

McKenzie, Natario, 2017, Morton Salt resumes "limited operations": The Tribune [Nassau, The Bahamas], October 31. (Accessed November 6, 2017, at http://www.tribune242.com/news/2017/oct/31/morton-salt-resumes-limited-operations/.)

Meyers, Donald, 2017, Icy winter pushes WSDOT's road salt budget into the red: Yakima [WA] Herald, February 27. (Accessed February 28, 2017, at http://www.yakimaherald.com/news/local/icy-winter-pushes-wsdot-s-road-salt-budget-into-the/article_4a5c6f72-fd82-11e6-af4f-27f76e8c34c3.html.)

Morton Salt, Inc., 2017, Morton Salt focuses on the future with continued investment in operations and workforce: Morton Salt, Inc. press release, February 7. (Accessed February 8, 2017, at https://www.mortonsalt.com/article/morton-salt-focuses-future-continued-investment-operations-workforce/.)

Parkinson, Stephanie, 2016, Frigid temperatures stop salt from working on roads: Flint, MI, WEYI–MiNBCnews, December 13. (Accessed December 18, 2016, at http://nbc25news.com/news/local/frigid-temperatures-stop-salt-from-working-on-roads.)

Payerchin, Richard, 2016, Lorain County salt supplies steady, sources say: The Morning Journal [Lorain, OH], December 26. (Accessed January 2, 2017, at http://www.morningjournal.com/general-news/20161226/lorain-county-salt-supplies-steady-sources-say.)

Roskill Information Services Ltd., 2017a, Chinese imports in 5M 2017 dramatically up in y-on-y: Roskill Information Services Ltd., July 11. (Accessed July 11, 2017, at https://roskill.com/news/salt-chinese-imports-5m-2017-dramatically-y-y/.)

Roskill Information Services Ltd., 2017b, Geko Salt plans 1Mtpy expansion: Roskill General News, November 20. (Accessed November 21, 2017, at https://roskill.com/news/geko-salt-plans-1mtpy-expansion/?utm_source=RWR&utm_campaign=a92b68a668-&utm_medium=email&utm_term=0_c2ff94622f-a92b68a668-43537479.)

Roskill Information Services Ltd., 2017c, New Ethiopian salt producer: Roskill Information Services Ltd., February 7. (Accessed February 7, 2017, at https://roskill.com/news/salt-new-ethiopian-salt-producer/.)

Shaw, David, 2017, Crestwood agrees to sell US Salt property for $225 million: Finger Lakes Times [Geneva, NY], November 2. (Accessed November 3, 2017, at http://www.fltimes.com/news/crestwood-agrees-to-sell-u-s-salt-property-for-million/article_1ce7f051-efc8-5475-a83e-bbcdccab2828.html.)

Skalka, Liz, 2017, Salt low after big storm: Stamford [CT] Advocate, February 11. (Accessed February 11, 2017, at http://www.stamfordadvocate.com/news/article/Salt-low-after-big-storm-10924404.php.)

Wells, Ricardo, 2017, Reports of hurricane damage to Morton Salt compound: The Tribune [Nassau, The Bahamas], September 8. (Accessed September 9, 2017, at http://www.tribune242.com/news/2017/sep/08/reports-hurricane-damage-morton-salt-compound/.)

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

Evaporites and Brines. Ch. in United States Mineral Resources, Professional Paper 820, 1973.
Historical Statistics for Mineral and Material Commodities in the United States. Data Series 140.
Salt. Ch. in Mineral Commodity Summaries, annual.

Other

Chlorine Institute, The.
Lefond, S.J., 1969, Handbook of world salt resources: New York, NY, Plenum Press, 384 p.
Material Flow of Salt, The. U.S. Bureau of Mines Information Circular 9343, 1993.
Salt. Ch. in Canadian Minerals Yearbook, annual.
Salt. Ch. in Industrial Minerals and Rocks (7th ed.), Society for Mining, Metallurgy, and Exploration, Inc., 2006.
Salt. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.
Salt. Mining Engineering, annual review of industrial minerals.
Salt Institute.
Sodium Chloride. American Chemical Society Monograph No. 145, 1960.
Solution Mining Research Institute.

TABLE 1
SALIENT SALT STATISTICS[1]

(Thousand metric tons and thousand dollars)

	2013	2014	2015	2016	2017
United States:					
Production:[2]					
Vacuum and open pans	4,130	4,140	4,190	4,050	4,120
Solar	3,580	3,900	3,590	2,900	3,340
Rock	14,800	20,000	20,400	17,900	16,500
Brine	17,400	17,300	16,900	16,900	15,600
Total	39,900	45,300	45,100	41,700	39,600
Sold or used by producers:[2]					
Quantity	43,100	46,000	42,800	39,900 r	38,200
Value	1,980,000	2,180,000	2,360,000	2,190,000	2,330,000
Exports:					
Quantity	536 r	909 r	830	729 r	1,120
Value	89,500 r	138,000 r	141,000	146,000	180,000
Imports for consumption:					
Quantity	11,900	20,200	21,600	12,100	12,600
Value	349,000 r	589,000	578,000	390,000	438,000
Consumption:					
Apparent[3]	54,500	65,300	63,600	51,300 r	49,700
Reported	47,600	55,700 r	52,300	47,800 r	45,500
World, production	296,000 r	292,000 r	292,000 r	284,000 r	286,000

[r]Revised.
[1]Table includes data available through March 4, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Excludes Puerto Rico.
[3]Sold or used plus imports minus exports.

