



2008 Minerals Yearbook

SALT [ADVANCE RELEASE]

SALT

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The United States had been the world's leading salt producing nation until 2005 when China surpassed the United States to become the leading producing country in the world. Total U.S. salt production in 2008 increased by 6% to 47.3 million metric tons (Mt) compared with that of 2007 (table 1). According to U.S. Geological Survey (USGS) data for 2008, 29 companies operated 62 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 2008, 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, 19%; New York, 16%; Kansas, 6%; and Utah, 5%. Other Eastern States (Alabama, Michigan, Ohio, Tennessee, Virginia, and West Virginia) accounted for 20% 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, 2008. 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 29 companies to which a canvass form was sent, 26 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 2008 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 29 companies and 62 plants by 2008.

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 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 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 2008, rock salt mining was 19.8 Mt, an 18% increase compared with the 2007 total of 16.8 Mt.

Solar Evaporation.—Solar salt production was 4.11 Mt in 2008, which was a 13% increase from the revised 2007 total of 3.65 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 USGS Minerals Yearbook, volume I, Metals and Minerals.

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 2008 was 18.9 Mt, which was about 4% less than the 2007 total of 19.7 Mt. This was the first time that total brine production did not exceed rock salt production. 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 can be found in the Salt chapter of the 2006 USGS Minerals Yearbook, volume I, Metals and Minerals.

Mechanical Evaporation.—Vacuum pan salt is not mined but is a type of salt produced using mechanical evaporation technology. Vacuum pan salt production in 2008 was 4.47 Mt, which was a slight increase compared with the 2007 total of 4.42 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 2008, apparent consumption (salt sold or used plus imports minus exports) was 60.5 Mt, whereas reported consumption (sales or use as reported by the salt companies, including their imports and exports) was 53.1 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 2008 reported percentage distribution of salt by major end use was ice control, 43%; chemicals, 35%; distributors (grocery and other wholesalers and retailers, and so forth), 8%; agricultural, food processing, general industrial, and primary water treatment, 3% each; 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. This was the first year that consumption of salt for deicing exceeded salt used for chemicals.

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.—For most years, 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 produced through 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 2008 was 18.6 Mt, of which 16.8 Mt was for chloralkali manufacture and 1.86 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 2008, according to the U.S. Census Bureau, 9.68 Mt of chlorine and 7.36 Mt of sodium hydroxide (caustic soda or lye) were produced in the United States (U.S. Census Bureau, 2009). 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 16.9 Mt of salt for feedstock. Reported consumption of total domestic and imported salt for chlorine manufacture was 16.8 Mt (table 6). Typically, 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, although in 2008, these were virtually the same.

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 10% of domestic salt sales for the entire chemical sector and only 4% 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. 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 2008, 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 first ranked end use of salt is for highway deicing. In 2008, U.S. consumption of salt for this application was 22.6 Mt, which was about 9% more than that of 2007. This increase was attributed to the greater winter precipitation in late 2008 that required more rock salt usage.

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 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.

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.

In late 2008, many municipalities across the nation reported apparent shortages of rock salt available for the upcoming winter season. Many purchasers of road salt also reported significant increases in rock salt prices compared with those of 2007 (Varnon, 2008). Salt was in such short supply and was so expensive in Waukesha, WI, that thieves stole 50 t of road salt valued from \$6,000 to \$7,500 from an outdoor storage area (Seibel, 2008). A similar event happened in Aurora, IL, when a man was caught stealing 135 t of rock salt from a warehouse (Associated Press, 2009).

The soaring rock salt prices and limited salt supplies prompted various communities to experiment with alternative deicing materials. In Ankeny, IA, (a Des Moines suburb), a spice company donated 9 t of garlic salt it was going to send to a landfill to the local public works department to mix with rock salt to spread on the roads (Associated Press, 2008). In Missouri, another lower cost deicing substitute was a product made from sugar beet juice. A byproduct carbohydrate solution from sugar beet processing was mixed with rock salt and adhered to road surfaces about 40% better than loose rock salt alone. Because it stayed on the road longer, the treatment did not have to be repeated several times, saving time and money (Nelson, 2009). A similar product was used in Sharon, PA, with favorable results. Road crews found that they only had to treat the roads once instead of two or three times nightly, which resulted in a tremendous cost savings (Starmack, 2008).

