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SALT

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Salt

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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 2011 increased by 4% to 45 million metric tons (Mt) compared with that of 2010 (table 1). According to U.S. Geological Survey (USGS) data for 2011, 28 companies operated 67 salt-producing plants in 16 States. Of these, 10 companies and 13 plants produced more than 1 Mt each and accounted for 91% and 69%, respectively, of total U.S. production and accounted for 61% and 36%, respectively, of total value. Several companies and plants produced more than one type of salt. In 2011, 13 companies (25 operations) produced salt brine; 11 companies (15 operations), rock salt; 10 companies (13 operations), solar-evaporated salt; and 7 companies (17 operations), vacuum pan salt.

The five leading States were, in descending order of total salt sold or used, Louisiana with 31%; Texas, 21%; New York, 14%; Kansas, 7%; and Utah, 6%. Other Eastern States (Alabama, Michigan, Ohio, Tennessee, Virginia, and West Virginia) accounted for 18% of the domestic total salt sold or used. Other Western States (Arizona, California, Nevada, New Mexico, and Oklahoma) represented 3% (table 5).

Salt, also known as sodium chloride, comprises 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-colored 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 are developed by the USGS from an annual voluntary 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, 2011. Rated capacity is defined as the maximum quantity of product that can be produced in a period of time 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.

Of the 28 companies to which a canvass form was sent, 25 responded, representing 92% of the totals shown in this report. Data for the nonrespondents were estimated based on their prior responses to previous annual surveys, the 2011 production estimate survey, or brine production capabilities for chloralkali manufacture based upon published chlorine production capacities [1.75 metric tons (t) of salt required per ton of chlorine capacity].

The structure of the U.S. salt industry has changed throughout the years. In 1970, 50 companies operated 95 salt-producing plants in the United States. Market competition, increased energy and labor costs, less expensive imports, fluctuations in currency exchange rates, and an excess of production capacity (resulting in the downsizing of the industry through mergers and acquisitions) reduced the number of operations in the industry to 28 companies and 67 plants by 2011.

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

Rock Salt.—Rock salt is mined by the room-and-pillar method, which is similar to that used in coal and trona mining. Additional information about rock salt mining can be found in the salt chapter in Minerals Yearbook 2006.

Because the majority of rock salt was used for deicing, the operating rate of rock salt facilities fluctuated with the demand for deicing salt, again 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. Assuming that the work week is 5 days (250 workdays per year), two working shifts and one maintenance shift per day, and at least one short-term planned turnaround for the mine and mill per year, table 2 lists the production capacities for domestic rock salt operations. In 2011, rock salt mining was 18.4 Mt, a 5% increase compared with the revised 2010 total of 17.6 Mt.

Solar Evaporation.—Solar salt production was 3.25 Mt in 2011, which was a 4% increase from the revised 2010 total of 3.12 Mt. Solar evaporation uses the wind and the sun to evaporate the water and is an effective method of producing solar salt in areas of high evaporation and low precipitation.

Additional information about solar salt production can be found in the salt chapter of the 2006 Minerals Yearbook.

Because evaporation rates must exceed the 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 vary 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.

Solution Mining.—U.S. salt brine production in 2011 was 19.2 Mt, which was about 4% more than the 2010 total of 18.5 Mt. The brine production capacities for table 2 are difficult to derive because they are based on the variabilities of the injection rate of the solvent and the solubility 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. Brine capacity is assumed to be equal to the amount of annual brine production. In order to avoid revealing company proprietary data, individual company brine capacities are not included in table 2.

Solution mining is used to obtain a sodium chloride feedstock for vacuum pan salt production and for chlorine, caustic soda, and synthetic soda ash (excluding the United States) manufacture. 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. Additional information about salt brine production can be found in the salt chapter of the 2006 Minerals Yearbook.

Mechanical Evaporation.—Vacuum pan salt is not mined but is a type of salt produced using mechanical evaporation technology. Vacuum pan salt production was 4.08 Mt in 2011, which was a slight decrease compared with the 2010 total of 4.10 Mt. The 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 are usually easier to establish because of the 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. The Alberger process is a modified grainer operation that produces cubic salt with some flake salt.

Consumption

In 2011, apparent consumption (salt sold or used plus imports minus exports) was 58.5 Mt, whereas reported consumption (sales or use as reported by the salt companies, including their imports and exports) was 47.6 Mt. Although these two measures of consumption are not necessarily expected to be identical, they normally are similar. Apparent consumption normally is greater than reported consumption because apparent consumption includes additional quantities of salt imported and exported by nonsalt-producing companies, such as some chloralkali operations and salt distributors. Reported consumption statistics are those reported only by the domestic salt producing companies.

The 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 2011 reported percentage distribution of salt by major end use was ice control, 41%; chemicals, 39%; distributors (grocery and other wholesalers and retailers, and so forth), 8%; food processing, 4%; agricultural, 3%; general industrial and other uses combined with exports, 2% each; and primary water treatment, 1% (table 6). Distributors represented a substantial share of salt sales by the salt industry; all this salt is ultimately resold to many different end users. For a more complete analysis of end-use markets, specific sectors of distribution in table 6 can be combined, such as agricultural and water treatment with agricultural and water conditioning distribution, respectively.

Aside from the different types of salt, there are various distinctions in the packaging and applications of salt. Salt for human consumption is packaged in different sized containers for several specialized purposes. Table salt may contain 0.01% potassium iodide as an additive, which provides a source of iodine that is essential to the oxidation processes in the body. Kosher salt, sea salt, condiment salt, and salt tablets are special varieties of salt.

Chemical Industry.—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, had been the chemical industry except for 2011 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 competition with less expensive natural soda ash, no synthetic soda ash has been manufactured in the United States; many countries, however, still produce synthetic soda ash and use vast quantities of salt brine as feedstock. Total salt sold or used by the chemical industry was 18.5 Mt in 2011, of which 17.5 Mt was for chloralkali manufacture and 1.03 Mt was for other chemical uses (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 considered to be the first generation of products made from salt. These two chemicals are further used to manufacture other materials, which are considered to be 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 made up 12% of the supply, and imported rock, solar, and vacuum pan salt, 9%.

In mid-2011, the U.S. Census Bureau terminated its data collection program for inorganic chemicals; therefore, data for chlorine and sodium hydroxide (caustic soda or lye) were unavailable to compare with the quantity of salt used in chloralkali manufacture. The industry average ratio of 1.75 t of salt is required to produce 1.0 t of chlorine and 1.1 t of coproduct sodium hydroxide. Reported consumption of total domestic and imported salt for chlorine manufacture was 17.5 Mt (table 6), however, the data do not include salt imported directly by the chlorine producers or captive brine produced by them.