TABLE 2
U.S. SALT COMPANIES BY PRODUCTION CAPACITY, LOCATION, AND TYPE IN 2017[1]

(Thousand short tons)

Company	Vacuum and open pans	Solar	Rock	Brine
American Rock Salt Co., Hampton Corners, NY	--	--	4,500	--
Boardwalk Louisiana Midstream, LLC, Plaquemine, LA	--	--	--	(2)
California Supreme Salt, LLC, Twentynine Palms, CA	--	20	--	--
Cargill, Inc.:				
Akron, OH	350	--	--	(2)
Avery Island, LA	--	--	2,700	(2)
Breaux Bridge, LA	250	--	--	--
Cleveland, OH	--	--	4,000	--
Freedom, OK	--	300	--	--
Hersey, MI	300	--	--	--
Lake Point, UT	--	850	--	--
Lansing, NY	--	--	2,500	--
Hutchinson, KS	450	--	--	--
Newark, CA	150	750	--	(2)
St. Clair, MI	425	--	--	--
Watkins Glen, NY	450	--	--	--
Chemours Co., The, New Johnsonville, TN	230	--	--	--
Corpus Christi Brine Services, Inc., Benavides, TX	--	--	--	(2)
Huck Salt Co., Fallon, NV	--	20	--	--
Hutchinson Salt Co., Hutchinson, KS	--	--	750	--
Independent Salt Co., Kanopolis, KS	--	--	750	--
Key Energy Services, LLC, Hobbs, NM	--	--	--	(2)
Kissner Group Holdings, LP, The:				
Lyons, KS	--	--	750	--
Detroit, MI	--	--	2,000	--
Moab Salt, Inc., Moab, UT	--	250	--	--
Morton International, Inc.:				
Fairport, OH	--	--	2,000	--
Glendale, AZ	--	150	--	--
Grand Saline, TX	150	--	400	--
Grantsville, UT	--	500	--	--
Manistee, MI	360	--	--	--
Rittman, OH	600	--	--	--
Silver Springs, NY	375	--	--	(2)
South Hutchinson, KS	350	--	--	--
Weeks Island, LA	--	--	1,800	(2)
New Mexico Salt and Mineral Corp., Loving, NM	--	125	--	--
North American Salt Co.:[3]				
Cote Blanche, LA	--	--	3,500	--
Lyons, KS	425	--	--	--
Ogden, UT[4]	--	1,500	--	--
Occidental Chemical Corp., Wichita, KS	--	--	--	(2)
Olin Corp.:				
Freeport, TX[5]	--	--	--	(2)
McIntosh, AL	--	--	--	(2)
Plaquemine, LA[5]	--	--	--	(2)
PB Energy Storage, Inc.:[6]				
Dale, NY	--	--	--	(2)
Napoleonville, LA	--	--	--	(2)
Redmond Clay & Salt Co., Inc., Redmond, UT	--	--	150	--
Searles Valley Minerals, Inc., Trona, CA	--	250	--	--
South Bay Salt Works, Chula Vista, CA	--	125	--	--
Tetra Technologies, Inc., Amboy, CA	--	75	--	--

See footnotes at end of table.

TABLE 2—Continued

U.S. SALT COMPANIES BY PRODUCTION CAPACITY, LOCATION, AND TYPE IN 2017[1]

Company	Vacuum and open pans	Solar	Rock	Brine
Texas Brine Corp.:				
Baytown, TX	--	--	--	(2)
Beaumont, TX	--	--	--	(2)
Chacahoula, LA	--	--	--	(2)
Clemville, TX	--	--	--	(2)
Houston, TX	--	--	--	(2)
Napoleonville, LA	--	--	--	(2)
Plaquemine, LA	--	--	--	(2)
Wyoming, NY	--	--	--	(2)
US Salt L.L.C., Watkins Glen, NY	375	--	--	(2)
United Salt Corp.:				
Baytown, TX	400	--	--	(2)
Carlsbad, NM	--	400	--	--
Hockley, TX	--	--	150	--
Saltville, VA	200	--	--	--
Westlake Chemical Corp.:[7]				
Lake Charles, LA	--	--	--	(2)
New Martinsville, WV	--	--	--	(2)
Willow Creek Salt Co., Salina, UT	--	--	50	--
Total production capacity	5,840	5,320	26,000	16,900

-- Zero.

[1]Table includes data available through March 4, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes brine for sale and for captive use. Individual brine capacity is assumed to be equal to the quantity of annual brine production, and therefore, considered company proprietary data. Brine producers include those chloralkali producers that produce captive brine and companies that supply brine for chloralkali manufacture, oilfield chemicals, and other uses. Total brine production capacity is the quantity of brine produced for the year.

[3]Owned by Compass Minerals, Inc.

[4]Owned by Compass Minerals, Inc.; operated by Great Salt Lake Minerals Corp.

