

SALT

By Dennis S. Kostick

Salt, also known as sodium chloride, is an important commodity that has many end uses. Virtually every person in the world has some daily contact with salt either directly or indirectly. 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 and these two important inorganic chemicals are used to make a multitude of consumer-related end-use products, such as polyvinyl chloride (PVC) plastic made from chlorine, and pulping chemicals manufactured from caustic soda.

Production

U.S. production data for salt are developed by the U.S. Geological Survey (USGS) from an annual voluntary survey of U.S. salt-producing sites and of company operations. Of the 28 companies to which a survey request was sent, all but one responded, representing 98% of the total production shown in this report. Data for the one company was estimated on the basis of its prior responses to previous annual surveys, the 1995 production estimate survey, or brine production capabilities for chloralkali manufacture based upon chlorine production capacities.

Total U.S. salt production increased 5% in 1995 compared with the previous year primarily because of increased brine production for chloralkali manufacture. Rock salt production decreased 7% despite the adverse winter weather during the first and fourth quarters of 1995. The decline was a result of losing the Akzo Nobel Salt Inc.'s rock salt mine that normally produced nearly 3.6 million metric tons of salt per year. Solar salt production rose 17%, mainly in the bulk salt category. According to the USGS canvass for 1995, 28 companies operated 64 salt-producing plants in 14 States. Eight of the companies and 14 of the plants produced more than 1 million tons each and accounted for 89% and 65%, respectively, of the U.S. total production and 93% and 28%, respectively, of total dollar value. Several companies and plants produced more than one type of salt. In 1995, 12 companies (16 operations) produced solar-evaporated salt; 5 companies (17 operations), vacuum pan salt; 10 companies (14 operations), rock salt; and 13 companies (27 operations), salt brine. (See tables 1, 2, and 3.)

The five leading States in terms of total salt sold or used were Louisiana, 36%; Texas, 22%; New York, 11%; and Kansas, 7%. Although Louisiana, New York, and Ohio were major rock salt-producing States, a substantial amount of salt was produced in Alabama, Kansas, Louisiana, New York, Ohio, Texas, Utah, and West Virginia as brine for the chemical industry. (See table

4.)

U.S. salt production accounted for about 22% of total world production. Production and trade of salt increased compared with 1994. Total world production of all types of salt decreased slightly. The depressed market for chlorine and environmental problems associated with emissions of chlorinated compounds may affect the short-term status of the world chloralkali industry, which is the largest single consumer of salt.

After 18 months of continuous flooding that began March 12, 1995, Akzo Nobel's Retsof, NY, rock salt mine, which was the largest underground room-and-pillar mine in the Western Hemisphere, officially closed on September 11. The mine had been in continuous operation since 1884 when the first two mine shafts were sunk by the Empire Salt Co. Empire Salt was reorganized in 1885 and named the Retsof Mining Co. In 1901, the company merged with other local salt companies to form International Salt Co., which operated under that name until 1989 when it was changed to its parent corporation's name of Akzo Salt Inc.

To alleviate any supply shortages in the forthcoming winter, about 2.3 million tons of rock salt was stockpiled on the surface ready for use. The company planned to replace the mine, which had an annual capacity of 3.6 millions tons, with another underground rock salt mine of similar capacity nearby at Hampton Corners in Groveland, NY. The new mine will have a lifespan of about 80 years. Construction was slated to begin by April 1996 with the sinking of the first shaft, which would take about 1 year to complete. The mine was scheduled to be operational in 1997 and fully operable within 1 ½ years after mine activities commence.¹

Akzo Nobel's vacuum pan salt facility at Manistee, MI, closed in early November after many years of production. The company cited rising logistics costs and a changing emphasis in the evaporated salt business as reasons for the decision. The operation was sold to Ambar Inc., an oil and gas services company that would recover calcium chloride and bromine from feedstock supplied by Martin Marietta Magnesia Specialties, Inc.² To counter the loss of vacuum pan salt capacity, a new refined salt operation was announced at New Johnsonville, TN, where high-quality salt will be recovered as a byproduct from E. I. DuPont's titanium dioxide facility. Discharged waste containing iron chloride and hydrochloric acid will be treated with soda ash to produce iron carbonate, which can be used in water treatment chemicals, and sodium chloride.³

