



2007 Minerals Yearbook

SALT [ADVANCE RELEASE]

SALT

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For more than 100 years, the United States had been the world's leading salt producing nation. Updated 2005 world production data show that China surpassed the United States and was the leading producing country in the world in 2005 through 2007. Total U.S. salt production in 2007 increased slightly to 44.5 million metric tons (Mt) compared with that of 2006 (table 1). According to U.S. Geological Survey (USGS) data for 2007, 31 companies operated 64 salt-producing plants in 16 States. Of these, 11 companies and 16 plants produced more than 1 Mt each and accounted for 92% and 60%, respectively, of total U.S. production and accounted for 91% and 37%, respectively, of total value. Several companies and plants produced more than one type of salt. In 2007, 14 companies (32 operations) produced salt brine; 11 companies (15 operations), rock salt; 10 companies (13 operations), solar-evaporated salt; and 6 companies (18 operations), vacuum pan salt.

The five leading States were, in descending order of total salt sold or used, Louisiana with 31%; Texas, 20%; New York, 18%; Kansas, 6%; and Utah, 5%. Other Eastern States (Alabama, Michigan, Ohio, Tennessee, Virginia, and West Virginia) accounted for 17% 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, 2007. 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 31 companies to which a canvass form was sent, 28 responded, representing 84% of the totals shown in this report. Data for the three nonrespondents were estimated based on their prior responses to previous annual surveys, the 2007 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 31 companies and 64 plants by 2007.

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 may be found in the 2006 salt Minerals Yearbook chapter.

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 five 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 list the production capacities for domestic rock salt operations. Rock salt mining in 2007 was 16.8 Mt, a slight increase compared with the revised 2006 total of 16.5 Mt.

Solar Evaporation.—Solar salt production in 2007 was 3.57 Mt, which was a slight decrease from the 2006 total of 3.64 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 may be found in the 2006 salt Minerals Yearbook chapter.

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 2007 was 19.7 Mt, which was slightly less than the 2006 total of 19.8 Mt. The brine 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 may be found in the 2006 salt Minerals Yearbook chapter.

Processing.—Rock Salt.—About 79% of total rock salt produced and imported is used for highway deicing. Crushing and screening to the proper physical size is usually the only processing that road salt undergoes. In many operations, these steps are done underground in the mine to minimize haulage and storage costs. In addition, the extremely fine fraction, which often is unusable and would represent a waste product if brought to the surface, remains underground.

Solar Salt.—In the production of solar salt, salt crystals first are harvested; then the salt crystals are washed with dilute brine to remove residual bitterns and impurities. The salt is transferred to processing facilities where it is washed with saline water, dried for about 8 minutes at approximately 160° C (300° F), and screened into fine to coarse sizes, depending on the end use of the salt to be sold. Most operations ship solar salt in bags and in bulk, using barges, rail, and truck transportation.

Mechanical Evaporation.—Vacuum pan salt is not mined but is a type of salt produced using mechanical evaporation technology. Vacuum pan salt production in 2007 was 4.42 Mt, which was a slight decrease compared with the 2006 total of 4.45 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 12 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.

Dominion Transmission Inc. (a subsidiary of Dominion Resources, Inc.) announced plans to build a 50-billion-cubic-foot natural gas storage facility and salt refinery for \$750 million in the halite beds near Tioga, PA. Eight storage caverns will be constructed through 2028, the first of which to begin construction in 2009 and to be in service by 2014. The recovered salt brine will be used as feedstock for a proposed new vacuum pan salt facility. About 650,000 metric tons of salt could be processed each year (Sun Gazette, 2007). The salt caverns will store natural gas for customers in the Northeast and Mid-Atlantic regions of the United States (Dominion Transmission, Inc., 2007).

Spectra Energy Corp. (formerly Duke Energy Gas Transmission), which had a natural gas storage facility and a pilot plant for salt processing, sold its salt operation to United Salt Corp. The new vacuum pan salt facility at Saltville, VA, was the newest evaporated salt plant built in the United States. A new bagging facility will be added to the plant to the existing bulk bag and bulk salt product lines (United Salt Corp., 2007).

Consumption

In 2007, apparent consumption (salt sold or used plus imports minus exports) was 53.2 Mt, whereas reported consumption (sales or use as reported by the salt companies, including their imports and exports) was the same. 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 2007 reported percentage distribution of salt by major end use was chemicals, 40%; ice control, 39%; distributors (grocery and other wholesalers and retailers, and so forth), 8%; agricultural, food processing, and general industrial, 3% each; primary water treatment, 2%; and other uses combined with exports, 2% (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.—The leading consumer of salt, primarily salt brine, is the chemical industry. Salt brine is extracted from natural underground saline sources or solution-mined halite deposits (salt beds or salt domes), or production from the dissolution of solar salt supplies. 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 in 2007 was 21.4 Mt, of which 19.8 Mt was for chloralkali manufacture and 1.6 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 a telephone survey by the author of domestic salt-base chlorine facilities, about 48% of the salt used to manufacture chlorine was captive (produced by the chloralkali companies) and 31% was purchased brine; purchased solar salt and rock salt made up 12% of the supply, and imported rock, solar, and vacuum pan salt, 9%.

In 2007, according to the U.S. Census Bureau, 10.8 Mt of chlorine and 8.05 Mt of sodium hydroxide (caustic soda or lye) were produced in the United States (U.S. Census Bureau, 2008). Based on the industry average ratio of 1.75 t of salt required to produce 1.0 t of chlorine and 1.1 t of coproduct sodium hydroxide, the chlorine and caustic soda industry consumed about 19 Mt of salt for feedstock. Reported consumption of total domestic and imported salt for chlorine manufacture was 19.8 Mt (table 6). The difference between the calculated and reported quantities was the amount of salt not reported to the USGS from imports or captive brine production of chloralkali producers.

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 only 7% of domestic salt sales for the entire chemical sector and only 3% of total domestic salt consumption.