[5]Acquired from Dow Chemical Corp.

[6]Associated with Texas Brine Corp.

[7]Formerly operated by Axiall Corp.

TABLE 3
SALT PRODUCED IN THE UNITED STATES, BY TYPE AND PRODUCT FORM[1]

(Thousand metric tons)

Product form	Vacuum and open pans	Solar	Rock	Brine	Total
2016:					
Bulk	969	1,710	17,500	16,900	37,100
Compressed pellets	1,120	339	XX	XX	1,460
Packaged	1,820	725	306	XX	2,860
Pressed blocks	131	131	37	XX	299
Total	4,050	2,900	17,900	16,900	41,700
2017:					
Bulk	1,070	2,080	16,100	15,600	34,900
Compressed pellets	1,120	404	XX	XX	1,530
Packaged	1,810	729	285	XX	2,820
Pressed blocks	118	133	42	XX	293
Total	4,120	3,340	16,500	15,600	39,600

XX Not applicable.
[1]Table includes data available through March 4, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 4
SALT SOLD OR USED IN THE UNITED STATES, BY TYPE AND PRODUCT FORM[1, 2]

(Thousand metric tons and thousand dollars)

	Vacuum and open pans		Solar		Rock		Brine		Total	
Product form	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
2016:										
Bulk	825	107,000	2,140	144,000	15,600	840,000	16,400 r	143,000 r	35,000 r	1,230,000
Compressed pellets	1,190	226,000	399	76,400	XX	XX	XX	XX	1,580	303,000
Packaged:										
Less-than-5-pound units	233	NA	13	NA	3	NA	XX	XX	249	XX
More-than-5-pound units	1,670	NA	609	NA	493	NA	XX	XX	2,770	XX
Total	1,900	441,000	623	95,300	496	73,200 r	XX	XX	3,020	609,000
Pressed blocks:										
For livestock	89	NA	59	NA	14	NA	XX	XX	162	XX
For water treatment	35	NA	65	NA	18	NA	XX	XX	119	XX
Total	125	20,600	124	21,000	32	5,690 r	XX	XX	281	47,300 r
Grand total	4,040	794,000	3,290	337,000	16,100	919,000	16,400 r	143,000 r	39,900 r	2,190,000
2017:										
Bulk	942	144,000	2,000	163,000	15,100	877,000	15,500	147,000	33,500	1,330,000
Compressed pellets	1,180	240,000	383	80,700	XX	XX	XX	XX	1,560	321,000
Packaged:										
Less-than-5-pound units	231	NA	13	NA	3	NA	XX	XX	247	XX
More-than-5-pound units	1,660	NA	608	NA	334	NA	XX	XX	2,600	XX
Total	1,890	466,000	621	104,000	337	57,000	XX	XX	2,850	627,000
Pressed blocks:										
For livestock	87	NA	54	NA	16	NA	XX	XX	157	XX
For water treatment	34	NA	64	NA	19	NA	XX	XX	118	XX
Total	121	21,500	118	22,200	36	5,860	XX	XX	275	49,600
Grand total	4,130	871,000	3,120	371,000	15,500	940,000	15,500	147,000	38,200	2,330,000

[r]Revised. NA Not available. XX Not applicable.
[1]Table includes data available through March 4, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]As reported at salt production locations, the term "sold or used" indicates that some salt, usually salt brine, is not sold but is used for captive purposes by the plant or company. Because data do not include salt imported, purchased, and (or) sold from inventory from regional distribution centers, salt sold or used by type may differ from totals shown in tables 5 and 6, which are derived from company totals.

TABLE 5

SALT SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars)

State	2016		2017	
	Quantity	Value	Quantity	Value
Kansas	2,560	209,000	2,130	159,000
Louisiana	12,000 r	307,000 r	11,800	342,000
New York	6,690 r	566,000	6,270	560,000
Texas	7,390 r	173,000 r	7,220	184,000
Utah	2,080	212,000	2,020	256,000
Other Eastern States[3]	7,770	562,000	7,370	655,000
Other Western States[4]	1,430	165,000	1,410	171,000
Total	39,900 r	2,190,000	38,200	2,330,000
Puerto Rico[e]	46	1,790	45	1,800

[e]Estimated. [r]Revised.

[1]Table includes data available through March 4, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

[2]The term "sold or used" indicates that some salt, usually salt brine, is not sold but is used for captive purposes by the plant or company.

[3]Includes Alabama, Michigan, Ohio, Tennessee, Virginia, and West Virginia.

[4]Includes Arizona, California, Nevada, New Mexico, and Oklahoma.