A sinkhole was discovered in February in the cap of the Weeks Island Strategic Petroleum Reserve that allowed water to seep into the salt dome where 73 million barrels of oil was stored. Decommissioning of the site was to be accomplished by

March 1997, and 60 million barrels of oil was to be transferred to the Big Hill salt dome facility near Port Arthur, TX.⁴

Consumption

A record 46.5 million metric tons of domestic and imported salt was consumed in the United States in 1995, based on the annual survey of the U.S. salt producers. The reported percent distribution of salt by major end use was chemicals, 45%; ice control, 28%; distributors, 9%; food and agricultural, 7%; industrial, 8%; primary water treatment, 1%; and other combined with exports, 2%. Distributors represent a substantial share of salt sales by the salt industry; however, all the salt ultimately is resold to many end users. Some customers have specific uses. For a more complete analysis of end-use markets, specific sectors of distribution in table 5 can be combined, such as agricultural and water conditioning with agricultural and water conditioning distribution, respectively.

The chemical industry consumes the majority of the salt produced, primarily salt brine. Although most salt brine is captively produced by chemical producers, many chloralkali manufacturers now purchase brine from independent brine supply companies. In certain cases, brine is captively produced by one chemical company, and any excess brine is sold to neighboring competitors. According to a survey of domestic salt-based chlorine facilities, about 48% of the salt used to manufacture chlorine was captive, and 31% was purchased brine. Purchased solar or rock salt comprised 12%, and imported rock, solar, and vacuum pan salt was 9%. (*See tables 5 and 6.*)

According to the Bureau of the Census data, 11.4 million tons of chlorine and 11.9 tons of sodium hydroxide were produced in 1995.⁵ Based on the industry average ratio of 1.75 tons of salt required to produce 1.0 ton of chlorine and 1.1 tons of coproduct sodium hydroxide, the chlorine and caustic soda industry consumed about 20 million tons of salt for feedstock. Reported consumption of total domestic and imported salt for chlorine manufacture was 20.1 million tons, as noted in table 5. The difference between the calculated and reported quantities was the amount of salt unreported to the USGS from imports or captive brine production of chloralkali producers.

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 that provides a source of iodine that is essential to the oxidation processes in the body. Kosher salt, seasalt, condiment salt, and salt tablets are special varieties of salt.

Water conditioning and animal feed salt are made into 22.7 kilogram (50-pound) pressed blocks. Sulfur, iodine, trace elements, and vitamins are occasionally added to salt blocks to provide missing nutrients not found naturally in the diet of certain livestock. Salt is also compressed into pellets and used for water conditioning.

There are reportedly about 14,000 different direct and indirect uses of salt. The USGS annually surveys 8 major categories comprising 29 separate end-uses.

Chemical.—The greatest quantity of salt used in the chemical industry is by the chloralkali sector. Traditionally, the chloralkali sector included salt consumed for chlorine, coproduct sodium hydroxide (also known as caustic soda and lye), and synthetic soda ash. Since 1986 when the last synthetic soda ash plant 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. Aside from a few economic deposits of natural soda ash, several countries in the world continue to use salt for synthetic soda ash production.

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 the sodium ions. About 98% of the domestic chlorine and sodium hydroxide produced is obtained from the electrolysis of salt brine feedstock using three different cell technologies. The types of cells and percent chlorine manufactured by them are diaphragm, 78%; mercury, 14%; and membrane, 6%.

It takes about 1.75 tons of salt to make 1.0 ton of chlorine and 1.1 tons of coproduct caustic soda. The electrolytic process ionizes the sodium chloride compound and selectively allows the ions to migrate through special membranes. Chlorine gas forms at the anode while sodium ions bond with water molecules at the cathode to form sodium hydroxide with hydrogen gas evolving.

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 second generation products from salt. Salt is also used as a feedstock in chemical establishments that make sodium chlorate (by the electrolysis of an acidified salt brine using hydrochloric acid adjusted to a pH of 6.5), metallic sodium (by the electrolysis of a molten salt mixture containing 33.2% sodium chloride and 66.8% calcium chloride, which is added to reduce the melting temperature of salt), and other downstream chemical operations. In powdered soaps and detergents, salt is used as a bulking agent and as 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 also used as a cofeedstock with sulfuric acid to produce sodium sulfate and hydrochloric acid. This subsector is relatively small, representing only 10% of domestic salt sales for the entire chemical sector and only 5% of total domestic salt consumption.