The consumption of salt for metallic sodium has declined during the past several years. Since the 1970s, the number of producers has decreased to one from three; Ethyl Corp. and RMI Titanium Corp. exited the market in 1985 and 1992, respectively, leaving E.I. du Pont de Nemours and Co., Inc. as the sole manufacturer of metallic sodium in the United States. In 1998, the domestic market for metallic sodium was less than 30,000 t, having decreased from about 126,000 t in 1978 because sodium metal was no longer needed for the production of leaded gasolines, which were phased out during a 25-year period and banned entirely in 1996.

In 1978, sodium usage in gasoline represented about 80% of the domestic market. Although there was no information about sodium consumption in 2007, the leading use of sodium in 1998 was for sodium borohydride production, which is the feedstock for sodium dithionite that is used as a reductive bleaching agent by the pulp and paper industry. Sodium for sodium borohydride manufacture accounted for about 38% of metallic sodium consumption. 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.—The second ranked end use of salt is for highway deicing. In 2007, U.S. consumption of salt for this application was 20.8 Mt which was a 68% increase compared with that of 2006. This increase was attributed to the greater winter precipitation in late 2007 that required more rock salt useage.

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 would have to 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 ground water 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.

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 in 2007 was 4.22 Mt.

General Industrial.—The industrial uses of salt are diverse. They include, in descending order of quantity consumed, oil and gas exploration, other industrial applications, textiles and dyeing, metal processing, pulp and paper, tanning and leather treatment, and rubber manufacture. Total salt sold to these sectors was 1.49 Mt in 2007.

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. Whenever 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-base 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 chlorinated bleaching compounds.

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 2007, 1.64 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. 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. This major 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 in 2007 was 1.68 Mt.

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).

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 2007, 1.12 Mt of salt was sold for primary water treatment and an additional 522,000 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 were reduced by yearend 2007 because of moderately severe winter weather during late 2007. 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 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 average annual 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.

Compass Minerals International, Inc. raised salt prices by about \$9 per metric ton for its two subsidiaries—North American Salt Co. and Sifto Canada Corp. The increases took effect December 3 or as contracts permitted for salt for agriculture, food-grade salt, industrial uses, swimming pools, and water conditioning. This followed the \$8 per ton increase in August on salt for commercial and consumer deicing products (Kansas City Star, 2007).

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 2007, the United States exported 833,000 t of salt; this was a 14% decrease compared with that of 2006 (table 9). In 2007, the majority of exports (71%) were to Canada. Salt was shipped to 68 countries through 31 customs districts; the Detroit, MI, district exported the most and represented 34% of the U.S. total (table 10). Based on U.S. Census Bureau statistics, the United States imported 8.64 Mt of salt from 36 countries in 2007, which was 9% less than was imported during 2006 (table 11). Canada was the leading source of imports, representing about 49% of total imports, followed by Chile (24%), Mexico (10%), and the Bahamas (5%). Table 12 lists the imports of salt by customs districts. Of the 39 customs districts that imported salt in 2007, the Milwaukee, WI, customs district was the largest in terms of tonnage, accounting for about 16% of the total. The quantity of imported salt was about 10 times more than that of exports. This indicates the magnitude of the United States 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 favor the price of imported salt rather 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 113 nations based on reported and estimated information. In 2007, the total estimated world production decreased to about 257 Mt. The United States remained a leading salt-producing country, representing 17% of total world output. China is rapidly increasing its production. In 2007, estimated salt production in China was nearly 60 Mt, making it the leading salt producer in the world.

Most countries possess some form of salt production capability, with production levels set to meet their own domestic demand requirements and with additional quantities available for export to many 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.

Azerbaijan.—The Azerbaijan Investment Co. completed negotiations to construct a refined table salt factory in Masazir. The plant was scheduled to have a capacity of 20,000 metric tons per year with the salt being supplied from the deposits in Azerbaijan and Turkmenistan. Some of the salt would be exported and provide economic opportunities for the country (Azerbaijan Business Center, 2007).

Outlook

The U.S. salt industry continued as an important leader in terms of increased production, consumption, and world trade of salt. Despite the closing and idling of some chlorine plants during the previous several years, remaining chlorine facilities have run at higher capacity utilization rates, thereby offsetting any change in 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 consistent and are expected to remain stable. U.S. salt production is expected to increase for the foreseeable future. Rock salt production and consumption are heavily dependent on the severity of winter weather. 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 more than 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 in 2008 is expected to be an estimated 45 Mt.

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Solution Mining Research Institute.

TABLE 1
SALIENT SALT STATISTICS¹

(Thousand metric tons and thousand dollars)

	2003	2004	2005	2006	2007
United States:					
Production:²					
Brine	20,000	20,500	19,900	19,800	19,700
Rock	16,300	18,300	17,700	16,500 ^r	16,800
Solar	3,330	3,520	3,430	3,640	3,570
Vacuum and open pans	4,070	4,100	4,170	4,450	4,420
Total	43,700	46,500	45,100	44,400 ^r	44,500
Sold or used by producers:					
Quantity	41,100	45,000	45,000	40,600 ^r	45,400
Value	1,130,000	1,270,000	1,310,000	1,310,000 ^r	1,520,000
Exports:					
Quantity	718	1,110	879	973	833
Value	37,500	47,600	51,800	54,900	59,600
Imports for consumption:					
Quantity	12,900	11,900	12,100	9,490	8,640
Value	196,000	159,000	180,000	163,000	171,000
Consumption:					
Apparent ³	53,200	55,800	56,200	49,100 ^r	53,200
Reported	50,200	50,700	53,100	42,400	53,200
World, production	225,000 ^r	236,000 ^r	250,000 ^r	262,000 ^r	257,000 ^e

^eEstimated. ^rRevised.

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

²Excludes Puerto Rico.

³Sold or used plus imports minus exports.