TABLE 6

DISTRIBUTION OF DOMESTIC AND IMPORTED SALT BY PRODUCERS IN THE UNITED STATES, BY END USE AND TYPE[1, 2]

(Thousand metric tons)

End use	Vacuum and open pans		Solar		Rock		Brine		Total[3]	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
Chemical:										
Chloralkali producers	2	6	283	286	441	434	15,900 r	14,700	16,600 r	15,400
Other chemical	314	317	179	155	710	656	551	519	1,750	1,650
Total	316	323	461	441	1,150	1,090	16,500 r	15,200	18,400 r	17,000
Food-processing industry:										
Meat packers	217	207	43	42	23	8	--	--	283	257
Dairy	141	155	9	13	3	2	--	--	153	170
Canning	160	154	19	20	2	3	--	--	181	177
Baking	160	168	4	3	7	6	--	--	171	177
Grain mill products	93	90	9	9	17	7	--	--	119	106
Other food processing	594	602	178	174	78	68	1	1	851	845
Total	1,370	1,380	262	262	130	94	1	1	1,760	1,730
General industrial:										
Textiles and dyeing	10	9	24	20	30	1	--	--	64	30
Metal processing	4	4	5	4	32	26	(4)	--	41	34
Rubber	2	2	1	(4)	1	1	(4)	(4)	4	3
Oil	78	78	164	136	68	51	6	10	316	275
Pulp and paper	7	7	38	38	18	17	--	--	63	62
Tanning and (or) leather	1	1	12	11	23	21	--	--	36	33
Other industrial	57	49	81	82	173	107	(4)	(4)	311	238
Total	159	150	323	291	344	223	6	10	832	674
Agricultural:										
Feed retailers and (or) dealers mixers	270	260	238	284	152	164	--	--	660	708
Feed manufacturers	66	69	67	78	244	311	--	--	377	458
Direct-buying end user	27	22	19	20	143	74	--	--	189	116
Total	363	351	324	382	538	549	--	--	1,230	1,280
Water treatment:										
Government (Federal, State, local)	87	87	102	101	161	152	1	(4)	351	340
Commercial or other	34	31	36	46	44	40	4	14	118	131
Total	121 r	118	139	146	205	192	5	14	470 r	471
Ice control and (or) stabilization:										
Government (Federal, State, local)	4	3	237	391	16,800	15,800	(4)	(4)	17,000	16,100
Commercial or other	30	80	260	254	3,010	3,090	--	--	3,300	3,420
Total	34	83	497	645	19,800	18,800	(4)	(4)	20,300	19,600
Distributors:										
Agricultural	79	108	108	97	241	265	--	--	428	470
Grocery wholesalers and (or) retailers	366	371	151	138	152	28	(4)	(4)	669	537
Institutional wholesalers and end users	162	161	73	72	96	41	(4)	(4)	331	274
Water-conditioning	130	129	289	308	17	9	1	1	437	447
U.S. Government resale	(4)	(4)	(4)	(4)	179	165	--	--	179	165
Other wholesalers and (or) retailers	1,220	1,240	882	885	106	94	(4)	(4)	2,210	2,220
Total	1,960	2,010	1,500	1,500	790	603	1	1	4,250	4,110
Other[5]	133	128	207	286	42	72	130	124	512	610
Grand total	4,450	4,540	3,720	3,950	23,000	21,700	16,600 r	15,300	47,800 r	45,500

[r]Revised. -- Zero.

[1]Table includes data available through March 4, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

[2]The quantity of imports included in the total for each type of salt is the amount reported by the U.S. salt industry, not the quantity reported by the U.S. Census Bureau that appears in tables 1, 9, 10, 11, and 12.

[3]Because data include salt imported, produced, and (or) sold from inventory from regional distribution centers, data for salt sold or used by type may differ from totals shown in tables 1, 3, and 4, which are derived from plant reports at salt production locations. Data from these tables may differ from totals shown in tables 5 and 7 because of changes in inventory and (or) incomplete reporting.

[4]Less than ½ unit.

[5]Includes exports.

TABLE 7
DISTRIBUTION OF DOMESTIC AND IMPORTED EVAPORATED AND ROCK SALT IN THE UNITED STATES, BY DESTINATION[1, 2]

(Thousand metric tons)