Food Processing.—Every person uses some quantity of salt in their food. The salt is either added to the food by the food processor or by the consumer through free choice. Salt is added to food as a flavor enhancer, preservative, binder, fermentation control additive, texture aid, and color developer. This major category is subdivided into six applications, in descending order of salt consumption; meat packers, canning, other food processing, grain mill products, baking, and dairy.

In meatpacking, salt is added to processed meats to promote the 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. Early pioneers used to store their perishables in salt barrels for protection and preservation. Salt acts as a binder in sausages to form a binding gel comprised of meat, fat, and moisture. Salt also acts as a flavor enhancer and a tenderizer.

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

In the “other food processing” category, salt is used mainly as a seasoning agent. Other food processing includes miscellaneous establishments that make food for human consumption (i.e., potato chips, pretzels) and domestic pet consumption (i.e., dog and cat food). 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 is grain mill products, which consists of milling flour and rice, and manufacturing cereal breakfast food and blended or prepared flour.

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

General Industrial.—The industrial uses of salt are diverse. They include, in descending order of salt usage, oil and gas exploration; other industrial; textiles and dyeing; metal processing; pulp and paper; tanning and leather treatment; and rubber manufacture.

In oil and gas exploration, salt is an important component of drilling fluids in well drilling. It is used to flocculate and to increase the density of the drilling fluid in order to overcome high down-well gas pressures. Whenever drilling activities encounter salt formations, salt is added to the drilling fluid to saturate the solution and minimize the dissolution within the salt strata. Salt is also used to increase the set rate of concrete in cemented casings. In metal processing, salt is used in concentrating uranium ore into uranium oxide (yellow cake). It is also used in processing aluminum, beryllium, copper, steel, and vanadium.

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 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. Although the chlorine dioxide process originated in Germany after World War I, it 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 replace some of the moisture in the hides. In rubber manufacture, salt is used to make neoprene rubber, white rubber, and buna rubber. Salt brine and sulfuric acid are used to coagulate an emulsified latex made from chlorinated butadiene.

Agricultural Industry.—Since prehistoric times, humankind has noticed that animals satisfied their salt hunger by locating salt springs, salt licks, or playa lake salt crusts. Barnyard and grazing livestock need supplementary salt rations to maintain proper nutrition. Veterinarians advocate adding loose salt in commercially mixed feeds or in block forms sold to farmers and ranchers. Salt also acts as an excellent carrier for trace elements not found in the vegetation consumed by grazing livestock. Sulfur, selenium, and other essential elements are commonly added to salt licks, or salt blocks, for free-choice feeding.

Water Treatment.—Approximately 1.2 trillion liters (325 billion gallons) of water is used daily in the United States for residential and commercial uses. 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. Commercial and residential water-softening units use salt to remove the ions causing water 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 the brine replenishes the lost sodium ions.

Ice Control and Road Stabilization.—The second largest end use of salt is for highway deicing. The developer of the Fahrenheit temperature scale (°F), discovered that salt mixed with ice (at a temperature below the freezing point) creates a solution with a lower freezing point than water by itself. The brine forms below the surface of the ice and snow and prevents the water from freezing into ice and bonding with the road surface. Therefore, salt causes snow and ice to melt. Salt is an inexpensive, widely available, and effective ice control agent. It does, however, become less effective as the temperature decreases below about -9.4° C to -6.7° 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 occur between -3.9° C to 0° C (25° F and 32° F), a range in which salt is most effective. An anticaking agent, such as ferric ferrocyanide (Prussian Blue) or sodium ferrocyanide (Yellow Prussiate of Soda), is used to prevent the salt from agglomerating. Both additives are nontoxic and harmless to humans. In fact, sodium ferrocyanide is approved for use in food grade salt by the Federal Food and Drug Administration.

In highway deicing, salt has been associated with corrosion to motor vehicles, bridge decks, unprotected steel structures, and reinforcement bar and wire used in road construction. Surface runoff, vehicle spraying, and windblown actions also affect roadside vegetation, soil, and local surface and ground water supplies. Although there is evidence of environmental

loading of salt during peak usage, the spring rains and thaws usually dilute the concentrations of sodium in the area.