TABLE 2
U.S. SALT COMPANIES BY PRODUCTION CAPACITY, LOCATION, AND TYPE IN 2007

(Thousand short tons)

Company	Rock	Solar	Vacuum and Open Pans	Brine
American Rock Salt Co., Hampton Corners, NY	3,500	--	--	--
Cargill, Inc.:				
Akron, OH	--	--	300	(1)
Avery Island, LA	2,700	--	--	(1)
Breaux Bridge, LA	--	--	200	--
Cleveland, OH	2,900	--	--	--
Freedom, OK	--	300	--	--
Lake Point, UT	--	800	--	--
Lansing, NY	2,400	--	--	--
Hutchinson, KS	--	--	450	--
Newark, CA	--	750	150	(1)
St. Clair, MI	--	--	425	--
Watkins Glen, NY	--	--	450	--
Corpus Christi Brine Service, Inc., Benavides, TX	--	--	--	(1)
Detroit Salt Co. LLC, Detroit, MI	1,300	--	--	--
Dow Chemical Co.:				
Freeport, TX	--	--	--	(1)
Plaquemine, LA	--	--	--	(1)
E.I. duPont de Nemours, New Johnsonville, TN	--	--	230	--
Huck Salt Co., Fallon, NV	20	--	--	--
Hutchinson Salt Co., Hutchinson, KS	750	--	--	--
Independent Salt Co., Kanapolis, KS	750	--	--	--
Key Energy Services, LLC ² , Hobbs, NM	--	--	--	(1)
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	(1)
South Hutchinson, KS	--	--	350	--
Weeks Island, LA	1,800	--	125	(1)
The Mosaic Co., Hersey, MI ³	--	--	300	--
New Mexico Salt and Mineral Corp., Loving, NM	--	30	--	--
North American Salt Co. ⁴				
Cote Blanche, LA	2,800	--	--	--
Lyons, KS	--	--	425	--
Ogden, UT ⁵	--	1,500	--	--
Occidental Chemical Corp. ⁶	--	--	--	(1)
Olin Corp., McIntosh, AL	--	--	--	(1)
Pacific Salt and Chemical Co., Trona, CA	--	--	--	--
Permian Brine Sales, Inc., Odessa, TX	--	--	--	(1)
PPG Industries, Inc.:				
Lake Charles, LA	--	--	--	(1)
New Martinsville, WV	--	--	--	(1)
Redmond Clay & Salt Co., Inc., Redmond, UT	150	--	--	--
Searles Valley Minerals, Inc. ⁷	--	200	--	--
South Bay Saltworks Co., Chula Vista, CA ⁸	--	125	--	--
Superior Salt Co., Twentynine Palms, CA	--	25	--	--

See footnotes at end of table.

TABLE 2—Continued
 U.S. SALT COMPANIES BY PRODUCTION CAPACITY, LOCATION, AND TYPE IN 2007

(Thousand short tons)

Company	Rock	Solar	Vacuum and Open Pans	Brine
Tetra Technologies, Inc., Amboy, CA	--	75	--	(1)
Texas Brine Corp.:				
Beaumont, TX	--	--	--	(1)
Chacahoula, LA	--	--	--	(1)
Clemville, TX	--	--	--	(1)
Corpus Christi, TX	--	--	--	(1)
Dale, NY	--	--	--	(1)
Houston, TX	--	--	--	(1)
LaPorte, TX	--	--	--	(1)
Napoleonville, LA	--	--	--	(1)
Wyoming, NY	--	--	--	(1)
US Salt L.L.C., Watkins Glen, NY	--	--	335	--
Union Texas Products Corp., Plaquemine, LA	--	--	--	(1)
United Salt Corp.:				
Baytown, TX	--	--	800	(1)
Carlsbad, NM	--	400	--	--
Hockley, TX	150	--	--	--
Saltville, VA	--	--	125	--
Vulcan Materials Co., Wichita, KS	--	--	--	(1)
Total Production Capacity	22,200	5,110	6,150	21,700

-- Zero.

¹Includes 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.

²Formerly Rowland Trucking Co., Inc.; then became Yale E. Key, Inc.

³Sells salt to North American Salt Co.

⁴Owned by Compass Minerals, Inc.

⁵Owned by Compass Minerals; operated by Great Salt Lake Minerals Corp.

⁶Formerly Vulcan Chemical Co.

⁷Formerly Pacific Salt and Chemical Co.

⁸Formerly Western Salt Co.

Source: U.S. Geological Survey.

TABLE 3
SALT PRODUCED IN THE UNITED STATES, BY TYPE AND PRODUCT FORM¹

(Thousand metric tons)

Product form	Vacuum and open pans				Total
	Solar	Rock	Brine		
2006:					
Bulk	1,040	2,710	15,900 ^r	19,800	39,500 ^r
Compressed pellets	1,310 ^r	315	XX	XX	1,620
Packaged	1,960	523	450	XX	2,930
Pressed blocks	150	93	119 ^r	XX	362 ^r
Total	4,450	3,640	16,500 ^r	19,800	44,400 ^r
2007:					
Bulk	1,250	2,710	16,400	19,700	40,000
Compressed pellets	1,270	331	XX	XX	1,600
Packaged	1,760	446	332	XX	2,540
Pressed blocks	146	86	68	XX	300
Total	4,420	3,570	16,800	19,700	44,500

^rRevised. XX Not applicable.