Because of the significant increases in Ohio rock salt prices (price increases ranged from 50% to 300% higher than those of the previous year), the Governor of Ohio requested that the Ohio Department of Transportation conduct a study to investigate the reasons for the unprecedented high prices. The study concluded that bad weather led to historic consumption (severe winter weather required large salt supplies and inventories were depleted without sufficient time to order salt at favorable prices); inflexible contract specifications led to artificial shortages (the State set contracts with unrealistic purchase guarantees with the contractor); and questionable bidding tactics led to reduced competition (the State had domestic preference statutes that gave preference to the two rock salt producers in the State, thereby blocking any outside suppliers from competing). The report made recommendations for future salt contracting that were expected to reduce the likelihood of another surge in salt prices in 2009 (Ohio Department of Transportation, 2008).

Concerns regarding the shortage of salt and the high prices of rock salt concerned several State government officials who were skeptical and initiated various investigations of potential price-fixing by suppliers. One extensive investigation by the office of the Illinois Attorney General found no evidence of price fixing or illegal conduct by the road salt suppliers but rather procedural problems with their procurement process (Hilkevitch, 2009). Their concerns were addressed by various salt companies and the Salt Institute that stated several factors contributed to the situation, such as 4 weeks of lock closures in the upper Mississippi River that hampered barge shipments, shortage of salt mine workers, increased fuel prices, and an increase in orders from communities that depleted their previous years' inventories (Baca, 2008). Extensive flooding on the Mississippi River in June forced the U.S. Army Corps of Engineers to close many locks along the River between Illinois City, IL, and Winfield, MO, until the high water receded. Many barges were stranded for a few weeks causing long delays in transporting many nonperishable goods such as salt (Taylor, 2008).

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 2008 was 4.48 Mt.

General Industrial.—The industrial uses of salt are diverse. They include, in descending order of quantity consumed, other industrial applications, oil and gas exploration, textiles and dyeing, pulp and paper, metal processing, tanning and leather treatment, and rubber manufacture. Total salt sold to these sectors was 1.36 Mt in 2008.

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-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 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 2008, 1.69 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 2008 was 1.72 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 2008, 1.33 Mt of salt was sold for primary water treatment and an additional 464,000 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 2008 because of moderately severe winter weather during late 2008. 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 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.

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 2008, the United States exported 1.03 Mt of salt; this was a 24% increase compared with that of 2007 (table 9). In 2008, the majority of exports (87%) were to Canada. Salt was shipped to 83 countries through 35 customs districts; the Detroit, MI, district exported the most and represented 70% of the U.S. total (table 10). Based on U.S. Census Bureau statistics, the United States imported 13.9 Mt of salt from 51 countries in 2008, which was 61% more than was imported during 2007 (table 11). Canada was the leading source of imports, representing about 34% of total imports, followed closely by Chile (34%). Table 12 lists the imports of salt by customs districts. Of the 38 customs districts that imported salt in 2008, the New York, NY, customs district was the largest in terms of tonnage, accounting for about 14% of the total, followed by Detroit, MI (11%); Boston, MA (11%); Portland, ME (9%); and Baltimore, MD (8%). The quantity of imported salt was about 13 times that of exports. Net salt imports also represented about 23% 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 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 2008, the total estimated world production increased to about 258 Mt. The United States remained a leading salt-producing country, representing 18% of total world output. China has rapidly increased its production. In 2008, estimated salt production in China was about 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 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.

Canada.—Compass Minerals International, Inc. expanded its plans to increase annual production capacity at its Goderich, Ontario, rock salt mine to 9 Mt by 2012. The company began its expansion program in 2007 to raise capacity to 7.25 Mt by 2009. Another 1 Mt of capacity would come onstream in 2010, with the final 750,000 t available online by 2012. The \$70 million project was planned to provide additional supplies of rock salt for winter highway use (Business Wire, 2008).

Outlook

The U.S. salt industry continued to be an important leader in terms of increased production, consumption, and world trade in 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 2009 is expected to be an estimated 45 Mt.