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 6% of domestic salt sales for the entire chemical sector and only 2% of total domestic salt consumption. The consumption of salt for metallic sodium has declined during the past several years. E.I. du Pont de Nemours and Co. was the sole manufacturer of metallic sodium in the United States. The domestic market for metallic sodium decreased because sodium metal was no longer needed for the production of leaded gasolines. The leading use of sodium was for sodium borohydride production, which is the feedstock for sodium dithionite 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. Other potential uses of sodium metal are in the remediation of chemical weapons, chlorofluorocarbons, pesticides, and polychlorinated biphenyls.

Ice Control and Road Stabilization.—In 2011, U.S. consumption of salt for this application was 19.6 Mt, which was about 5% more than that of 2010. Additional imports of rock salt by the salt companies were available if needed during 2011.

There are at least four ways to treat snow and ice accumulation on roadways. 1) Anti-icing is the application of chemicals to roads prior to when the snow-pavement bond begins. This practice emphasizes the prevention of this bonding rather than reaction. 2) De-icing is the practice of removing the snow or ice after it has bonded to the road. This involves plowing and continued application of chemicals and abrasives. Plowing normally begins when there is an inch or more of snow covering the road. 3) Pre-treatment is a form of anti-icing in which chemicals (calcium chloride, magnesium chloride, sodium chloride, calcium-magnesium acetate, and potassium acetate) are applied to the road up to 48 hours before adverse weather begins to prevent a bond to develop between the pavement and the snow or ice. 4) Pre-wetting pertains to treating the dry de-icing chemicals with liquids prior to being applied to the roads. This hastens the activation of the chemicals before they are spread on the roads (Virginia Department of Transportation, undated.)

The use of salt brine for road deicing has been increasing for the past several years. Regular rock salt can be dissolved to create the salt brine solution. Salt brine is used as a pre-treatment prior to ice or snow accumulation. After the solution is applied, it is possible that up to three-quarters of an inch of new snow can melt immediately (Caldwells Patch, The, 2011).

Salt is an inexpensive, widely available, and effective ice control agent. It does, however, become less effective as the temperature decreases below about 6.5 °C to 9.5 °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 usage, the spring rains and thaws usually dilute the concentrations of sodium in the area where salt was applied.

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.

The winter of 2010–11 was less severe than the 2009–10 winter. Although rock salt production and sales in 2011 increased, most municipalities and State transportation departments reported high inventories in mid-2011 in preparation for the 2011–12 winter weather. Despite the full silos, domes, and warehouses, some municipalities had contracts with salt suppliers that stated they were required to buy at least 80% of the salt they normally ordered. The contracts allowed them to purchase another 25% more than they ordered at the original price if the weather was severe. Some of the customers constructed temporary storage facilities to stockpile their salt. One community used an abandoned railroad tunnel to store salt (Walker, 2012).

Many municipalities and transportation departments had a budget surplus because they did not have to purchase additional quantities of rock salt for the winter of 2011–12. A few salt companies, however, reported decreased earnings and two companies were compelled to temporarily layoff some rock salt workers in Louisiana and New York (Levato, 2011).

Salt also is added to stabilize the soil and to provide firmness to the foundation on which highways are built. The salt acts to minimize the effects of shifting caused in the subsurface by changes in humidity and traffic load.

Distributors.—A large amount of salt is marketed through various 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 4.03 Mt in 2011.

General Industrial.—The industrial uses of salt are diverse. They include, in descending order of quantity consumed, other industrial applications, oil and gas exploration, pulp and paper, textiles and dyeing, metal processing, tanning and leather treatment, and rubber manufacture. Total salt sold to these sectors was 962,000 t in 2011.

In oil and gas exploration, salt is an important component of drilling fluids 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 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.

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

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, an excellent oxygen-based bleaching chemical. The chlorine dioxide process, which originated in Germany after World War I, is becoming more popular because of environmental pressures to reduce or eliminate other bleaching compounds containing chlorine.

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 types. Salt brine and sulfuric acid are used to coagulate an emulsified latex made from chlorinated butadiene.

Agricultural Industry.—Barnyard and grazing livestock need supplementary salt rations to maintain proper nutrition. In 2011, 1.71 Mt of salt was sold to the agricultural industry. Animal feed and water conditioning salt are made into 22.7-kilogram (50-pound) pressed 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. Salt is also compressed into pellets that are used for water conditioning.

Food Processing.—Every person uses some quantity of salt in food. Aside from table salt, sodium is found in many processed foods, such as monosodium glutamate and baking soda. The salt is added to the food by the food processor or by the consumer as a flavor enhancer, preservative, binder, fermentation-control additive, texture-control agent, and color developer. Studies show that about 90% of Americans eat more sodium than is recommended for a healthy diet. In fact, a study published in the American Journal of Clinical Nutrition showed that infants as young as 6 months can develop a preference for salty foods such as starchy, sodium-bearing bread, crackers, and cereals that are used as beginning solid foods for babies (Huget, 2011).

The U.S. Department of Health and Human Services reported that 77% of the sodium intake by people comes from processed and prepared foods with 65% coming from food bought at retail stores and another 25% from meals purchased in restaurants where the actual sodium contents can vary. The Centers for Disease Control and Prevention (CDC) indicated that 10 types of food account for 44% of the sodium intake by people. They are, in declining order of sodium content, breads and rolls, cold cuts and current meats (deli or packaged ham or turkey), pizza, fresh and processed poultry (chicken nuggets and tenders), soups, sandwiches (cheeseburgers), cheese, pasta dishes (excluding macaroni and cheese), meat mixed dishes (meat loaf with tomato sauce), and snacks (chips, pretzels, and popcorn). Other sources of sodium intake include salt added while cooking (5%), salt added while eating (6%), and from natural sources (12%) (Los Angeles Times, 2010; Ruggles, 2012;Centers for Disease Control and Prevention, 2012).

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 1.77 Mt in 2011.

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 would lead to spoilage of the product. Salt acts as a binder in sausages to form a binding gel made up of meat, fat, and moisture. Salt also acts as a flavor enhancer and as a 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 desserts, ice cream, natural and processed cheese, and specialty dairy products.

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 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, such as a topping on baked goods.

The food-processing category also contains grain mill products. These products consist of milling flour and rice and

manufacturing 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).

Many consumers are confused with the words salt and sodium and often think the two words are synonymous, but they are not. Medical experts agree that the daily sodium intake per person should be 2,300 milligrams (mg) or less, which is the equivalent of one teaspoon of salt, or 5.8 grams (gm). Each gram of salt contains 0.4 gm of sodium, and one gram of sodium is equal to 2.5 gm of salt (Downs, 2010; ScienceDaily, 2010).