¹Data 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
2006:										
Bulk	970	97,000	1,500	47,200	13,000 ^r	297,000 ^r	19,800	138,000 ^r	35,200 ^r	580,000 ^r
Compressed pellets	1,280	198,000	381	51,600 ^r	XX	XX	XX	XX	1,660	249,000
Packaged:										
Less-than-5-pound units	303 ^r	NA	25	NA	30 ^r	NA	XX	XX	358 ^r	XX
More-than-5-pound units	1,600 ^r	NA	967	NA	404 ^r	NA	XX	XX	2,970 ^r	XX
Total	1,900	310,000	992	88,100	435 ^r	37,300 ^r	XX	XX	3,330	436,000
Pressed blocks:										
For livestock	62 ^r	NA	90	NA	88	NA	XX	XX	240 ^r	XX
For water treatment	88 ^r	NA	41	NA	19	NA	XX	XX	148 ^r	XX
Total	149 ^r	16,800	131	14,900	107	10,600 ^r	XX	XX	388	42,300
Grand total	4,300	622,000	3,000	202,000	13,500 ^r	345,000 ^r	19,800	138,000 ^r	40,600 ^r	1,310,000 ^r
2007:										
Bulk	1,010	111,000	1,640	51,200	18,000	478,000	19,600	140,000	40,300	780,000
Compressed pellets	1,260	203,000	395	53,200	XX	XX	XX	XX	1,660	256,000
Packaged:										
Less-than-5-pound units	501	NA	176	NA	(3)	NA	XX	XX	677	XX
More-than-5-pound units	1,400	NA	744	NA	363	NA	XX	XX	2,500	XX
Total	1,900	333,000	920	77,700	363	32,600	XX	XX	3,180	443,000
Pressed blocks:										
For livestock	93	NA	125	NA	66	NA	XX	XX	284	XX
For water treatment	50	NA	2	NA	1	NA	XX	XX	53	XX
Total	143	17,300	127	14,500	67	8,830	XX	XX	337	40,600
Grand total	4,310	663,000	3,080	197,000	18,400	520,000	19,600	140,000	45,400	1,520,000

^rRevised. NA Not available. XX Not applicable.

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

²As 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.

³Less than ½ unit.

TABLE 5
SALT SOLD OR USED BY PRODUCERS IN THE UNITED STATES,
BY STATE^{1,2}

(Thousand metric tons and thousand dollars)

State	2006		2007	
	Quantity	Value	Quantity	Value
Kansas	2,600	144,000	2,870	158,000
Louisiana	12,300 ^r	143,000 ^r	13,900	180,000
New York	4,890	257,000	7,990	400,000
Texas	9,570	132,000	8,950	143,000
Utah	2,350	149,000	2,460	135,000
Other Eastern States ³	7,660	403,000 ^r	8,050	416,000
Other Western States ⁴	1,230	79,100	1,250	87,500
Total	40,600 ^r	1,310,000 ^r	45,400	1,520,000
Puerto Rico ⁶	45	1,500	45	1,500

^eEstimated. ^rRevised.

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

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

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

⁴Includes 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	
		2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
Chemical:											
Chloralkali producers	2812	15	15	294 ^r	305	369	639	16,300	18,800	17,000	19,800
Other chemical	28 (excludes 2812, 2899)	270	218	183	260	821	1,040	75	81	1,350	1,600
Total		285	233	477^r	565	1,190	1,680	16,400	18,900	18,400	21,400
Food-processing industry:											
Meat packers	201	262	229	63 ^r	53	55	23	--	--	380 ^r	305
Dairy	202	127	119	9	9	4	6	--	--	140	134
Canning	2091, 203	140	139	30	25	38	34	--	--	208	198
Baking	205	187	133	4	4	12	12	--	--	203	149
Grain mill products	204 (excludes 2047)	87	89	6	8	18	21	--	--	111	118
Other food processing	206-208, 2047, 2099	576	522	77	85	75	163	2	1	730	771
Total		1,380	1,230	189^r	184	202	259	2	1	1,770	1,680
General industrial:											
Textiles and dyeing	22	83	58	29	34	9	6	(4)	(4)	121	98
Metal processing	33, 34, 35, 37	10	8	18	14	21	14	(4)	(4)	49	36
Rubber	2822, 30 (excludes 3079)	3	3	(4)	(4)	2	2	61	(4)	66	6
Oil	13, 29	47 ^r	52	113	104	50	46	1,940	9	2,150	211
Pulp and paper	26	10	10	32 ^r	29	12	21	18	--	72 ^r	60
Tanning and/or leather	311	8	2	10	10	32	29	--	--	50	41
Other industrial	XX	144	115	61	85	80	831	1	2	285 ^r	1,030
Total		305^r	248	263^r	276	206	949	2,020	12	2,790	1,490
Agricultural:											
Feed retailers and/or dealers mixers	5159	317	356	389	324	384	477	(4)	(4)	1,090	1,160
Feed manufacturers	2048	39	21	121 ^r	91	342	345	--	--	502 ^r	457
Direct-buying end user	02	4	2	12	13	21	12	--	--	37	27
Total		360^r	379	522^r	428	747	834	(4)	(4)	1,630	1,640
Water treatment:											
Government (Federal, State, local)	2899	18	19	181	310	141	156	3	1	343	486
Commercial or other	2899	163	131	346	362	91	134	9	4	609	632
Total		181	150	527	673	232	290	12	6	952^r	1,120
Ice control and/or stabilization:											
Government (Federal, State, local)	9621	1	297	433	530	10,200	16,300	--	--	10,600	17,100
Commercial or other	XX	6	46	110	248	1,650	3,330	--	2	1,770	3,620
Total		7	343	543	778	11,800	19,600	--	2	12,400	20,800
Distributors:											
Agricultural distribution	5191	70	80	96	134	45 ^r	171	--	--	211 ^r	385
Grocery wholesalers and/or retailers	514, 54	491	553	249	260	30	129	--	--	770	943
Institutional wholesalers and end users	58, 70	113	122	64	72	27	199	(4)	(4)	204	393
Water-conditioning distribution	7399	118	105	347	326	23	90	1	1	489	522
U.S. Government resale	9199	(4)	(4)	1	1	1	1	--	--	2	2
Other wholesalers and/or retailers	5251	857	827	858	880	233	267	9 ^r	(4)	1,960 ^r	1,970
Total		1,650	1,690	1,620	1,670	359^r	857	10^r	1	3,630	4,220
Other ⁵		109	76	65	163	516	431	204	277	894	947
Grand total		4,280	4,350	4,200	4,740	15,300	24,900	18,700	19,200	42,400	53,200

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}¹Revised. -- Zero. XX Not applicable.¹Data are rounded to no more than three significant digits; may not add to totals shown.²The 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, 11, and 12.³Because 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.⁴Less than ½ unit.⁵Includes exports.