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TABLE 1
 SALIENT SALT STATISTICS¹

(Thousand metric tons and thousand dollars)

	2004	2005	2006	2007	2008
United States:					
Production: ²					
Brine	20,500	19,900	19,800	19,700	18,900
Rock	18,300	17,700	16,500	16,800	19,800
Solar	3,520	3,430	3,640	3,650 ^r	4,110
Vacuum and open pans	4,100	4,170	4,450	4,420	4,470
Total	46,500	45,100	44,400	44,500	47,300
Sold or used by producers:					
Quantity	45,000	45,000	40,600	45,500 ^r	47,600
Value	1,270,000	1,310,000	1,310,000	1,520,000	1,780,000
Exports:					
Quantity	1,110	879	973	833	1,030
Value	47,600	51,800	54,900	59,600	65,900
Imports for consumption:					
Quantity	11,900	12,100	9,490	8,640	13,800
Value	159,000	180,000	163,000	171,000	282,000
Consumption:					
Apparent ³	55,800	56,200	49,100	53,300 ^r	60,500
Reported	50,700	53,100	42,400	53,200	53,100
World, production	235,000 ^r	250,000	261,000 ^r	250,000 ^r	258,000

^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 2008

(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 Services, Inc., Benavides, TX	--	--	--	(1)
Detroit Salt Co. LLC, Detroit, MI	1,300	--	--	--
Dow Chemical Co., The:				
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, Hobbs, NM ²	--	--	--	(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., Wichita, KS ⁶	--	--	--	(1)
Olin Corp., McIntosh, AL	--	--	--	(1)
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., Trona, CA ⁷	--	200	--	--
South Bay Salt Works, Chula Vista, CA ⁸	--	125	--	--

See footnotes at end of table.

TABLE 2—Continued
 U.S. SALT COMPANIES BY PRODUCTION CAPACITY, LOCATION, AND TYPE IN 2008

(Thousand short tons)

Company	Rock	Solar	Vacuum and Open Pans	Brine
Superior Salt Inc., Twentynine Palms, CA	--	25	--	--
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	--
Total Production Capacity	22,200	5,110	6,150	20,800

-- 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		
2007:					
Bulk	1,250	2,790 ^r	16,400	19,700	40,100
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	3,650 ^r	16,800	19,700	44,500
2008:					
Bulk	1,230	3,320	19,400	18,900	42,800
Compressed pellets	1,290	323	XX	XX	1,610
Packaged	1,810	396	294	XX	2,500
Pressed blocks	144	73	161	XX	379
Total	4,470	4,110	19,800	18,900	47,300

^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
2007:										
Bulk	1,010	111,000	1,660 ^r	51,800 ^r	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	3,100 ^r	197,000	18,400	520,000	19,600	140,000	45,500 ^r	1,520,000
2008:										
Bulk	1,210	146,000	1,900	72,600	20,600	624,000	18,800	193,000	42,600	1,040,000
Compressed pellets	1,290	215,000	393	54,100	XX	XX	XX	XX	1,680	269,000
Packaged:										
Less-than-5-pound units	187	NA	10	NA	21	NA	XX	XX	218	XX
More-than-5-pound units	1,560	NA	892	NA	280	NA	XX	XX	2,730	XX
Total	1,750	312,000	902	79,600	301	32,900	XX	XX	2,950	424,000
Pressed blocks:										
For livestock	93	NA	115	NA	150	NA	XX	XX	358	XX
For water treatment	47	NA	2	NA	3	NA	XX	XX	51	XX
Total	140	17,900	117	13,800	153	16,100	XX	XX	410	47,800
Grand total	4,380	690,000	3,310	220,000	21,100	673,000	18,800	193,000	47,600	1,780,000

^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 1/2 unit.

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

(Thousand metric tons and thousand dollars)

State	2007		2008	
	Quantity	Value	Quantity	Value
Kansas	2,870	158,000	3,010	178,000
Louisiana	13,900	180,000	14,600	231,000
New York	7,990	400,000	7,660	431,000
Texas	8,950	143,000	9,080	157,000
Utah	2,470	135,000	2,150	139,000
Other Eastern States ³	8,050	416,000	9,720	539,000
Other Western States ⁴	1,260 ^r	88,100 ^r	1,350	102,000
Total	45,500 ^r	1,520,000	47,600	1,780,000
Puerto Rico ^c	45	1,500	45	1,500