A study in the New England Journal of Medicine (NEJM) stated that cutting dietary sodium by three grams daily could reduce coronary heart disease and strokes. The report claimed that if everyone reduced their daily salt intake by one-half teaspoon, there would be between 54,000 and 99,000 fewer heart attacks, between 32,000 to 66,000 fewer strokes, between 44,000 and 92,000 fewer deaths, and between 60,000 to 120,000 fewer new cases of coronary heart disease in the United States each year. In addition, the salt reduction would result in an annual savings of $24 billion in health care costs (Bibbins-Domingo and others, 2010).

The NEJM study received support by the New York City Department of Health and Mental Hygiene that endorsed draft guidelines that recommended a reduction of salt intake by 20% during a 5-year period. The recommendations also were endorsed by 25 other city or State agencies and 17 national health organizations (Caruso, 2010; Felten, 2010).

In an effort to address the concerns of excess sodium in the diet by the medical community and various government agencies, several major food processing companies voluntarily agreed to reduce the salt content in their processed foods. These companies found that consumers responded better to reducing their sodium intake when the sodium content was not emphasized on the labels. Foods that contained more than 500 mg of sodium per 100 gm were considered to be "high sodium" while foods with less than 120 mg of sodium per 100 gm were "low sodium." Many of the food processing companies began an effort to reduce the salt content in their food products by about 20% during a 3-year period as recommended by the NEJM study, so that the changes were not so noticeable (Brat and Tamman, 2010; RedOrbit Inc., 2010).

Many food processors began to use sea salt in their foods as a replacement for vacuum pan salt (table salt) as a more natural and healthy alternative. By weight, sea salt and table salt contain about the same amount of sodium chloride, and both have the same basic nutritional value. Sea salt is advertized and marketed as containing beneficial trace elements contained in seawater. According to the Mayo Clinic, these trace elements are virtually insignificant for human health but do add some flavor, larger crystal size, and color to the sea salt compared with the table salt that eliminates trace minerals and adds iodine and various free-flowing agents (Phillips, 2010; Zeratsky, 2010).`

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. Commercial and residential water-softening units use salt to remove the ions that cause the hardness. 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 2011, 311,000 t of salt was sold for primary water treatment and an additional 493,000 t was sold for water conditioning distribution.

Stocks

Because bulk salt is stored at many different locations, such as plants, ports, terminals, and warehouses, data on the quantity of salt stockpiled by the salt industry are not reliable enough to formulate accurate inventory totals; however, yearend stocks of producers were estimated to be 2 Mt, and consumer inventories also were estimated to be high. Most of these inventories were imported rock salt and solar salt. Many salt distributors, municipalities, road deicing contractors, salt producers, and States stockpiled additional quantities of salt in anticipation of adverse weather conditions. Deicing salt inventories during late 2011 to early 2012 were very large because the winter weather was unseasonably mild throughout most of the country. For the reasons discussed above, salt stocks are assumed to be the difference between salt production and salt sold or used in calculating apparent consumption.

Transportation

Because the locations of the salt supplies are not often near consumers, transportation may be an important cost. 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. As salt is packaged, handled, and shipped in smaller units, the costs increase and are reflected in higher selling prices.

Transportation costs significantly add to the price of salt. In some cases, shipping costs are higher than the actual value of the salt. Ocean vessels can transport greater quantities of salt than barge, rail, or truck shipments. Transoceanic imports of salt have been increasing in some areas of the United States because they are more cost competitive than salt purchased from domestic suppliers using barge, rail, or truck transportation. 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.

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 less. Vacuum pan salt is the most expensive because of the higher energy costs involved in processing and the purity of the product.

Price quotations are not synonymous with average 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 values, as collected by the USGS and listed in table 8, represent a national average value for each of the types of salt and the various product forms.

Foreign Trade

Under Harmonized Tariff Schedule of the United States (HTS) nomenclature, 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 same classification also applies to exports. The HTS code for salt is 2501.00.0000. The trade tables in this report list the previous and current identification codes for salt. 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 2011, the United States exported 846,000 t of salt; this was a 42% increase compared with that of 2010 (table 9). In 2011, the majority of exports (89%) were to Canada. Salt was shipped to 90 countries through 39 customs districts; the Buffalo, NY, district exported the most and represented 52% of the U.S. total (table 10). Based on U.S. Census Bureau statistics, the United States imported 13.8 Mt of salt from 52 countries in 2011, which was 7% more than was imported during 2010 (table 11). Canada was the leading source of imports, representing about 39% of total imports, followed closely by Chile (36%). Table 12 lists the imports of salt by customs districts. Of the 40 customs districts that imported salt in 2011, the New York, NY, customs district was the largest in terms of tonnage, accounting for about 14% of the total, followed by Philadelphia, PA (12%); Baltimore, MD (10%); Boston, MA (9%); Detroit, MI (9%); Chicago, IL (8%); and Milwaukee, WI (8%). The quantity of imported salt was about 16 times that of exports. Net salt imports also represented about 24% of U.S. apparent consumption. This indicates the magnitude of the U.S. reliance on salt imports. The majority of 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 115 nations based on reported and estimated information. In 2011, the total estimated world production increased to about 286 Mt. The United States remained a leading salt-producing country, representing 16% of total world output. China has rapidly increased its production. In 2011, estimated salt production in China was about 72 Mt, making it the leading salt producer in the world, with about 25% of total world output.

Most countries possess some form of salt production capability, with production levels set to meet their own domestic requirements and with additional quantities available for export to other countries. Many developing nations tend to develop their agricultural resources to feed their population first. Utilization of easily extractable mineral resources follows, and salt is one of the first mineral commodities to be mined. Some countries, such as the United States, import a substantial amount of salt to meet total demand requirements because of economic factors, as previously discussed.

Outlook

The U.S. salt industry continued to be a leader in terms of production, consumption, and world trade in salt. Despite the closing and idling of some chlorine plants since 2007 and the Nation's economic problems, the remaining chlorine facilities ran at higher capacity utilization rates, thereby increasing chlorine and caustic soda production as well as salt brine production and consumption. Because the chloralkali industry is energy intensive, any increase in energy prices is likely to reduce chlorine manufacture as well as salt brine usage. Solar salt and vacuum pan salt production and consumption have been constant and are expected to remain stable. U.S. salt production is expected to be between 44 Mt to 48 Mt through 2015. Rock salt production and consumption are heavily dependent on the severity of winter weather. Because many municipalities had sufficient inventories on hand for the 2011–12 winter season, less rock salt was produced in 2012. Although the severity of the weather is virtually impossible to accurately forecast far in advance, the supplies of salt, from either domestic or imported sources, are likely adequate to meet any anticipated increase in demand.

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. If energy prices increase, 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 in accordance with population growth. U.S. total salt production is expected to be an estimated 44 Mt in 2012.