	2016				2017			
	Evaporated				Evaporated			
Destination	Vacuum and open pans	Solar	Rock	Total	Vacuum and open pans	Solar	Rock	Total
Alabama	48	172	41	261	49	12	44	105
Alaska	9	3	4	16	1	3	(3)	3
Arizona	48	71	4	123	51	75	1	127
Arkansas	37	11	45	93	38	8	47	93
California	255	512	94	861	267	637	88	992
Colorado	23	70	28	121	23	89	31	143
Connecticut	12	5	507	524	12	4	474	489
Delaware	7	8	61	76	7	8	56	72
District of Columbia	--	--	31	31	--	--	32	32
Florida	114	125	109	347 r	119	154	101	374
Georgia	131	89	123	343	133	86	113	332
Hawaii	1	2	--	2 r	1	2	--	2
Idaho	24	149	(3)	173	25	273	2	300
Illinois	342	112	1,870	2,320	309	108	1,320	1,740
Indiana	254	106	546	906	266	95	395	755
Iowa	129	125	394	647 r	132	100	313	546
Kansas	76	40	585	701	76	39	751	866
Kentucky	72	6	840	918	73	5	580	658
Louisiana	94	10	145	249	99	10	131	240
Maine	18	2	159	179	18	2	128	149
Maryland	72	27	668	767	70	28	607	705
Massachusetts	39	15	604	658	39	15	570	624
Michigan	264	28	1,780	2,080	279	25	1,610	1,920
Minnesota	67	183	716	966	120	192	552	864
Mississippi	19	5	102	126	21	5	100	125
Missouri	104	82	359	545	115	85	356	556
Montana	1	32	(3)	33	4	28	(3)	32
Nebraska	62	45	148	255	58	43	122	223
Nevada	12	64	(3)	76	13	44	(3)	58
New Hampshire	10	6	60	76	10	6	163	180
New Jersey	95	28	866	990 r	98	28	877	1,000
New Mexico	29	152	(3)	182 r	28	153	(3)	181
New York	133	29	3,280	3,440	182	29	3,420	3,630
North Carolina	132	53	156	342 r	133	49	157	339
North Dakota	6	12	5	23	7	13	6	26
Ohio	445	47	2,420	2,910	451	43	2,140	2,630
Oklahoma	26	28	58	112	27	29	62	119
Oregon	25	46	1	71 r	23	49	1	74
Pennsylvania	184	62	1,680	1,920	191	101	2,260	2,550
Rhode Island	2	1	171	174	2	1	158	161
South Carolina	56	15	52	122 r	57	14	48	119
South Dakota	28	48	371	447	29	49	38	116
Tennessee	89	13	505	607	90	12	388	490
Texas	324	181	96	601	330	190	89	610
Utah	32	215	33	280	31	236	67	333
Vermont	2	1	307	310	3	1	341	344
Virginia	75	33	512	620	77	30	443	550
Washington	35	225	--	260	36	234	1	272
West Virginia	23	5	246	274	24	6	189	218
Wisconsin	205	139	1,410	1,760	218	161	1,540	1,920
Wyoming	3	52	1	56	4	57	1	62
Other[4]	157 r	226 r	826 r	1,210 r	66	285	751	1,100
Total[5]	4,450 r	3,720 r	23,000 r	31,200 r	4,540	3,950	21,700	30,100

See footnotes at end of table.

TABLE 7—Continued
DISTRIBUTION OF DOMESTIC AND IMPORTED EVAPORATED AND ROCK SALT IN THE UNITED STATES, BY DESTINATION[1, 2]

(Thousand metric tons)

[r]Revised. -- Zero.
[1]Table includes data available through March 4, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Each type of salt includes domestic and imported quantities. Brine is excluded because it is not shipped out of State.
[3]Less than ½ unit.
[4]Includes exports and shipments to overseas areas administered by the United States, Puerto Rico, and unspecified destinations.
[5]Because data include salt imported, purchased, and (or) sold from inventory from regional distribution centers, data for evaporated and rock salt distributed by State may differ from totals shown in tables 1 and 3, which are derived from plant reports at salt production locations. Data may differ from totals shown in table 5 and 6 because of changes in inventory and (or) incomplete reporting.

TABLE 8
AVERAGE VALUE OF SALT, BY PRODUCT FORM AND TYPE[1]

(Dollars per metric ton)

Product form	Vacuum and open pans	Solar	Rock	Brine
2016:				
Bulk	129.49	67.13	53.86	8.68 r
Compressed pellets	190.96	191.53	XX	XX
Packaged	231.65	152.96	147.38	XX
Average[2]	197.78	99.69	56.75 r	8.68 r
Pressed blocks	164.93	169.33	173.61 r	XX
2017:				
Bulk	152.42	81.50	57.99	9.49
Compressed pellets	203.81	210.80	XX	XX
Packaged	246.12	168.18	169.30	XX
Average[2]	211.71	115.88	60.41	9.49
Pressed blocks	178.10	187.92	164.07	XX

[r]Revised. XX Not applicable.
[1]Net selling value, free on board plant, excluding container costs.
[2]Salt value data reported prior to 1984 were an aggregate value per metric ton of bulk, compressed pellets, and packaged salt. For time series continuity, an average of these three types of product forms is presented that is based on the aggregated values and quantities of the product form for each type of salt listed in table 3.

TABLE 9
U.S. EXPORTS OF SALT, BY COUNTRY OR LOCALITY[1]

(Thousand metric tons and thousand dollars)

Country or locality	2016 Quantity	2016 Value[2]	2017 Quantity	2017 Value[2]
Australia	1	1,180	1	1,330
Bahamas, The	1	492	1	455
Bahrain	1	417	1	404
Belgium	7	21,600	5	14,300
Brazil	1	2,970	2	3,780
Canada	594 r	48,400	956	66,800
China	55	29,300	75	44,100
Colombia	3	1,180	3	1,600
Costa Rica	2	860	2	847
Dominican Republic	2	727	3	743
El Salvador	1	308	1	347
Germany	2	915	2	908
Honduras	1	208	2	504
Ireland	1	1,240	1	1,550
Japan	2	2,010	3	2,180
Korea, Republic of	1	672	1	915
Mexico	32	11,300	33	12,500
Netherlands	1	1,060	1	724
Panama	1	483	2	682
Saudi Arabia	3	1,810	4	2,160
Singapore	3	8,440	5	11,700
United Arab Emirates	1	735	1	365
United Kingdom	3	2,790	3	2,240
Other	10	7,360	11	8,620
Total	729 r	146,000	1,120	180,000

[r]Revised.
[1]Table includes data available through March 4, 2020. Data are rounded to no more than three significant digits; may not add to totals shown. The Harmonized Tariff Schedule of the United States code for salt is 2501.00.0000.
[2]Free alongside ship value at U.S. ports.