^cEstimated. ^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, 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	
		2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
Chemical:											
Chloralkali producers	2812	15	100	415 ^r	317	639	614	18,800	15,700	19,900 ^r	16,800
Other chemical	28 (excludes 2812, 2899)	218	255	260	262	1,040	1,350	81	1	1,600	1,860
Total		233	355	676 ^r	580	1,680	1,960	18,900	15,700	21,500 ^r	18,600
Food-processing industry:											
Meat packers	201	229	209	53	50	23	24	--	--	305	283
Dairy	202	119	117	9	9	6	6	--	--	134	132
Canning	2091, 203	139	130	25	28	34	32	--	--	198	190
Baking	205	133	128	4	4	12	12	--	--	149	144
Grain mill products	204 (excludes 2047)	89	84	8	6	21	17	--	--	118	107
Other food processing	206–208, 2047, 2099	522	714	85	80	163	73	1	1	771	868
Total		1,230	1,380	184	177	259	164	1	1	1,680	1,720
General industrial:											
Textiles and dyeing	22	58	42	34	32	6	4	(4)	(4)	98	78
Metal processing	33, 34, 35, 37	8	8	14	18	14	16	(4)	(4)	36	42
Rubber	2822, 30 (excludes 3079)	3	3	(4)	(4)	2	2	(4)	(4)	6	6
Oil	13, 29	52	65	104	118	46	55	9	47	211	286
Pulp and paper	26	10	16	30 ^r	38	21	23	--	--	61	77
Tanning and/or leather	311	2	2	10	9	29	26	--	--	41	37
Other industrial	XX	115	107	85	94	831	634	2	(4)	1,030	833
Total		248	243	277 ^r	308	949	759	12	49	1,490	1,360
Agricultural:											
Feed retailers and/or dealers mixers	5159	356	378	324	399	477	480	(4)	(4)	1,160	1,260
Feed manufacturers	2048	21	28	91	90	345	286	--	--	457	405
Direct-buying end user	02	2	5	13	8	12	12	--	--	28	25
Total		379	411	429 ^r	498	834	778	(4)	(4)	1,640	1,690
Water treatment:											
Government (Federal, State, local)	2899	19	22	310	333	156	55	1	2	487 ^r	412
Commercial or other	2899	131	123	271 ^r	278	134	519	4	2	541 ^r	922
Total		150	145	581 ^r	611	290	574	6	4	1,030	1,330
Ice control and/or stabilization:											
Government (Federal, State, local)	9621	297	2	530	472	16,300	18,200	--	1	17,100	18,600
Commercial or other	XX	46	43	248	335	3,330	3,600	2	--	3,620	3,980
Total		343	45	778	807	19,600	21,800	2	1	20,800	22,600
Distributors:											
Agricultural distribution	5191	80	96	134	130	171	209	--	--	385	436
Grocery wholesalers and/or retailers	514, 54	553	539	260	268	129	185	--	--	943	992
Institutional wholesalers and end users	58, 70	122	126	72	63	199	230	(4)	(4)	393	418
Water-conditioning distribution	7399	105	120	326	315	90	28	1	1	522	464
U.S. Government resale	9199	(4)	(4)	1	1	1	(4)	--	--	2	2
Other wholesalers and/or retailers	5251	827	801	880	994	267	374	(4)	(4)	1,970	2,170
Total		1,690	1,680	1,670	1,770	857	1,030	2 ^r	1	4,220	4,480
Other ⁵		76	70	163	184	431	506	277	528	947	1,290
Grand total		4,350	4,330	4,760 ^r	4,940	24,900	27,500	19,200	16,300	53,200	53,100

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	2007				2008			
	Evaporated		Rock	Total	Evaporated		Rock	Total
	Vacuum and open pans	Solar			Vacuum and open pans	Solar		
Alabama	59	4	63	126	50	5	67	123
Alaska	4	2	--	7	3	3	--	6
Arizona	14	109	1	124	11	105	1	117
Arkansas	51	3	75	130	51	5	74	130
California	211	763 ^r	2	976	206	702	2	909
Colorado	12	84	65	162	12	71	8	91
Connecticut	14	108	152	274	14	109	140	263
Delaware	8	14	6	29	10	11	3	25
District of Columbia	(3)	37	1	38	(3)	16	4	20
Florida	71	220	3	293	75	208	3	286
Georgia	108	53	41	201	113	68	33	214
Hawaii	(3)	1	--	1	(3)	1	--	2
Idaho	21	115	(3)	136	20	127	1	148
Illinois	324	120	2,880	3,330	307	132	3,230	3,670
Indiana	249	110	856	1,220	249	116	1,110	1,470
Iowa	130	108	539	777	131	111	938	1,180
Kansas	87	66	821	973	88	59	987	1,130
Kentucky	63	6	683	752	68	8	875	951
Louisiana	61	3	511	576	61	4	437	502
Maine	12	7	211	231	11	9	225	245
Maryland	58	163	18	239	66	131	17	214
Massachusetts	24	8	276	309	28	8	321	357
Michigan	271	38	2,070	2,380	274	42	2,980	3,300
Minnesota	127	185	691	1,000	126	305	880	1,310
Mississippi	21	1	243	265	22	2	239	263
Missouri	147	65	577	789	155	78	585	818
Montana	1	54	(3)	54	1	53	(3)	54
Nebraska	54	43	216	313	56	42	38	135
Nevada	6	250 ^r	17	273	4	238	(3)	243
New Hampshire	15	63	187	265	15	37	216	269
New Jersey	88	120	120	329	97	155	78	330
New Mexico	19	96	1	115	17	81	(3)	98
New York	407	34	4,560	5,000	295	71	4,180	4,540
North Carolina	118	57	59	234	134	62	81	276
North Dakota	15	15	5	35	24	14	6	45
Ohio	410	48	2,700	3,160	419	45	3,510	3,970
Oklahoma	33	26	53	112	33	26	76	134
Oregon	18	97	1	115	19	43	1	63
Pennsylvania	159	77	2,400	2,630	166	58	2,340	2,560
Rhode Island	3	246	1	250	3	190	1	195
South Carolina	37	6	2	45	44	9	1	54
South Dakota	20	63	63	145	21	56	18	95
Tennessee	122	6	381	509	110	6	423	539
Texas	266	161	145	571	277	167	172	616
Utah	12	329	435	777	14	503	1	518
Vermont	6	4	298	308	6	2	296	303
Virginia	69	97	86	252	87	60	87	233
Washington	27	129	3	159	26	126	1	154
West Virginia	13	10	227	250	16	49	261	326
Wisconsin	216	145	1,790	2,150	220	189	2,120	2,520