TABLE 7

DISTRIBUTION OF DOMESTIC AND IMPORTED EVAPORATED AND ROCK SALT IN THE UNITED STATES, BY DESTINATION^{1,2}

(Thousand metric tons)

Destination	2006				2007			
	Evaporated		Rock	Total	Evaporated		Rock	Total
	Vacuum and open pans	Solar			Vacuum and open pans	Solar		
Alabama	64	4	74	142	59	4	63	126
Alaska	10	3	--	14	4	2	--	7
Arizona	13	111	1	125	14	109	1	124
Arkansas	53	3	100	156	51	3	75	130
California	214	710	3	927	211	717	2	930
Colorado	12	80	253	346	12	84	65	162
Connecticut	15	65	87	167	14	108	152	274
Delaware	7	12	2	21	8	14	6	29
District of Columbia	1	10	2	12	(3)	37	1	38
Florida	76	220	4	299	71	220	3	293
Georgia	90	46	41	177	108	53	41	201
Hawaii	(3)	1	--	1	(3)	1	--	1
Idaho	22	111	50	182	21	115	(3)	136
Illinois	328	103	1,270	1,700	324	120	2,880	3,330
Indiana	255	114	466	835	249	110	856	1,220
Iowa	130	108	422	660	130	108	539	777
Kansas	84	67	260	411	87	66	821	973
Kentucky	60	6	599	666	63	6	683	752
Louisiana	57	3	496	556	61	3	511	576
Maine	17	8	168	193	12	7	211	231
Maryland	69	50	60	179	58	163	18	239
Massachusetts	32	32	190	254	24	8	276	309
Michigan	270	41	1,500	1,810	271	38	2,070	2,380
Minnesota	126	198	687	1,010	127	185	691	1,000
Mississippi	31	1	254	285	21	1	243	265
Missouri	142	62	340	544	147	65	577	789
Montana	1	44	1	46	1	54	(3)	55
Nebraska	56	44	112	212	54	43	216	313
Nevada	7	256	19	282	6	277	17	300
New Hampshire	16	54	131	201	15	63	187	265
New Jersey	120	96	71	287	88	120	120	329
New Mexico	21	57	--	78	19	96	1	115
New York	188	34	2,140	2,360	407	34	4,560	5,000
North Carolina	122	61	59	242	118	57	59	234
North Dakota	12	14	55	81	15	15	5	35

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)

Destination	2006				2007			
	Evaporated			Total	Evaporated			Total
	Vacuum and open pans	Solar	Rock		Vacuum and open pans	Solar	Rock	
Ohio	449	48	1,230	1,720	410	48	2,700	3,160
Oklahoma	32	27	93	151	33	26	53	112
Oregon	18	100	--	118	18	97	1	115
Pennsylvania	182	67	1,040	1,290	159	77	2,400	2,630
Rhode Island	5	220	1	225	3	246	1	250
South Carolina	32	8	2	42	37	6	2	45
South Dakota	20	60	72	152	20	63	63	145
Tennessee	136	7	437	581	122	6	381	509
Texas	242	151	154	547	266	161	145	571
Utah	14	285	160	459	12	329	435	777
Vermont	6	4	222	233	6	4	298	308
Virginia	70	54	64	188	69	97	86	252
Washington	27	123	4	154	27	129	3	159
West Virginia	12	4	136	151	13	10	227	250
Wisconsin	211	140	1,280	1,640	216	145	1,790	2,150
Wyoming	(3)	20	2	22	1	29	1	31
Other ⁴	98	56	466	620	64	161	399	625
Total ⁵	4,280	4,200	15,300	23,800	4,350	4,740	24,900	34,000

-- Zero.

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

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

³Less than ½ unit.

⁴Includes shipments to overseas areas administered by the United States, Puerto Rico, exports, and some shipments to unspecified destinations.

⁵Because 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
2006:				
Bulk	100.00 ^r	31.49 ^r	22.94 ^r	6.99 ^r
Compressed pellets	154.64	135.28 ^r	XX	XX
Packaged	163.46 ^r	88.79 ^r	85.85 ^r	XX
Average ³	145.90 ^r	65.06 ^r	24.98 ^r	6.99 ^r
Pressed blocks	111.90 ^r	113.62 ^r	99.30 ^r	XX
2007:				
Bulk	109.46	31.23	26.59	7.11
Compressed pellets	160.74	134.83	XX	XX
Packaged	175.35	84.45	89.66	XX
Average ³	154.95	61.65	27.84	7.11
Pressed blocks	120.67	114.01	131.27	XX

^rRevised. XX Not applicable.

¹Net selling value, free on board plant, excluding container costs.

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

³Salt 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 COUNTRY¹

(Thousand metric tons and thousand dollars)

Country	2006		2007	
	Quantity	Value ²	Quantity	Value ²
Argentina	(3)	203	(3)	222
Bahamas, The	1	311	1	393
Bahrain	1	246	2	531
Belgium	2	226	2	319
Canada	775	37,500	588	38,000
Chile	(3)	78	1	28
China	12	772	17	692
Colombia	13	787	7	545
Costa Rica	2	365	4	294
Dominican Republic	1	162	2	236
El Salvador	1	269	1	152
Germany	1	1,300	4	2,090
Honduras	2	353	7	787
Hong Kong	(3)	275	(3)	291
Israel	(3)	56	(3)	57
Italy	(3)	54	(3)	155
Japan	31	2,420	40	2,970
Korea, Republic of	4	365	11	494
Kuwait	(3)	59	(3)	133
Lebanon	(3)	75	(3)	103
Malaysia	12	562	5	140
Mexico	82	4,040	67	4,140
Netherlands	2	275	32	903
Norway	--	--	(3)	84
Panama	1	130	1	220
Philippines	3	112	4	131
Saudi Arabia	2	667	6	1,330
United Arab Emirates	2	297	--	--
United Kingdom	3	491	1	273
Other	20	2,500	30	3,880
Total	973	54,900	833	59,600

-- Zero.