Source: U.S. Census Bureau.

TABLE 10
U.S. EXPORTS OF SALT, BY CUSTOMS DISTRICT[1]

(Thousand metric tons and thousand dollars)

District	2016 Quantity	2016 Value[2]	2017 Quantity	2017 Value[2]
Anchorage, AK	3	1,110	1	274
Baltimore, MD	1	775	1	438
Buffalo, NY	22	5,080	111	10,100
Charleston, SC	1	963	(3)	337
Chicago, IL	1	1,360	2	865
Cleveland, OH	372 r	16,400	406	18,300
Detroit, MI	44	10,300	97	12,700
El Paso, TX	2	566	2	571
Great Falls, MT	1	588	2	678
Houston, TX	4	1,970	26	2,770
Laredo, TX	19	7,140	23	9,020
Los Angeles, CA	59	41,100	81	59,400
Miami, FL	5	2,350	6	2,370
New Orleans, LA	4	1,060	3	1,040
New York City, NY	13	24,600	17	19,500
Nogales, AZ	8	2,140	3	969
Norfolk, VA	4	5,560	5	6,590
Ogdensburg, NY	18	3,580	66	6,740
Pembina, ND	4	1,320	5	1,320
Philadelphia, PA	1	467	1	807
San Diego, CA	3	1,320	5	2,090
San Francisco, CA	2	1,030	1	919
Savannah, GA	2	963	1	974
Seattle, WA	7	2,480	37	5,540
St. Albans, VT	4	707	5	900
Other[4]	125	11,400	212	14,400
Total	729 r	146,000	1,120	180,000

[r]Revised.
[1]Table includes data available through March 4, 2020. Data are rounded to no more than three significant digits; may not add to totals shown. The Harmonized Tariff Schedule of the United States code for salt is 2501.00.0000.
[2]Free alongside ship value at U.S. ports.
[3]Less than ½ unit.
[4]Customs district unidentified but assumed to be rail and (or) truck shipments to Canada through various points of departure. Also includes minor shipments through 14 other customs districts.

Source: U.S. Census Bureau.

TABLE 11
U.S. IMPORTS FOR CONSUMPTION OF SALT, BY COUNTRY OR LOCALITY[1]

(Thousand metric tons and thousand dollars)

Country or locality	2016		2017	
	Quantity	Value[2]	Quantity	Value[2]
Australia	235	4,740	156	2,290
Bahamas, The	206	6,540	320	9,530
Brazil	593	14,300	280	9,150
Canada	3,200	109,000	3,630	129,000
Chile	4,340	105,000	4,230	101,000
China	71	4,690 r	33	11,300
Dominican Republic	22	528	1	215
Egypt	471	13,700	629	19,900
Germany	2	1,580	2	2,350
India	50	1,080	5	124
Ireland	62	11,200	48	19,400
Israel	33	12,500	43	11,500
Italy	120	6,870	171	8,200
Korea, Republic of	47	2,240	109	2,740
Mexico	1,500	36,200	1,710	42,500
Morocco	304	8,480	185	4,790
Netherlands	321	10,200	383	12,000
Pakistan	70	10,000	63	13,100
Peru	202	3,590	262	5,180
South Africa	56	2,910	10	3,770
Spain	83	4,230	88	4,670
Tunisia	22	169	32	746
Turkey	94	3,840	137	4,200
Other[3]	48 r	17,600 r	86	21,000
Total	12,100	390,000	12,600	438,000

[r]Revised.
[1]Table includes data available through March 4, 2020. Data are rounded to no more than three significant digits; may not add to totals shown. The Harmonized Tariff Schedule of the United States code for salt is 2501.00.0000.
[2]Customs value.
[3]Includes imports from 52 other countries and (or) localities.

Source: U.S. Census Bureau.

TABLE 12
U.S. IMPORTS OF SALT, BY CUSTOMS DISTRICT[1]

(Thousand metric tons and thousand dollars)

District	2016		2017	
	Quantity	Value[2]	Quantity	Value[2]
Baltimore, MD	1,280	39,800	463	18,600
Boston, MA	1,380	30,200	1,810	41,300
Buffalo, NY	223	7,820	101	4,440
Charleston, SC	119	4,610	118	4,890
Chicago, IL	598	15,700	353	12,300
Cleveland, OH	114	3,870	142	4,010
Columbia-Snake, OR	138	5,370	132	5,240
Detroit, MI	766	19,200	1,080	31,900
Duluth, MN	76	8,280	70	7,890
El Paso, TX	202	167	(3)	93
Houston-Galveston, TX	37	3,760	3	3,470
Laredo, TX	456	3,420	269	3,990
Los Angeles, CA	196	8,880 r	155	18,100
Miami, FL	5	1,940	31	1,730
Milwaukee, WI	897	19,600 r	1,120	26,600
Minneapolis, MN	175	4,310	428	10,500
Mobile, AL	11	7,860	47	7,250
New Orleans, LA	183	6,700	220	9,300
New York City, NY	1,810	56,000 r	2,030	64,200
Nogales, AZ	41	2,440	82	2,860
Norfolk, VA	185	16,500	157	24,200
Ogdensburg, NY	85	24,800	86	26,900
Pembina, ND	58	5,540	69	6,890
Philadelphia, PA	973	27,300	854	24,500
Portland, ME	796	18,400	945	19,500
Providence, RI	400	9,770	433	11,300
San Diego, CA	111	1,980	251	2,290
San Francisco, CA	159	6,150	159	6,720
Savannah, GA	39	1,740	43	2,710
Seattle, WA	71	4,970	188	8,020
St. Albans, VT	14	1,400	70	1,580
Tampa, FL	376	13,800	568	17,500
Wilmington, NC	151	5,440	113	3,830
Other[4]	11 r	2,460 r	23	3,780
Total	12,100	390,000	12,600	438,000