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TABLE 1
SALIENT SALT STATISTICS[1]

(Thousand metric tons and thousand dollars)

	2007	2008	2009	2010	2011
United States:					
Production:[2]					
Brine	19,700	18,900	17,800	18,500	19,200
Rock	16,800	20,900	20,300	17,600 r	18,400
Solar	3,650	4,070	3,880	3,120 r	3,250
Vacuum and open pans	4,420	4,200	4,030	4,100	4,080
Total	44,500	48,000	46,000	43,300	45,000
Sold or used by producers:					
Quantity	45,500	47,400	43,100	43,500	45,500
Value	1,520,000	1,690,000	1,750,000	1,690,000	1,770,000
Exports:					
Quantity	833	1,030	1,450	595	846
Value	59,600	65,900	74,100	69,300	87,500
Imports for consumption:					
Quantity	8,640	13,800	14,700	12,900	13,800
Value	171,000	282,000	337,000	322,000	367,000
Consumption:					
Apparent[3]	53,300	60,200	56,400	55,800	58,500
Reported	53,200	53,100	45,000	48,600	47,600
World, production	261,000 r	267,000 r	278,000 r	279,000 r	286,000 e

[e]Estimated. [r]Revised.
[1]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 2011

(Thousand short tons)

Company	Rock	Solar	Vacuum and Open pans	Brine
American Rock Salt Co., Hampton Corners, NY	4,500	--	--	--
California Supreme Salt, LLC, Twentynine Palms, CA[1]	--	15	--	--
Cargill, Inc.:				
Akron, OH	--	--	350	(2)
Avery Island, LA	2,700	--	--	(2)
Breaux Bridge, LA	--	--	200	--
Cleveland, OH	4,000	--	--	--
Freedom, OK	--	300	--	--
Lake Point, UT	--	800	--	--
Lansing, NY	2,400	--	--	--
Hutchinson, KS	--	--	450	--
Newark, CA	--	750	150	(2)
St. Clair, MI	--	--	425	--
Watkins Glen, NY	--	--	450	--
Corpus Christi Brine Services, Inc., Benavides, TX	--	--	--	(2)
Detroit Salt Co. LLC, Detroit, MI	1,500	--	--	--
Dow Chemical Co., The:				
Freeport, TX	--	--	--	(2)
Plaquemine, LA	--	--	--	(2)
E.I. duPont de Nemours, New Johnsonville, TN	--	--	230	--
Huck Salt Co., Fallon, NV	20	--	--	--
Hutchinson Salt Co., Hutchinson, KS	750	--	--	--
Independent Salt Co., Kanopolis, KS	750	--	--	--
Key Energy Services, LLC, Hobbs, NM[3]	--	--	--	(2)
Lyons Salt Co., Lyons, KS	600	--	--	--
Moab Salt, Inc., Moab, UT	--	250	--	--
Morton International, Inc.:				
Fairport, OH	2,000	--	--	--
Glendale, AZ	--	150	--	--
Grand Saline, TX	400	--	150	--
Grantsville, UT	--	500	--	--
Manistee, MI	--	--	360	--
Rittman, OH	--	--	600	--
Silver Springs, NY	--	--	375	(2)
South Hutchinson, KS	--	--	350	--
Weeks Island, LA	1,800	--	--	(2)
The Mosaic Co., Hersey, MI[4]	--	--	300	--
New Mexico Salt and Mineral Corp., Loving, NM	--	100	--	--
North American Salt Co.[5]				
Cote Blanche, LA	3,500	--	--	--
Lyons, KS	--	--	425	--
Ogden, UT[6]	--	1,500	--	--
Occidental Chemical Corp., Wichita, KS[7]	--	--	--	(2)
Olin Corp., McIntosh, AL	--	--	--	(2)
PB Energy Storage, Inc.:[8]				
Dale, NY	--	--	--	(2)
Napoleonville, LA	--	--	--	(2)
PPG Industries, Inc.:				
Lake Charles, LA	--	--	--	(2)
New Martinsville, WV	--	--	--	(2)
Redmond Clay & Salt Co., Inc., Redmond, UT	150	--	--	--
Searles Valley Minerals, Inc., Trona, CA[9]	--	200	--	--
South Bay Salt Works, Chula Vista, CA[10]	--	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 2011

(Thousand short tons)

Company	Rock	Solar	Vacuum and Open pans	Brine
Texas Brine Corp.:				
Beaumont, TX	--	--	--	(2)
Chacahoula, LA	--	--	--	(2)
Clemville, TX	--	--	--	(2)
Corpus Christi, TX	--	--	--	(2)
Houston, TX	--	--	--	(2)
LaPorte, TX	--	--	--	(2)
Wyoming, NY	--	--	--	(2)
US Salt L.L.C., Watkins Glen, NY	--	--	335	(2)
Union Texas Products Corp., Plaquemine, LA	--	--	--	(2)
United Salt Corp.:				
Baytown, TX	--	--	400	(2)
Carlsbad, NM	--	400	--	--
Hockley, TX	150	--	--	--
Saltville, VA	--	--	200	--
Total Production Capacity	25,200	5,150	5,750	20,400

-- Zero.
[1]Formerly Superior Salt Co.
[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, oil field chemicals, etc. Total brine production capacity is the quantity of brine produced for the year.
[3]Formerly Rowland Trucking Co., Inc.; then became Yale E. Key, Inc.
[4]Sells salt to North American Salt Co.
[5]Owned by Compass Minerals, Inc.
[6]Owned by Compass Minerals; operated by Great Salt Lake Minerals Corp.
[7]Formerly Vulcan Chemical Co.
[8]Associated with Texas Brine Corp.
[9]Formerly Pacific Salt and Chemical Co.
[10]Formerly Western Salt Co.

Source: U.S. Geological Survey.

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
2010:					
Bulk	959	2,230 r	17,100 r	18,500	38,800
Compressed pellets	1,230	326	XX	XX	1,560
Packaged	1,770	474 r	388 r	XX	2,640
Pressed blocks	138	92	67	XX	297
Total	4,100	3,120 r	17,600 r	18,500	43,300
2011:					
Bulk	949	2,410	17,900	19,200	40,500
Compressed pellets	1,220	337	XX	XX	1,560
Packaged	1,790	430	438	XX	2,650
Pressed blocks	127	75	52	XX	254
Total	4,080	3,250	18,400	19,200	45,000

[r]Revised. XX Not applicable.
[1]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)