¹Data 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.)

²Free alongside ship value at U.S. ports.

³Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 10
U.S. EXPORTS OF SALT, BY CUSTOMS DISTRICT¹

(Thousand metric tons and thousand dollars)

District	2006		2007	
	Quantity	Value ²	Quantity	Value ²
Anchorage, AK	26	424	3	634
Baltimore, MD	1	344	1	392
Boston, MA	(3)	41	--	--
Buffalo, NY	118	6,590	38	6,290
Charleston, SC	(3)	24	(3)	22
Chicago, IL	(3)	1,400	1	1,850
Cleveland, OH	234	8,310	107	5,450
Columbia-Snake, OR	(3)	5	--	--
Dallas-Fort Worth, TX	(3)	51	--	--
Detroit, MI	181	8,390	280	12,800
Duluth, MN	1	79	(3)	47
El Paso, TX	1	128	2	166
Great Falls, MT	17	1,730	3	653
Honolulu, HI	(3)	271	(3)	216
Houston, TX	11	2,040	48	3,730
Laredo, TX	51	2,920	37	2,900
Los Angeles, CA	54	3,510	85	4,330
Miami, FL	22	1,770	15	1,400
Mobile, AL	(3)	99	2	312
New Orleans, LA	1	400	1	216
New York, NY	11	1,540	12	2,370
Nogales, AZ	2	119	2	125
Norfolk, VA	1	294	4	546
Ogdensburg, NY	90	3,820	23	3,470
Pembina, ND	7	847	7	865
Philadelphia, PA	1	250	1	273
Portland, ME	1	73	(3)	51
San Diego, CA	27	887	26	968
San Francisco, CA	19	988	9	969
San Juan, PR	(3)	3	--	--
Savannah, GA	(3)	69	(3)	78
Seattle, WA	13	1,160	18	1,930
St. Albans, VT	1	173	7	901
Tampa, FL	(3)	30	(3)	23
Washington, DC	(3)	4	--	--
Other ⁴	80	6,160	100	5,620
Total	973	54,900	833	59,600

-- Zero.

¹Data 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.)

²Free alongside ship value at U.S. ports.

³Less than ½ unit.

⁴Unknown but assumed to be rail and/or truck shipments to Canada through various points of departure.

Source: U.S. Census Bureau.

TABLE 11
U.S. IMPORTS FOR CONSUMPTION OF SALT, BY COUNTRY¹

(Thousand metric tons and thousand dollars)

Country	2006		2007	
	Quantity	Value ²	Quantity	Value ²
Australia	1	147	2	251
Bahamas, The	961	11,400	469	5,530
Belgium	2	620	2	531
Brazil	132	1,640	153	1,990
Canada	4,150	71,300	4,220	81,000
Chile	2,440	27,900	2,090	29,400
China	11	2,240	12	2,800
Colombia	6	590	5	646
Egypt	113	2,880	94	1,540
France	37	4,950	59	7,970
Germany	15	1,170 ^r	4	1,270
India	1	54	(3)	56
Israel	1	776	2	921
Italy	68	1,850	66	1,980
Japan	(3)	98	(3)	94
Korea, Republic of	2	706	4	833
Mexico	793	20,500	828	17,000
Netherlands	93	2,680	84	3,250
Netherlands Antilles	125	2,400	208	3,940
New Zealand	1	142	3	303
Pakistan	2	290	3	544
Panama	106	1,670	--	--
Peru	394	3,300	191	1,570
South Africa	22	899	6	916
Spain	9	1,490	5	3,830
United Kingdom	5 ^r	465 ^r	117	1,780
Other	8 ^r	875 ^r	8	889
Total	9,490	163,000	8,640	171,000

¹Revised. -- Zero.

¹Data 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.)

²Customs value only.

³Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 12
U.S. IMPORTS OF SALT, BY CUSTOMS DISTRICT¹

(Thousand metric tons and thousand dollars)

District	2006		2007	
	Quantity	Value ²	Quantity	Value ²
Anchorage, AK	27	668	25	844
Baltimore, MD	577	13,100	775	20,000
Boston, MA	476	9,500	727	9,490
Buffalo, NY	43	803	35	996
Charleston, SC	130	2,290	96	1,540
Chicago, IL	613	8,940	735	13,000
Cleveland, OH	280	4,740	276	6,970
Columbia-Snake, OR	67	1,940	155	4,380
Dallas-Fort Worth, TX	(3)	129	(3)	111
Detroit, MI	1,460	29,600	964	19,100
Duluth, MN	4	236	9	582
El Paso, TX	(3)	12	(3)	3
Great Falls, MT	2	254	2	414
Honolulu, HI	(3)	15	(3)	12
Houston-Galveston, TX	14	782	1	969
Laredo, TX	1	334	1	346
Los Angeles, CA	119	4,460	108	4,450
Miami, FL	(3)	137	1	201
Milwaukee, WI	1,020	13,200	1,360	19,200
Minneapolis, MN	283	4,310	176	2,880
Mobile, AL	(3)	12	(3)	72
New Orleans, LA	10	867	1	499
New York, NY	1,870	28,300	1,150	25,100
Nogales, AZ	(3)	8	(3)	41
Norfolk, VA	87	1,020	13	173
Ogdensburg, NY	168	2,710	91	2,330
Pembina, ND	7	471	12	688
Philadelphia, PA	602	8,300	682	9,940
Portland, ME	822	9,990	615	9,910
Providence, RI	326	4,010	177	3,490
San Diego, CA	2	682	3	770
San Francisco, CA	6	744	4	632
San Juan, PR	7	674	5	675
Savannah, GA	35	1,250	33	2,520
Seattle, WA	6	967	7	1,230
St. Albans, VT	1	86	2	378
St. Louis, MO	(3)	101	3	229
Tampa, FL	369	5,450	361	5,780
Wilmington, NC	59	1,850	31	911
Total	9,490	163,000	8,640	171,000

¹Data 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.)