[r]Revised.
[1]Table includes data available through March 4, 2020. Data are rounded to no more than three significant digits; may not add to totals shown. The Harmonized Tariff Schedule of the United States code for salt is 2501.00.0000.
[2]Customs value.
[3]Less than ½ unit.
[4]Includes imports through 7 other customs districts.

Source: U.S. Census Bureau.

TABLE 13
SALT: WORLD PRODUCTION, BY COUNTRY OR LOCALITY[1]

(Thousand metric tons)

Country or locality[2]	2013	2014	2015	2016	2017
Afghanistan, rock	145	41	87	98 r	57
Algeria, brine and sea	173	193	176 r	158 r	160 e
Angola[e]	40	40	48 r	43 r	45
Argentina, common	1,669 r	1,537 r	1,401 r	1,812 r	1,813
Armenia	31	30	27	32 r	33
Australia	12,900	12,998 r	11,390 r	10,410 r	11,675
Austria:					
Brine	3,717	3,847	3,247	3,446	3,500 e
Evaporated	1,115	1,154	1,100 e	1,100 e	1,100 e
Total	4,832	5,001	4,347	4,546	4,600 e
Azerbaijan, marketable	5	5	5	5	5
Bangladesh, marine[3]	1,439	1,461	1,463 r	1,477 r	1,450 e
Belarus	2,625	1,821	2,055 r	2,477 r	3,069
Bolivia, rock	2	3 r	2	5 r	5 e
Bosnia and Herzegovina	857	921	992	1,092 r	1,029
Botswana[4]	521	515	404	400	370
Brazil:					
Rock	1,349	1,451	1,476 r	1,500 r, e	1,500 e
Sea	5,926	6,050	6,200 r	6,200 r, e	6,200 e
Total	7,275	7,501	7,676 r	7,700 r, e	7,700 e
Bulgaria	2,000	3,300	3,500 e	3,500 e	3,500 e
Burma, rock, crude	169	188	129	221 r	156 e
Cambodia, marine[3]	--	--	170	140	32
Canada	12,244	14,473	14,343	10,252 r	11,424
Chile	6,577	10,533	11,831	8,140 r	7,441
China	73,676	70,497	66,655	66,201 r	66,542
Colombia:					
Rock	319	494 r	335 r	354 r	336
Sea	155 r	37 r	96 r	176 r	165
Total	474 r	531 r	431 r	530 r	501
Croatia	43	33	52	40 r	53
Cuba	222	243	285 r	248 r	246
Denmark[e]	600	600	600	600	600
Djibouti[e]	1	1	1	1	830
Egypt	2,194	1,543	1,669 r	1,700 r, e	1,750 e
Eritrea, sea[e]	290	300	300	310	320
Ethiopia, rock[e, 3]	410	420	440	450	450
France	5,900 r	5,725 r	6,062 r	5,463 r	5,003
Germany:					
Evaporated	297	274	280 e	290 e	290 e
Industrial brines	8,073	6,776 r	7,765 r	7,770 r, e	7,300 e
Rock and other brines	9,026	4,999 r	6,124 r	6,200 r, e	5,300 e
Total	17,396	12,049 r	14,169 r	14,300 r, e	12,900 e
Ghana[e]	250	250	250	250	250
Greece	190	146	122	158 r	160 e
India, other	26,886	23,017	24,241	27,500 r, e	28,000 e
Indonesia	1,088	2,192	600 e	1,000 e	1,000 e
Iran[5]	2,079	3,940	4,450 r	3,000 r, e	3,000 e
Iraq	182	200	209 r	200 r, e	200 e
Israel, marketable	442	460	333	389 r	514
Italy:					
Industrial[6]	2,672	2,820	3,031	2,551	2,500 e
Table	365	468	305	484	547
Total	3,037 r	3,288 r	3,336 r	3,035 r	3,047
Japan	929	928	938	928 r	930 e
Jordan:					
Brine	32 e	35 e	40	40	40 e
Dead sea	3 r	2 r	3 r	1	1
Total	35 r	37 r	43 r	41	41

See footnotes at end of table.