Product form	Vacuum and open pans		Solar		Rock		Brine		Total	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
2010:										
Bulk	750	83,100	1,850 r	48,200 r	17,500 r	598,000 r	18,500	138,000	38,500	867,000
Compressed pellets	1,230	219,000	399	53,500	XX	XX	XX	XX	1,630	272,000
Packaged:										
Less-than-5-pound units	270	NA	29 r	NA	7 r	NA	XX	XX	307 r	XX
More-than-5-pound units	1,630	NA	667 r	NA	351 r	NA	XX	XX	2,640	XX
Total	1,900	396,000	697 r	67,500 r	358 r	37,900 r	XX	XX	2,950	502,000
Pressed blocks:										
For livestock	128	NA	131	NA	69	NA	XX	XX	328	XX
For water treatment	10	NA	3	NA	1	NA	XX	XX	14	XX
Total	139	19,700	134	14,700	70	11,000	XX	XX	342	45,400
Grand total	4,020	718,000	3,080 r	184,000 r	17,900 r	647,000 r	18,500	138,000	43,500	1,690,000
2011:										
Bulk	763	82,400	2,700	64,700	17,900	652,000	19,200	156,000	40,600	955,000
Compressed pellets	1,230	214,000	379	60,200	XX	XX	XX	XX	1,610	274,000
Packaged:										
Less-than-5-pound units	250	NA	49	NA	57	NA	XX	XX	356	XX
More-than-5-pound units	1,630	NA	639	NA	447	NA	XX	XX	2,720	XX
Total	1,890	378,000	688	67,600	503	53,900	XX	XX	3,080	500,000
Pressed blocks:										
For livestock	118	NA	111	NA	50	NA	XX	XX	279	XX
For water treatment	9	NA	3	NA	1	NA	XX	XX	13	XX
Total	127	17,900	114	16,300	51	8,480	XX	XX	291	42,600
Grand total	4,000	692,000	3,880	209,000	18,500	714,000	19,200	156,000	45,500	1,770,000

rRevised. NA Not available. XX Not applicable.

[1]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 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	2010		2011	
	Quantity	Value	Quantity	Value
Kansas	3,080	194,000	3,060	186,000
Louisiana	14,100	234,000	14,300	234,000
New York	6,460	442,000	6,520	452,000
Texas	9,130	173,000	9,330	180,000
Utah	1,940	100,000	2,660	126,000
Other Eastern States[3]	7,440	437,000	8,190	485,000
Other Western States[4]	1,340	107,000	1,440	109,000
Total	43,500	1,690,000	45,500	1,770,000
Puerto Rico[e]	45	1,500	45	1,500

eEstimated.

[1]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 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	Standard industrial classification	Vacuum and open pans		Solar		Rock		Brine		Total[3]	
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Chemical:											
Chloralkali producers	2812	89	86	299	316	653	660	18,100	16,400	19,100	17,500
Other chemical	28 (excludes 2812, 2899)	232	255	188	173	668	598	1	--	1,090	1,030
Total		321	341	486	489	1,320	1,260	18,100	16,400	20,200	18,500
Food-processing industry:											
Meat packers	201	219	208	33	29	22	23	--	--	275	260
Dairy	202	155	162	11	11	5	6	--	--	171	179
Canning	2091, 203	198	151	32	24	29	20	--	--	258	195
Baking	205	346	143	5	6	13	12	--	--	364	162
Grain mill products	204 (excludes 2047)	96	103	9	8	8	7	--	--	113	118
Other food processing	206-208, 2047, 2099	406	645	93	121	80	87	1	1	580	854
Total		1,420	1,410	184	200	157	155	1	1	1,760	1,770
General industrial:											
Textiles and dyeing	22	19	16	35	25	5	5	(4)	2	59	49
Metal processing	33, 34, 35, 37	5	4	11	12	10	27	(4)	--	26	44
Rubber	2822, 30 (excludes 3079)	3	2	(4)	(4)	2	2	(4)	--	5	5
Oil	13, 29	67	66	133	157	109	85	16	15	325	322
Pulp and paper	26	8	7	32	43	19	17	--	--	59	67
Tanning and (or) leather	311	1	3	11	13	27	25	--	--	39	42
Other industrial	XX	110	126	91	109	216	198	(4)	--	418	433
Total		213	226	314	361	388	359	17	17	931	962
Agricultural:											
Feed retailers and (or) dealers mixers	5159	340	328	353	274	637	570	--	--	1,330	1,170
Feed manufacturers	2048	50	58	89	93	285	286	--	--	425	438
Direct-buying end user	02	4	7	7	13	74	75	--	--	85	95
Total		394	393	450	380	996	931	--	--	1,840	1,710
Water treatment:											
Government (Federal, State, local)	2899	47	65	369	102	170	47	5	10	591	225
Commercial or other	2899	63	28	143	39	109	19	7	1	322	87
Total		110	93	512	141	279	67	12	11	913	311
Ice control and (or) stabilization:											
Government (Federal, State, local)	9621	4	10	480	302	15,300	16,000	--	2	15,800	16,300
Commercial or other	XX	56	74	275	332	2,510	2,850	--	--	2,840	3,260
Total		60	84	755	634	17,900	18,800	--	2	18,700	19,600

See footnotes at end of table.

TABLE 6—Continued
DISTRIBUTION OF DOMESTIC AND IMPORTED SALT BY PRODUCERS IN THE UNITED STATES, BY END USE AND TYPE[1, 2]

(Thousand metric tons)

End use	Standard industrial classification	Vacuum and open pans		Solar		Rock		Brine		Total[3]	
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Distributors:											
Agricultural distribution	5191	74	74	127	139	158	162	--	--	359	375
Grocery wholesalers and (or) retailers	514, 54	432	401	215	196	113	108	--	--	761	706
Institutional wholesalers and end users	58, 70	127	130	70	68	118	88	(4)	(4)	315	286
Water-conditioning distribution	7399	143	155	303	320	13	17	1	1	461	493
U.S. Government resale	9199	(4)	(4)	(4)	(4)	(4)	(4)	--	--	1	1
Other wholesalers and (or) retailers	5251	854	878	968	979	299	310	(4)	(4)	2,120	2,170
Total		1,630	1,640	1,680	1,700	702	685	2	2	4,020	4,030
Other[5]		16	61	3	11	2	685	253	--	274	757
Grand total		4,160	4,250	4,390	3,920	21,700	23,000	18,400	16,400	48,600	47,600

-- Zero.