²Customs value only.

³Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 13
SALT: WORLD PRODUCTION, BY COUNTRY^{1, 2}

(Thousand metric tons)

Country ³	2003	2004	2005	2006	2007 ^c
Afghanistan, rock salt ^c	13	13	12	12	12
Albania	21	25	25 ^e	25 ^e	25
Algeria, brine and sea salt	191	183	197	260 ^r	183 ⁴
Angola ^c	30	30	30	35 ^r	35
Argentina	1,668	1,372	1,846 ^r	1,918 ^r	1,920
Armenia	32	32	35	37 ^r	35 ⁴
Australia, salt and marine salt	10,256	11,088	12,444	11,363 ^r	11,440 ⁴
Austria, rock and brine	1,028	1,030	1,024	1,030 ^e	1,030
Azerbaijan	8	9	11 ^r	12 ^r	13
Bahamas, The	1,342	1,269	1,270	1,152 ^r	578 ⁴
Bangladesh, marine salt ^{e, 5}	350	350	350	350	360
Belarus	1,543	1,833	1,839	1,900 ^e	2,000
Bolivia	2	1	1	(6) ^{r, e}	1
Bosnia and Herzegovina	200 ^r	261 ^r	392 ^r	416 ^r	420
Botswana ⁷	229	208	210	210 ^e	210
Brazil:					
Brine salt	5,144	5,206	5,520 ^r	5,122 ^r	5,300
Rock salt	1,420	1,442	1,559	1,624 ^r	1,625 ⁴
Total	6,564	6,648	7,079 ^r	6,746 ^r	6,930
Bulgaria	1,882	1,900	1,900	2,000 ^r	2,000
Burkina Faso ^c	5	5	5	5 ^e	5
Burma ^{e, 8}	35	35	35	35	35
Cambodia ^c	36	40	--	6 ^r	77
Canada	13,718	14,096 ^r	13,643 ^r	14,389 ^r	11,790 ⁴
Cape Verde ^c	2	2	2	2	2
Chile	6,213	4,939	6,068	4,580 ^r	4,404 ⁴
China	32,424	37,101	46,610	56,630 ^r	59,760 ⁴
Colombia:					
Marine salt	248	294	429 ^r	390 ^r	390
Rock salt	199	232	216 ^r	248 ^r	248
Total	447	526	645 ^r	638 ^r	638
Costa Rica, marine salt ^c	20	20	20	20	20
Croatia	31	23 ^e	37 ^r	30 ^r	33 ⁴
Cuba	176	206	173	173 ^e	173
Denmark, sales ^c	605	610	610	600	600
Djibouti	137	26	78	138 ^e	138
Dominican Republic: ^c					
Marine salt	50	50	50	50	50
Rock salt	107 ⁴	--	--	--	--
Total	157 ⁴	50	50	50	50
Ecuador ^c	75	75	75	75	75
Egypt ^c	2,400	2,400	2,400	2,400	2,400
El Salvador, marine salt ^c	31 ⁴	31	31	30	30
Eritrea, marine salt	52 ^r	31 ^r	63 ^{r, e}	60 ^{r, e}	60
Ethiopia, rock salt ⁵	145	200	87	218 ^r	220
France, all sources ^{e, 9}	6,673 ^r	6,910 ^r	6,730 ^r	8,718 ^r	6,140 ⁴
Georgia ^c	30	30	30	30	30

See footnotes at end of table.

TABLE 13—Continued
SALT: WORLD PRODUCTION, BY COUNTRY^{1,2}

(Thousand metric tons)

Country ³	2003	2004	2005	2006	2007 ^c
Germany:					
Industrial brines	9,078	10,432	9,904	9,590 ^r	9,600
Rock salt and other	6,620	7,833	8,834	9,663 ^r	9,660
Salt, evaporated, includes marine salt	727	572	594	593 ^r	590
Total	16,424	18,838	19,333	19,846 ^r	19,900
Ghana ^c	250	265	300	300	300
Greece ^c	150	150	150	150	150
Guadeloupe ^c	49	49	49	49	49
Guatemala ^c	60	60	60	50 ^r	50
Guinea ^c	15	15	15	15	15
Honduras ^c	42	42	42	40	40
Iceland ^c	5	5	5	5	5
India: ^e					
Marine salt	15,000	15,000	15,500	15,500	16,000
Rock salt	3	3	3	3	3
Total	15,000	15,000	15,500	15,500	16,000
Indonesia ^c	680	680	680	700 ^r	700
Iran ¹⁰	2,003	1,791	2,009 ^r	2,000 ^e	2,000
Iraq ^e	50	50	25	25	25
Israel	376	385	406	434 ^r	430
Italy, all sources ¹¹	2,922	2,876	3,476 ^r	3,438 ^r	2,214 ⁴
Jamaica ^c	19	19	19	19	19
Japan	1,263	1,225 ^r	1,227	1,166 ^r	1,190
Jordan	12	29	30 ^e	29	29
Kazakhstan, salt and sodium chloride	287	348	178	417	228 ⁴
Kenya, crude salt	48	60	52	60 ^{r, e}	60
Korea, North ^c	500	500	500	500	500
Korea, Republic of ^c	800	800	800	800	800
Kuwait ^c	45	50	50	50	50
Laos, rock salt	16	15	34	35 ^e	35
Lebanon ^c	4	4	4	4	4
Libya ^c	40	40	40	40	40
Madagascar ^c	50 ^r	55 ^r	65 ^r	75 ^r	75
Mali ^c	6	6	6	6	6
Malta, marine salt ^c	(6)	(6)	(6)	(6)	(6)
Martinique ^c	200	200	200	200	200
Mauritania ^c	(6) ⁴	(6) ⁴	(6)	(6)	(6)
Mauritius	7 ^e	7	8	9 ^r	8
Mexico	7,547	8,566	9,508	8,371 ^r	8,400
Mongolia, mine output	2	2	2	1	1
Montenegro, sea water evaporate	33 ¹²	20 ¹²	15 ¹²	5	5
Morocco, marine and rock salt	237	254	254	250	250
Mozambique, marine salt ^c	80	80	80	80	80
Namibia, marine salt	698	754 ^r	573 ^r	604 ^r	600
Nepal ^{e, 13}	5	4	2	-- ^r	--
Netherlands ^c	5,000	5,000	5,000	5,000	5,000
Netherlands Antilles ^c	500	500	500	500	500
New Zealand ^c	70	70	100	100	100
Nicaragua, marine salt ^c	31 ⁴	30 ^r	30 ^r	30 ^r	30

See footnotes at end of table.