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	2007				2008			
	Evaporated		Rock	Total	Evaporated		Rock	Total
	Vacuum and open pans	Solar			Vacuum and open pans	Solar		
Wyoming	1	29	1	31	1	37	(3)	38
Other ⁴	64	161	399	625	78	182	457	718
Total ⁵	4,350	4,760 ^r	24,900	34,000	4,330	4,940	27,500	36,800

^rRevised. --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
2007:				
Bulk	109.46	31.28 ^r	26.59	7.11
Compressed pellets	160.74	134.83	XX	XX
Packaged	175.35	84.45	89.66	XX
Average ³	154.95	61.50 ^r	27.84	7.11
Pressed blocks	120.67	114.01	131.27	XX
2008:				
Bulk	120.70	38.16	30.25	10.25
Compressed pellets	166.74	137.72	XX	XX
Packaged	178.40	88.25	109.46	XX
Average ³	158.42	64.53	31.39	10.25
Pressed blocks	128.31	118.66	104.78	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	2007		2008	
	Quantity	Value ²	Quantity	Value ²
Canada	588	38,000	896	42,200
China	17	692	6	878
Colombia	7	545	2	409
Costa Rica	4	294	2	303
Dominican Republic	2	236	1	359
Germany	4	2,090	1	271
Honduras	7	787	4	515
Japan	40	2,970	9	2,230
Korea, Republic of	11	494	1	347
Malaysia	5	140	3	558
Mexico	67	4,140	36	6,030
Netherlands	32	903	31	2,190
Philippines	4	131	2	190
Saudi Arabia	6	1,330	5	1,230
United Kingdom	1	273	6	519
Other	38 ^r	6,570 ^r	20	7,690
Total	833	59,600	1,030	65,900

^rRevised.

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.

Source: U.S. Census Bureau.

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

(Thousand metric tons and thousand dollars)

District	2007		2008	
	Quantity	Value ²	Quantity	Value ²
Anchorage, AK	3	634	2	358
Buffalo, NY	38	6,290	34	6,680
Cleveland, OH	107	5,450	(3)	107
Detroit, MI	280	12,800	719	22,100
El Paso, TX	2	166	1	169
Great Falls, MT	3	653	1	445
Houston, TX	48	3,730	43	4,100
Laredo, TX	37	2,900	27	4,960
Los Angeles, CA	85	4,330	26	4,810
Miami, FL	15	1,400	4	1,380
Mobile, AL	2	312	(3)	75
New York, NY	12	2,370	9	3,470
Nogales, AZ	2	125	1	305
Norfolk, VA	4	546	1	551
Ogdensburg, NY	23	3,470	21	3,440
Pembina, ND	7	865	3	883
San Diego, CA	26	968	6	580
San Francisco, CA	9	969	3	596
Seattle, WA	18	1,930	8	1,620
St. Albans, VT	7	901	6	726
Other ⁴	114	8,790	116	8,560
Total	833	59,600	1,030	65,900

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. Also includes minor shipments through 15 other customs districts.

Source: U.S. Census Bureau.