[1]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 may differ from totals shown in table 6 because of changes in inventory and (or) incomplete data 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)

	2010				2011			
	Evaporated				Evaporated			
Destination	Vacuum and open pans	Solar	Rock	Total	Vacuum and open pans	Solar	Rock	Total
Alabama	41	9	45	95	43	12	41	97
Alaska	3	3	--	6	2	3	--	4
Arizona	12	112	1	125	14	109	1	123
Arkansas	48	6	49	103	45	7	70	122
California	197	548	2	747	197	713	3	913
Colorado	12	85	58	156	12	86	31	129
Connecticut	17	165	151	332	14	5	159	178
Delaware	9	9	3	22	11	6	2	19
District of Columbia	(3)	43	9	52	(3)	(3)	(3)	(3)
Florida	68	198	3	269	75	195	3	273
Georgia	105	74	60	238	104	95	47	246
Hawaii	(3)	2	--	2	(3)	2	--	2
Idaho	21	90	(3)	111	20	130	(3)	150
Illinois	332	105	2,340	2,780	320	100	2,270	2,690
Indiana	254	108	923	1,290	246	115	887	1,250
Iowa	128	102	604	833	123	97	440	660
Kansas	78	45	859	983	75	38	835	948
Kentucky	72	7	1,160	1,240	72	6	1,080	1,160
Louisiana	51	7	216	274	59	8	233	300
Maine	20	6	73	99	15	4	126	145
Maryland	83	161	159	403	78	22	110	211
Massachusetts	32	43	238	313	33	6	334	373
Michigan	269	38	1,740	2,050	262	36	1,290	1,590
Minnesota	120	206	766	1,090	115	204	1,750	2,070
Mississippi	22	5	197	224	20	5	183	209
Missouri	112	75	532	719	110	97	540	747
Montana	1	64	(3)	65	1	62	(3)	63
Nebraska	56	43	145	244	54	43	212	310
Nevada	4	226	27	258	5	282	27	314
New Hampshire	15	56	42	113	15	10	78	103
New Jersey	105	107	118	330	105	94	112	311
New Mexico	21	192	(3)	213	21	196	(3)	217
New York	176	30	2,850	3,050	181	24	3,220	3,430
North Carolina	107	108	170	386	112	48	111	271
North Dakota	23	17	8	49	18	19	5	42
Ohio	422	44	2,710	3,180	431	47	2,710	3,190
Oklahoma	30	30	122	182	29	29	83	141
Oregon	19	38	(3)	57	20	41	1	62
Pennsylvania	181	119	2,180	2,480	187	65	2,090	2,350
Rhode Island	4	71	(3)	75	3	1	(3)	5
South Carolina	45	31	2	78	36	15	1	52
South Dakota	24	51	6	81	23	51	61	136
Tennessee	110	6	539	656	133	7	494	634
Texas	293	168	315	776	309	171	259	740
Utah	15	261	9	285	17	207	9	234
Vermont	5	1	202	209	5	1	327	332
Virginia	99	121	276	496	113	32	148	294
Washington	25	124	17	166	24	126	(3)	151
West Virginia	26	5	421	452	20	3	256	279
Wisconsin	186	155	1,340	1,680	202	173	1,650	2,030
Wyoming	2	64	(3)	66	3	62	(3)	65
Other[4]	65	1	14	79	117	8	680	804
Total[5]	4,160	4,390	21,700	30,300	4,250	3,920	23,000	31,100

-- Zero.

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

[2]Each salt type includes domestic and imported quantities. Brine is excluded because brine is not shipped out of State.

[3]Less than ½ unit.

[4]Includes shipments to overseas areas administered by the United States, Puerto Rico, exports, and some shipments to 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 because of changes in inventory and (or) incomplete data reporting.

TABLE 8
AVERAGE VALUE OF SALT, BY PRODUCT FORM AND TYPE[1, 2]

(Dollars per metric ton)

Product form	Vacuum and open pans	Solar	Rock	Brine
2010:				
Bulk	110.83	26.03 r	34.23 r	7.49
Compressed pellets	177.44	134.10	XX	XX
Packaged	209.19	96.85 r	105.75 r	XX
Average[3]	180.08	57.41 r	35.67 r	7.49
Pressed blocks	141.56	110.27	158.23	XX
2011:				
Bulk	108.06	23.98	36.36	8.15
Compressed pellets	173.92	159.02	XX	XX
Packaged	200.74	98.17	107.04	XX
Average[3]	174.00	51.11	38.29	8.15
Pressed blocks	140.96	143.16	167.49	XX

rRevised. XX Not applicable.
[1]Net selling value, free on board plant, excluding container costs.
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]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[1]

(Thousand metric tons and thousand dollars)

Country	2010		2011	
	Quantity	Value[2]	Quantity	Value[2]
Canada	451	40,000	754	55,400
China	1	797	1	556
Colombia	2	480	2	537
Costa Rica	2	379	2	357
Dominican Republic	1	271	1	242
Germany	1	494	1	525
Honduras	1	233	1	267
Japan	3	2,390	6	1,710
Malaysia	1	378	1	1,210
Mexico	29	6,500	35	7,810
Netherlands	1	630	3	1,710
Panama	1	611	1	373
Saudi Arabia	8	2,200	6	1,660
United Arab Emirates	2	609	1	695
Other	91	13,300	31	14,500
Total	595	69,300	846	87,500

[1]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)

	2010		2011	
District	Quantity	Value[2]	Quantity	Value[2]
Anchorage, AK	(3)	11	2	331
Buffalo, NY	76	9,830	440	26,200
Cleveland, OH	1	136	(3)	85
Detroit, MI	191	15,200	75	9,670
El Paso, TX	2	288	2	315
Great Falls, MT	2	647	3	855
Houston, TX	13	5,510	11	4,230
Laredo, TX	22	4,860	29	6,410
Los Angeles, CA	2 r	3,150	10	4,290
Miami, FL	3	1,190	2	1,890
Mobile, AL	(3)	108	(3)	26
New York, NY	13	4,390	14	7,620
Nogales, AZ	4	1,030	3	692
Norfolk, VA	2	1,490	3	1,190
Ogdensburg, NY	27	5,220	27	5,270
Pembina, ND	2	628	4	1,090
San Diego, CA	1	321	1	389
San Francisco, CA	3	821	3	1,240
Seattle, WA	34	2,450	8	2,200
St. Albans, VT	4	771	7	1,200
Other[4]	193 r	11,300	202	12,300
Total	595	69,300	846	87,500

rRevised.

[1]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]Unknown but assumed to be rail and (or) truck shipments to Canada through various points of departure. Also includes minor shipments through 19 other customs districts.

Source: U.S. Census Bureau.

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

(Thousand metric tons and thousand dollars)

Country	2010		2011	
	Quantity	Value[2]	Quantity	Value[2]
Australia	118	3,590	63	947
Bahamas, The	935	16,500	512	8,940
Belgium	3	887	4	1,190
Brazil	208	4,290	132	3,120
Canada	4,240	119,000	5,340	153,000
Chile	5,000	96,100	5,030	102,000
China	9	2,720	12	1,750
Colombia	5	992	4	909
Cyprus	4	286	3	186
Egypt	398	4,930	359	7,450
France	8	6,800	17	5,620
Germany	6	1,820	2	1,880
India	2	435	4	314
Israel	10	4,620	13	4,120
Italy	68	3,970	34	3,390
Japan	1	96	1	161
Korea, Republic of	9	1,720	6	1,700
Mexico	1,000	28,200	1,480	44,700
Netherlands	362	11,100	127	5,800
New Zealand	(3)	91	(3)	98
Pakistan	2	946	3	1,520
Peru	406	4,420	560	8,250
South Africa	11	1,310	14	1,510
Spain	44	4,160	7	3,560
Switzerland	(3)	7	(3)	27
Syria	18	290	--	--
United Kingdom	9	916	13	1,270
Vietnam	2	219	1	245
Other	24	1,840	95	3,130
Total	12,900	322,000	13,800	367,000

-- Zero.