TABLE 13—Continued
SALT: WORLD PRODUCTION, BY COUNTRY OR LOCALITY[1]

(Thousand metric tons)

Country or locality[2]	2013	2014	2015	2016	2017
Kazakhstan	531	597	609	730 r	804
Kenya, refined	207	223	242	240	260 e
Korea, North[e]	70	70	70	100	100
Korea, Republic of	421	304	310 e	372 r	309
Kuwait	15 e	56 r	64 r	67 r	58
Kyrgyzstan, rock	2 e	2 e	2 e	2	2 e
Laos, rock	6	9	2 r	-- r	1 e
Lebanon	15 e	1 r	1 r	1 r	1
Libya[e]	30	30	30	30	40
Madagascar, sea	110 e	120 e	120	130 e	130 e
Malta, solar[e]	1	2	2	2	2
Mauritania	1	1 e	1 e	1 e	1 e
Mauritius, sea	4 e	4 e	2 e	1 r	1 e
Mexico	9,461	10,251	9,088	8,907 r	9,000 e
Mongolia	2	2	2	2 e	2 e
Montenegro, sea water evaporate	10	--	--	--	-- e
Morocco, rock	509 r	459 r	556 r	635 r	640 e
Mozambique, sea[e]	150	160	160	170	170
Namibia	827	797	733	836 r	880
Netherlands, rock	6,518	6,485	6,743	6,625	6,935
New Zealand[e]	100	100	100	100	100
Niger[e]	30	30	30	30	30
Oman	12	13	13	12 r	18
Pakistan:					
Rock[4]	2,263 r	2,243 r	2,779 r	3,535 r	3,492
Sea	297	300 e	293 r	283 r	169
Total	2,560 r	2,543 r	3,072 r	3,818 r	3,661
Panama	61	57	60 e	60 e	60 e
Peru	1,205	1,175	1,471	1,450	1,481
Philippines, sea	993	1,016	1,020	1,025 r	1,000 e
Poland:					
Evaporated	686	647	671	647 r	609
Rock	1,321	775	650	709 r	993
Other	2,735 r	2,705	2,798	2,965 r	2,989
Total	4,742 r	4,127	4,119 r	4,321 r	4,591
Portugal, rock	473	70	30	6 r	8
Romania:					
Rock	40 e	47	50	52 r	52
Other	2,200 e	2,000	2,100 r	2,000	2,300
Total	2,240 e	2,047	2,150 r	2,052 r	2,352
Russia	5,500 r	5,600 r	5,600 r	6,887 r	7,070 e
Saudi Arabia	1,900 e	1,990	2,000 r	2,400 r	2,520
Senegal	243	245	266 e	263 r	259
Serbia	14	13	13	13 e	13 e
Slovenia	3	--	2	2	2
South Africa	477 r	494	517	473 r	493
Spain:					
Rock	2,903 r	2,754 r	2,970 r	3,253 r	3,100
Sea, including evaporated	1,229 r	1,359 r	1,237 r	1,200 r	1,111
Total	4,132 r	4,113 r	4,207 r	4,453 r	4,211
Sri Lanka	37	102	29 r	106 r	74
Sudan	21	37	70 r	223 r	234
Switzerland	652	388	550	458 r	590
Syria	30	30 e	20 e	25 e	25 e
Tajikistan	31	35	36	36	24
Tanzania	34 r	75 r	92	171 r	100
Thailand	1,300	1,381	1,386	1,391 r	1,497
Tunisia, sea	1,146	888	1,700	1,600 e	1,600 e
Turkey	5,614	5,331	6,257 r	5,328 r	6,645

See footnotes at end of table.

TABLE 13—Continued
SALT: WORLD PRODUCTION, BY COUNTRY OR LOCALITY[1]

(Thousand metric tons)

Country or locality[2]	2013	2014	2015	2016	2017
Turkmenistan	220 e	92 e	100 e	100	100
Uganda	15 e	15 e	15 e	15	15 e
Ukraine	5,796	2,498	2,137 r	1,784 r	1,816
United Kingdom[7]	6,930	4,690	4,600 r	4,500 r	5,100 e
United States:					
Brine	17,400	17,300	16,900	16,900	15,600
Rock	14,800	20,000	20,400	17,900	16,500
Solar	3,580	3,900	3,590	2,900	3,340
Vacuum and open pan	4,130	4,140	4,190	4,050	4,120
Other, from Puerto Rico[e]	45	45	46	46	45
Total	40,000	45,300	45,100	41,800 r	39,600
Vietnam	718 r	906	1,061 r	982 r	854
Yemen	75 r	75 r, e	75 r, e	75 r, e	75 e
Grand total	296,000 r	292,000 r	292,000 r	284,000 r	286,000

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

[1]Table includes data available through July 23, 2019. All data are reported unless otherwise noted. Grand totals, U.S. data, and estimated data are rounded to three significant digits; may not add to totals shown.

[2]In addition to the countries and (or) localities listed, Guinea, Iceland, Mali, and Venezuela may have produced salt, but available information was inadequate to make reliable estimates of output. Some salt brine production data for manufacture of chlorine, caustic soda, and soda ash are not reported because of incomplete reporting by many countries.

[3]Production is based on fiscal year, with a starting date of July 1 of the year shown.

[4]From natural soda ash production.

[5]Production is based on fiscal year, with a starting date of March 21 of the year shown.

[6]Does not include production from Sardinia and Sicily, which is estimated to be 200,000 metric tons per year.

[7]Production is based on fiscal year, with a starting date of July 16 of the year shown.