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

(Thousand metric tons and thousand dollars)

Country	2007		2008	
	Quantity	Value ²	Quantity	Value ²
Australia	2	251	2	187
Bahamas, The	469	5,530	578	7,510
Belgium	2	531	2	709
Brazil	153	1,990	393	9,500
Canada	4,220	81,000	4,740	107,000
Chile	2,090	29,400	4,680	67,100
China	12	2,800	13	2,150
Colombia	5	646	4	650
Egypt	94	1,540	620	5,770
France	59	7,970	82	13,400
Germany	4	1,270	2	1,260
Israel	2	921	11	1,930
Italy	66	1,980	62	3,440
Korea, Republic of	4	833	4	981
Mexico	828	17,000	1,180	31,900
Netherlands	84	3,250	100	4,690
Netherlands Antilles	208	3,940	154	2,970
New Zealand	3	303	2	178
Pakistan	3	544	15	575
Peru	191	1,570	587	6,270
South Africa	6	916	2	1,210
Spain	5	3,830	30	3,470
United Kingdom	117	1,780	497	5,890
Other	5	1,040	121	3,510
Total	8,640	171,000	13,900	282,000

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.

Source: U.S. Census Bureau.

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

(Thousand metric tons and thousand dollars)

District	2007		2008	
	Quantity	Value ²	Quantity	Value ²
Anchorage, AK	25	844	21	1,330
Baltimore, MD	775	20,000	1,170	25,400
Boston, MA	727	9,490	1,480	18,300
Buffalo, NY	35	996	29	924
Charleston, SC	96	1,540	103	2,060
Chicago, IL	735	13,000	1,050	16,800
Cleveland, OH	276	6,970	190	6,790
Columbia-Snake, OR	155	4,380	165	5,340
Dallas-Fort Worth, TX	(3)	111	2	415
Detroit, MI	964	19,100	1,550	33,000
Duluth, MN	9	582	56	4,860
Great Falls, MT	2	414	8	702
Los Angeles, CA	108	4,450	164	5,130
Miami, FL	1	201	2	412
Milwaukee, WI	1,360	19,200	1,090	16,300
Minneapolis, MN	176	2,880	144	2,560
New Orleans, LA	1	499	1,120	23,500
New York, NY	1,150	25,100	2,010	33,900
Norfolk, VA	13	173	71	1,470
Ogdensburg, NY	91	2,330	382	20,800
Pembina, ND	12	688	5	851
Philadelphia, PA	682	9,940	930	13,200
Portland, ME	615	9,910	1,290	20,400
Providence, RI	177	3,490	227	3,450
San Diego, CA	3	770	6	1,010
San Francisco, CA	4	632	1	1,080
San Juan, PR	5	675	4	674
Savannah, GA	33	2,520	56	2,260
Seattle, WA	7	1,230	16	1,630
St. Albans, VT	2	378	6	747
St. Louis, MO	3	229	48	3,220
Tampa, FL	361	5,780	367	6,410
Wilmington, NC	31	911	113	5,320
Other ³	3	1,440	3	1,890
Total	8,640	171,000	13,900	282,000

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.

³Includes imports through 6 other customs districts.

Source: U.S. Census Bureau.

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

(Thousand metric tons)