[1]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 only.

[3]Less than ½ unit.

Source: U.S. Census Bureau.

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

(Thousand metric tons and thousand dollars)

District	2010		2011	
	Quantity	Value[2]	Quantity	Value[2]
Anchorage, AK	16	631	19	722
Baltimore, MD	1,690	38,100	1,320	35,800
Boston, MA	1,100	17,300	1,210	20,000
Buffalo, NY	122	2,780	107	2,700
Charleston, SC	97	2,710	182	4,000
Chicago, IL	912	15,400	1,140	22,600
Cleveland, OH	271	6,720	233	6,760
Columbia-Snake, OR	187	6,580	157	5,450
Dallas-Fort Worth, TX	1	390	(3)	73
Detroit, MI	895	19,700	1,180	24,400
Duluth, MN	28	2,610	62	5,880
Great Falls, MT	7	844	6	939
Los Angeles, CA	152	6,120	137	6,210
Miami, FL	1	294	1	429
Milwaukee, WI	675	12,000	1,060	22,400
Minneapolis, MN	206	4,140	287	5,960
Mobile, AL	2	2,260	1	1,220
New Orleans, LA	137	3,910	197	8,870
New York, NY	2,010	49,300	1,950	45,900
Norfolk, VA	240	5,210	154	3,980
Ogdensburg, NY	765	45,200	736	46,000
Pembina, ND	12	1,660	27	2,970
Philadelphia, PA	1,600	31,700	1,600	35,600
Portland, ME	708	12,300	891	18,400
Providence, RI	350	6,860	270	6,180
San Diego, CA	6	2,010	7	2,050
San Francisco, CA	3	1,370	38	1,940
San Juan, PR	5	1,050	5	968
Savannah, GA	42	1,500	31	1,630
Seattle, WA	44	3,110	121	4,410
St. Albans, VT	1	131	5	564
St. Louis, MO	1	320	1	273
Tampa, FL	490	9,830	432	10,100
Wilmington, NC	126	4,360	159	5,930
Other[4]	4	3,660	123	5,530
Total	12,900	322,000	13,800	367,000

[1]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 only.
[3]Less than ½ unit.
[4]Includes imports through six other customs districts.

Source: U.S. Census Bureau.

TABLE 13
SALT: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons)

Country[3]	2007	2008	2009	2010	2011[e]
Afghanistan, rock salt	170 [r]	158 [r]	180 [r]	186 [r]	190
Albania[e]	25	25	25	25	25
Algeria, brine and sea salt	183	202	269	187 [r]	200
Angola[e]	35	35	35	45	45
Argentina	2,358	1,681	1,478	1,500 [e]	1,500
Armenia	35	37	37	40 [e]	40
Australia, salt and marine salt	10,855	11,160	10,316	11,968	11,744 [4]
Austria, rock and brine	742	874	1,038 [r]	1,083 [r]	1,050
Azerbaijan	7	8	5	4 [r, e]	4
Bahamas, The	882 [r]	1,024 [r]	1,000 [r, e]	1,036 [r]	1,000 [r]
Bangladesh, marine salt[e, 5]	360	360	360	360	360
Belarus	1,665 [r]	1,476 [r]	1,695 [r]	1,700 [r, e]	1,700
Bolivia	2	1	2	1	2 [4]
Bosnia and Herzegovina	502	555	556	663	832 [4]
Botswana[e, 6]	210	210	210	210	200
Brazil:[e]					
Brine salt	5,365 [4]	5,370	5,370	5,370	5,370
Rock salt	1,621 [4]	1,650	1,650	1,650	1,650
Total	6,986 [4]	7,020	7,020	7,020	7,020
Bulgaria[e]	2,000	2,100	1,300	1,300 [r]	1,300
Burkina Faso[e]	5	5	5	5	5
Burma, brine salt	71	54	133	97	98
Cambodia	77	78	--	--	--
Canada	11,862	14,386	14,615	10,537	12,625 [p, 4]
Cape Verde[e]	2	2	2	2	2
Chile	4,404	6,431	8,382	7,695 [r]	9,966 [4]
China	59,760	59,520	66,630 [r]	70,380 [r]	72,000
Colombia:					
Marine salt	310	386	357	375 [e]	375
Rock salt	204	245	255	260 [e]	260
Total	514	632	612	635 [e]	635
Costa Rica, marine salt[e]	20	--	--	--	--
Croatia[e]	33 [4]	33	32	32	32
Cuba	141	157	266	260 [e]	260
Denmark, sales[e]	600	600	600	60	60
Djibouti[e]	30 [r]	30 [r]	30 [r]	30 [r]	30
Dominican Republic, marine salt[e]	50	50	50	50	50
Ecuador[e]	75	75	75	75	75
Egypt	1,214	1,879	2,952	2,800 [r]	3,000
El Salvador, marine salt[e]	30	30	30	--	--
Eritrea, marine salt[e]	60	60	60	60	60
Ethiopia, rock salt[e, 5]	260 [r]	300 [r]	351 [r, 4]	550 [r, 4]	560
France, all sources[7]	6,140	6,100	6,100 [e]	6,100 [e]	6,100
Georgia[e]	30	30	30	30	30
Germany:					
Industrial brines	10,395 [r]	9,084	9,798	8,752 [r]	9,160
Rock salt and other	7,819	6,169	8,816	10,602 [r]	9,300
Salt, evaporated, includes marine salt	592	580	325	322 [r]	320
Total	18,806 [r]	15,833	18,939	19,676 [r]	18,800
Ghana[e]	124	239	250 [r]	250 [r]	300
Greece[e]	150	150	150	150	150
Guadeloupe[e]	49	49	49	49	49
Guatemala[e]	60	60	50	50	50
Guinea[e]	15	15	15	15	15
Honduras[e]	40	40	40	40	40

See footnotes at end of table.