TABLE 13—Continued
SALT: WORLD PRODUCTION, BY COUNTRY^{1,2}

(Thousand metric tons)

Country ³	2003	2004	2005	2006	2007 ^c
Niger ^e	2	2	1 ^{r,4}	1 ^r	1
Oman ^e	12 ^r	12 ^r	11 ^r	11 ^r	11
Pakistan: ⁵					
Marine salt ^c	17	12	14	13	14
Rock salt	1,426	1,640	1,648	1,650	1,620
Total	1,443	1,652	1,662	1,663	1,634
Panama, marine salt ^c	18	18	18	18	18
Peru	1,900	1,200	1,300	1,300	1,200
Philippines, marine salt	429	428	421	425 ^r	425
Poland:					
Rock salt	848	1,099	1,123	1,130	591
Recovered from brine	3,812	4,043	3,067	3,825 ^r	3,800
Total	4,660	5,142	4,190 ^r	4,955 ^r	4,391 ⁴
Portugal, rock salt	602	662	598	586	590
Romania:	0	0 ^r	0	0 ^r	0
Rock salt	47	43	46 ^e	45	45
Other	2,417	2,357	2,374	2,574	2,425 ⁴
Total	2,464	2,400	2,420	2,619 ^{r,e}	2,470
Russia ^c	2,700	2,900	2,700	2,800	2,200
Saudi Arabia ^e	1,300	1,530	1,738	1,752	1,800
Senegal ^e	235	240	240	240	240
Serbia	78	50	30	30 ^e	30
Slovakia	133	122	151	150	150
Slovenia	125	1 ^{r,e}	1 ^{r,e}	2 ^r	2
South Africa	441	333	399	465	404 ⁴
Spain:					
Marine and other evaporated salt	1,400	1,336	1,350	1,350 ^e	1,350
Rock salt	2,563	2,657	3,200 ^r	3,200 ^{r,e}	3,200
Total	3,963	3,993	4,550 ^r	4,550 ^{r,e}	4,550
Sri Lanka ^e	79 ⁴	79	80	81	82
Sudan ^e	61 ⁴	62	62	62	62
Switzerland ^c	300	300	300	300	300
Syria	128	141	110	133 ^r	130
Taiwan, marine salt	(11)	--	--	--	--
Tanzania	59	57	51 ^r	36 ^r	36
Thailand:					
Rock salt	892	1,031	1,074 ^r	1,008 ^r	1,010
Other ^e	100	100	100	100	100
Total	992	1,131	1,174 ^r	1,108 ^r	1,110
Tunisia, marine salt	899 ^r	1,117 ^r	1,132 ^r	1,127 ^r	1,100 ⁴
Turkey	2,243	2,158	2,253 ^r	2,800 ^r	2,700
Turkmenistan ^c	215	215	215	215	215
Uganda ^e	5	5	5	5	5
Ukraine	3,863 ^r	4,393 ^r	4,811 ^r	5,996 ^r	5,548 ⁴

See footnotes at end of table.

TABLE 13—Continued
SALT: WORLD PRODUCTION, BY COUNTRY^{1,2}

(Thousand metric tons)

Country ³	2003	2004	2005	2006	2007 ^c
United Kingdom ^e					
Brine salt ¹⁴	3,200	2,800	2,800 ^r	2,800 ^r	2,800
Rock salt	1,700	2,000	2,000	2,000	2,000
Other salt ¹⁵	1,000	1,000	1,000	1,000	1,000
Total	5,900	5,800	5,800 ^r	5,800 ^r	5,800
United States, including Puerto Rico:					
United States:					
Brine	20,000	20,500	19,900	19,800	19,700 ⁴
Rock salt	16,300	18,300	17,700	16,500 ^r	16,800 ⁴
Solar salt	3,330	3,520	3,430	3,640	3,570 ⁴
Vacuum and open pan	4,070	4,100	4,170	4,450	4,420 ⁴
Puerto Rico ^c	45	45	45	45	45
Total	43,700	46,500	45,200	44,400 ^r	44,500 ⁴
Venezuela ^c	350	350	350	350	350
Vietnam	909	906	898 ^r	955 ^r	960
Yemen	116	88 ^r	90 ^{r,c}	100 ^r	100
Grand total	225,000 ^r	236,000 ^r	250,000 ^r	262,000 ^r	257,000

^cEstimated. ^rRevised. -- Zero.

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

²Table includes data available through July 3, 2008.

³Salt 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.

⁴Reported figure.

⁵Year ending June 30 of that stated.

⁶Less than ½ unit.

⁷From natural soda ash production.

⁸Brine salt produced, as reported by the Government of Burma in metric tons, was as follows: 2003—73,112; 2004—58,395; 2005—116,768 (revised); 2006—84,208 (revised); and 2007—85,000 (estimated).

⁹Includes marine and rock salt and salt solution.

¹⁰Year beginning March 21 of that stated.

¹¹Includes marine salt.

¹²Montenegro and Serbia formally declared independence in June 2006 from each other and dissolved their union.

¹³Does not include production from Sardinia and Sicily, which is estimated to be 200,000 metric tons per year.

¹⁴Year ending July 15 of that stated.

¹⁵Data 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.