Country ³	2004	2005	2006	2007	2008 ^e
Afghanistan, rock salt ^e	13	12	12	12	12
Albania ^e	25 ⁴	25	25	25	25
Algeria, brine and sea salt	183	197	260	183	202 ⁴
Angola ^e	30	30	35	35	35
Argentina	1,372	1,846	1,918	2,358 ^r	2,000
Armenia	32	35	37	35	37 ⁴
Australia, salt and marine salt	11,088	12,444	11,424 ^r	10,855 ^r	11,000
Austria, rock and brine	1,030	1,024	807 ^r	742 ^r	800
Azerbaijan	9	11	12	7 ^r	7
Bahamas, The	1,269	1,270	1,152	578	600
Bangladesh, marine salt ^{e,5}	350	350	350	360	350
Belarus	1,833	1,839	1,900 ^e	2,000 ^e	2,000
Bolivia	1	1	1 ^r	2 ^r	2
Bosnia and Herzegovina	261	392	416	502 ^r	500
Botswana ⁶	208	210	210 ^e	210 ^e	210
Brazil:					
Brine salt	5,206	5,520	5,122	5,300	5,300
Rock salt	1,442	1,559	1,624	1,625	1,600
Total	6,648	7,079	6,746	6,925	6,900
Bulgaria	1,900	1,900	2,000	2,000 ^e	2,000
Burkina Faso ^e	5	5	5	5	5
Burma, brine salt	58 ^r	117 ^r	84 ^r	71 ^r	54 ⁴
Cambodia ^e	40	--	6	77	75
Canada	14,096	13,643	14,389	11,862 ^r	14,386 ^{p,4}
Cape Verde ^e	2	2	2	2	2
Chile	4,939	6,068	4,580	4,404	6,431 ⁴
China	37,101	46,610	56,630	59,760	59,520 ⁴
Colombia:					
Marine salt	294	429	390	310 ^r	310
Rock salt	232	216	248	204 ^r	204
Total	526	645	638	514 ^r	514
Costa Rica, marine salt ^e	20	20	20	20	10
Croatia	23 ^e	37	30	33	33
Cuba	408 ^r	351 ^r	266 ^r	142 ^r	140
Denmark, sales ^e	610	610	600	600	600
Djibouti ^e	26	53 ^r	78 ^r	98 ^r	118
Dominican Republic, marine salt ^e	50	50	50	50	50
Ecuador ^e	75	75	75	75	75
Egypt ^e	1,010 ^r	1,200 ^r	1,200 ^r	1,200 ^r	1,200
El Salvador, marine salt ^e	31	31	30	30	30
Eritrea, marine salt ^e	31 ⁴	63	60	60	60
Ethiopia, rock salt ⁵	200	87	218	240 ^r	260
France, all sources ⁷	6,910	6,730	8,718	6,140	6,100
Georgia ^e	30	30	30	30	30
Germany:					
Industrial brines	10,432	9,904	9,590	7,540 ^r	8,000
Rock salt and other	7,833	8,834	9,663	7,819 ^r	8,000
Salt, evaporated, includes marine salt	572	594	593	318 ^r	350
Total	18,838	19,333	19,846	15,678 ^r	16,400

See footnotes at end of table.

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

(Thousand metric tons)

Country ³	2004	2005	2006	2007	2008 ^e
Ghana ^e	265	250 ^r	250 ^r	250 ^r	250
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	42	42	40	40	40
Iceland ^e	5	5	5	5	5
India: ^e					
Marine salt	15,000	15,500	15,500	16,000	16,000
Rock salt	3	3	3	3	3
Total	15,000	15,500	15,500	16,000	16,000
Indonesia ^e	680	680	700	700	700
Iran ⁸	1,791	2,009	2,000 ^e	2,000 ^e	2,000
Iraq ^e	50	25	25	25	25
Israel	385	406	434	400 ^r	400
Italy, all sources ⁹	2,876	3,476	3,438	2,214	2,200
Jamaica ^e	19	19	19	19	19
Japan	1,225	1,227	1,166	1,190 ^e	1,200
Jordan	29	30	29	17 ^r	29
Kazakhstan, salt and sodium chloride	348	178	417	228	225
Kenya, crude salt	60	52	60 ^e	60 ^e	60
Korea, North ^e	500	500	500	500	500
Korea, Republic of ^e	800	800	800	800	800
Kuwait ^e	10 ^r	8 ^r	13 ^r	14 ^r	15
Laos, rock salt	15	34	35 ^e	35 ^e	35
Lebanon ^e	4	4	4	4	4
Libya ^e	40	40	40	40	40
Madagascar ^e	55	65	75	75	75
Mali ^e	6	6	6	6	6
Malta, marine salt ^e	(10)	(10)	(10)	(10)	(10)
Martinique ^e	200	200	200	200	200
Mauritania	(10)	(10) ^e	(10)	(10)	1 ⁴
Mauritius	7	8	9	8	8
Mexico	8,566	9,508	8,371	8,400 ^e	8,809 ⁴
Mongolia, mine output	2	2	1	1	1
Montenegro, sea water evaporate	20 ¹¹	15 ¹¹	5	20 ^{r,e}	25
Morocco, marine and rock salt	254	254	250	250 ^e	250
Mozambique, marine salt ^e	80	80	80	80	80
Namibia, marine salt	754	573	604	800 ^r	800
Nepal ^{e,12}	4	2	--	--	--
Netherlands ^e	5,000	5,000	5,000	5,000	5,000
Netherlands Antilles ^e	500	500	500	500	500
New Zealand ^e	70	100	100	100	100
Nicaragua, marine salt ^e	30	30	30	30	30
Niger ^e	2	1 ⁴	1	1	1
Oman	12	11	11	10 ^r	10 ⁴

See footnotes at end of table.