TABLE 13—Continued
SALT: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons)

Country[3]	2007	2008	2009	2010	2011[e]
Iceland[e]	5	5	5	5	5
India:[e]					
Marine salt	16,000	16,000	16,500	17,000	17,000
Rock salt	3	3	3	3	3
Total	16,000	16,000	16,500	17,000	17,000
Indonesia[e]	700	700	585 [r]	600 [r]	650
Iran[8]	2,565	2,158	2,200 [e]	2,200 [e]	2,000
Iraq[e]	153	109	113	102 [r]	110
Israel	400	421	357	421 [r]	430
Italy, all sources[e, 9, 10]	2,214 [4]	2,200	2,200	2,200	2,200
Jamaica[e]	19	19,000	19,000	19	19
Japan[e]	1,190	1,200	1,200	1,250	1,300
Jordan	17	25	23 [r]	33 [r]	35
Kazakhstan, salt and sodium chloride	228	504	223	229	325 [4]
Kenya, crude salt[11]	12	24	24	6 [r]	6
Korea, North[e]	500	500	500	500	500
Korea, Republic of	250	348	382	223 [r]	250
Kuwait[e]	14	14	14	14	15
Kyrgyzstan[e]	1	1	1	1	1
Laos, rock salt[e]	35	35	35	35	35
Lebanon[e]	20	20	20	20	20
Libya[e]	40	40	40	40	20
Madagascar[e]	75	75	75	75	85
Mali[e]	6	6	6	6	6
Malta, marine salt[e]	(11)	(11)	(11)	(11)	(11)
Martinique[e]	200	200	200	200	200
Mauritania	(11)	1	(11)	(11) [r, e]	1
Mauritius[e]	8 [4]	8	8	8	8
Mexico	8,400 [e]	8,809	7,445	8,431	8,812 [4]
Mongolia, mine output[e]	1 [4]	(11)	1	1	1
Montenegro, sea water evaporate[e]	20	25	17	17	18
Morocco, marine and rock salt[e]	250	250	250	250	250
Mozambique, marine salt[e]	110	110	110	110	110
Namibia, marine salt	811	732	807 [r]	771 [r]	800
Nepal[e]	2	--	--	--	--
Netherlands[e]	5,000	5,000	5,000	5,000	5,000
Netherlands Antilles[e]	500	500	500	--	--
New Zealand[e]	100	100	100	100	100
Nicaragua, marine salt[e]	30	30	30	30	30
Niger[e]	1	1	1	1	1
Oman	10	11	31	12 [r, e]	15
Pakistan:[5]					
Marine salt[e]	18	50 [r]	93 [r, 4]	190 [r, 4]	200 [r]
Rock salt	1,833 [r]	1,883 [r]	1,941 [r]	2,058 [r]	2,000
Total[e]	1,850 [r]	1,930 [r]	2,034 [r, 4]	2,248 [r, 4]	2,200 [r]
Panama, marine salt[e]	18	18	17 [4]	17	17
Peru	1,185	1,276	1,567	1,570 [e]	1,468 [4]
Philippines, marine salt	438	510	516	558 [r]	560
Poland:					
Rock salt	591	618	999 [r]	1,236 [r]	1,240
Recovered from brine	2,931	2,783	2,533 [r]	2,464 [r]	2,500
Total	3,522	3,401	3,532 [r]	3,700 [r]	3,740
Portugal, rock salt	591	560	560	561	561

See footnotes at end of table.

TABLE 13—Continued
SALT: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons)

Country[3]	2007	2008	2009	2010	2011[e]
Romania:[e]					
Rock salt	51 [4]	50	40	45	45
Other	2,425 [4]	2,400	2,000	2,000	2,000
Total	2,476 [4]	2,450	2,040	2,050	2,050
Russia[e]	2,200 [4]	2,200	2,200	2,200	2,200
Saudi Arabia	1,507	1,600	1,640 [r, e]	1,800 [e]	1,800
Senegal	212	241	222	231 [r]	230
Serbia	30	30	29	31 [r]	23 [4]
Slovakia	101	99 [e]	38	40 [e]	40
Slovenia[e]	2	2	2	2	2
South Africa	412	430 [r]	408 [r]	394 [r]	340
Spain:[e]					
Marine and other evaporated salt	1,500 [4]	1,500	1,500	1,500	1,500
Rock salt	2,850 [4]	2,850	2,850	2,850	2,850
Total	4,350 [4]	4,350	4,350	4,350	4,350
Sri Lanka	70	111	11 [r]	10 [r]	11
Sudan	23	11	36	142 [r]	150
Switzerland[e]	300	300	300	300	300
Syria	81	89 [r]	78	81 [r]	80
Tajikistan[e]	52	52	52	52	52
Tanzania	35	26	28 [r]	24 [r]	25
Thailand:[e]					
Rock salt	1,135 [4]	1,212 [4]	1,200	1,200	1,200
Other	100	100	100	100	100
Total	1,235 [4]	1,312 [4]	1,300	1,300	1,300
Tunisia, marine salt	933	1,063	1,280 [r]	1,804 [r]	1,500
Turkey	2,366	2,472	3,768	4,000 [e]	4,000
Turkmenistan[e]	215	215	215	215	215
Uganda[e]	5	5	5	5	5
Ukraine	5,548	4,425	5,395	4,908 [r]	4,900
United Kingdom:[e]					
Brine salt[12, 13]	2,800	2,800	2,800	2,800	2,800
Rock salt	2,000	2,000	2,000	2,000	2,000
Other salt[13]	1,000	1,000	1,000	1,000	1,000
Total	5,800	5,800	5,800	5,800	5,800
United States, including Puerto Rico:					
United States:					
Brine	19,700	18,900	17,800	18,500	19,200 [4]
Rock salt	16,800	20,900	20,300	17,600 [r]	18,400 [4]
Solar salt	3,650	4,070	3,880	3,120 [r]	3,250 [4]
Vacuum and open pan	4,420	4,200	4,030	4,100	4,080 [4]
Total	44,500	48,000	46,000	43,300 [r]	45,000 [4]
Puerto Rico[e]	45	45	45	45	45
Total, United States and Puerto Rico	44,600	48,100	46,100	43,300 [r]	45,000 [4]
Venezuela[e]	350	350	350	350	350
Vietnam	857	717	679 [r]	1,057 [r]	1,050
Yemen[e]	53	61	65	75 [r]	65
Grand total	253,000 [r]	258,000 [r]	270,000 [r]	270,000 [r]	277,000 [r]

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

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

[2]Table includes data available through July 15, 2012.

[3]Salt is produced in many other countries, but quantities are relatively insignificant and reliable production data are not available. Some salt brine production data for manufacture of chlorine, caustic soda, and soda ash are not reported because of incomplete data reporting by many countries.

[4]Reported figure.

[5]Year ending June 30 of that stated.

[6]From natural soda ash production.

[7]Includes marine and rock salt and salt solution.

TABLE 13—Continued
SALT: WORLD PRODUCTION, BY COUNTRY[1, 2]

[8]Year beginning March 21 of that stated.
[9]Includes marine salt.
[10]Does not include production from Sardinia and Sicily, which is estimated to be 200,000 metric tons per year.
[11]Production by Magadi Soda Ash Ltd. only.
[12]Year ending July 15 of that stated.
[13]Data captioned "Brine salt" for the United Kingdom are the quantities of salt obtained from the evaporation of brine; that captioned "Other salt" are for salt content of brines used for purposes other than production of salt.