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

(Thousand metric tons)

Country ³	2004	2005	2006	2007	2008 ^e
Pakistan: ⁵					
Marine salt ^e	12	14	13	13 ^r	13
Rock salt	1,640	1,648	2,008 ^r	1,620	1,620
Total	1,652	1,662	2,021 ^r	1,633 ^r	1,630
Panama, marine salt^e	18	18	18	18	18
Peru	1,249	1,255	1,253	1,185	1,276 ⁴
Philippines, marine salt	428	421	418 ^r	438 ^r	440
Poland:					
Rock salt	1,099	1,123	1,130	591	590
Recovered from brine	4,043	3,762 ^r	3,825	3,800 ^e	3,800
Total	5,142	4,885 ^r	4,955	4,391	4,390
Portugal, rock salt	662	598	586	590 ^e	600
Romania:					
Rock salt	43	46	47 ^r	51 ^r	50
Other	2,357	2,374	2,574	2,425	2,425 ⁴
Total	2,400	2,420	2,621 ^r	2,476 ^r	2,475 ⁴
Russia	2,900	2,700	2,900 ^r	2,200	2,200
Saudi Arabia	1,530	1,738	1,752	1,800 ^e	1,900
Senegal	168 ^r	134 ^r	199 ^r	212 ^r	200
Serbia	50 ¹¹	35 ^{r,e}	30 ^r	30 ^r	30
Slovakia	122	151	150 ^e	150 ^e	150
Slovenia	1 ^e	1	2	2 ^e	2
South Africa	333	399	465	412 ^r	416 ⁴
Spain:					
Marine and other evaporated salt	1,336	1,350	1,350 ^e	1,350 ^e	1,350
Rock salt	2,657	3,200	3,200 ^e	3,200 ^e	3,200
Total	3,993	4,550	4,550 ^e	4,550 ^e	4,550
Sri Lanka^e	79	80	88 ^r	70 ^r	70
Sudan	45 ^{r,e}	30 ^{r,e}	12 ^r	23 ^r	23
Switzerland^e	300	300	300	300	300
Syria	141	110	133	81 ^r	81
Tanzania	57	135 ^r	35 ^r	35 ^r	36
Thailand:					
Rock salt	1,031	1,074	1,008	1,010 ^e	1,000
Other ^e	100	100	100	100	100
Total	1,131	1,174	1,108	1,110 ^e	1,100
Tunisia, marine salt	1,117	1,132	1,127	933 ^r	859 ⁴
Turkey	2,158	2,253	2,800	1,500 ^r	1,500
Turkmenistan^e	215	215	215	215	215
Uganda^e	5	5	5	5	5
Ukraine	4,393	4,811	5,996	5,548	5,500
United Kingdom:^e					
Brine salt ^{13,14}	2,800	2,800	2,800	2,800	2,800
Rock salt	2,000	2,000	2,000	2,000	2,000
Other salt ¹⁴	1,000	1,000	1,000	1,000	1,000
Total	5,800	5,800	5,800	5,800	5,800

See footnotes at end of table.

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

(Thousand metric tons)

Country ³	2004	2005	2006	2007	2008 ^e
United States, including Puerto Rico:					
United States:					
Brine	20,500	19,900	19,800	19,700	18,900 ⁴
Rock salt	18,300	17,700	16,500	16,800	19,800 ⁴
Solar salt	3,520	3,430	3,640	3,650 ^r	4,110 ⁴
Vacuum and open pan	4,100	4,170	4,450	4,420	4,470 ⁴
Puerto Rico ^e	45	45	45	45	45
Total	46,500	45,200	44,400	44,600 ^r	47,300 ⁴
Venezuela ^e	350	350	350	350	350
Vietnam	906	898	955	960 ^e	950
Yemen	88	90 ^e	100	100 ^e	100
Grand total	235,000 ^r	250,000	261,000 ^r	250,000 ^r	258,000

^aEstimated. ^bPreliminary. ^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 14, 2009.

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.

⁶From natural soda ash production.

⁷Includes marine and rock salt and salt solution.

⁸Year beginning March 21 of that stated.

⁹Includes marine salt.

¹⁰Less than ½ unit.

¹¹Montenegro and Serbia formally declared independence in June 2006 from each other and dissolved their union.

¹²Does not include production from Sardinia and Sicily, which is estimated to be 200,000 metric tons per year.

¹³Year ending July 15 of that stated.

¹⁴Data 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.