Salt is also 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 by changes in humidity and traffic load in the subsurface.

Distributors.—A tremendous amount of salt is marketed through various distributors, some of which specialize in certain markets such as agricultural and water treatment services. In addition to these two categories, distributor sales include grocery wholesalers and/or retailers, institutional wholesalers, U.S. Government resale, and other wholesalers and retailers.

Stocks

Because bulk salt is stored at many different locations, such as at the plants, warehouses, ports, and terminals, data on the quantity of salt stockpiled by the salt industry is not reliable enough to formulate accurate inventory totals; however, yearend stocks reported by producers were estimated to be 3.0 million tons. Most of these inventories were imported rock salt and solar salt. Many salt producers, States, municipalities, distributors, and road-deicing contractors stockpiled additional quantities of salt in anticipation of adverse weather conditions. Deicing salt inventories were extremely large by yearend because the mild winter in the domestic snow belt did not require as much salt as had been stockpiled. 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

The locations of the salt supplies often are not in proximity of the consumers location, and transportation can become 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 are increased and are reflected in higher selling prices.

Ocean borne imports of salt have been increasing in some areas of the United States because they are less expensive with respect to transportation costs than what could be purchased from domestic suppliers using rail transportation.

Prices

The four types of salt that are produced each 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. 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 occurred, nor do they represent bid and asked prices. They are quoted here to serve only as a reference to yearend price levels. Yearend prices were quoted in Chemical Marketing Reporter, as shown in table 7. The average annual values, as collected by the USGS in table 8 and represent a national average value for each of the types of salt and the various product forms. (*See tables 7 and 8.*)

Foreign Trade

Under the Harmonized Tariff Schedule nomenclature, imports only have one category known as "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 trade tables in this report list the previous and current identification codes for salt.

Based on Bureau of the Census statistics, the United States in 1995 exported 670,000 tons, a 10% decrease compared with 1994. Salt was shipped to 63 countries through 32 U.S. customs districts; Cleveland, OH, district exported the most and represented 48% of the U.S. total. In 1995, the majority of exports, or 83% of the total, was to Canada. The Journal of Commerce's Port Import/Export Reporting Service (PIERS), which reports only ocean commerce (no rail or truck traffic between borders with Canada and Mexico) reported that six domestic salt producing companies exported 93% of the 323,000 metric tons exported in 1995. The companies were Akzo Nobel Salt Inc., Cargill Salt Co. and its affiliate Leslie Salt Co., North American Salt Co., Morton Salt Co., Western Salt Co., and United Salt Co. Therefore, the remaining 7% of exports was by companies that do not produce salt.

Based on Bureau of the Census statistics, the United States imported salt from 35 countries 7.09 million tons in 1995, which was 26% less than was imported during the previous year. The level of imports was the second highest on record. The large quantity of imports was to counter the shortage of rock salt supplies resulting from the September closure of Akzo's rock salt mine. The quantity of imports was nearly 11 times more than the quantity of salt that was exported. Although this would indicate that the United States is import reliant on salt to meet its salt requirements, 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 customers at costs lower than the comparable domestic product because production costs are lower abroad, currency exchange rates are more favorable, and ocean freight rates are less expensive than overland rail or truck rates.

The PIERS service reported that 5.76 million tons was imported; however, PIERS data includes only ocean freight and does not include salt shipped by rail or truck over the U.S. land

borders with Canada and Mexico. Therefore, Census data and PIERS data often are dissimilar. Using PIERS data, Akzo Nobel Salt Inc., Cargill Inc., Morton International, and North American Salt Co., imported 63% of the total imports. Three companies that manufacture chlorine, which was the single largest domestic salt market, consumed 15% of total imports, which was primarily solar salt. These companies were Atochem North America, Occidental Chemical Corp. and Weyerhaeuser Co. Four salt distributors, Continental Salt Co., Eastern Minerals, Granite State Minerals, and Southern Salt Co., imported 15% of the total salt. The salt producers, salt distributors, and chloralkali producers imported 93% of total PIERS imports; the remainder was by many small direct buyers. Tables 9 through 12 list the import and export statistics reported by the Bureau of Census for 1994-95. (*See tables 9, 10, 11, and 12.*)

World Review

Table 13 lists world salt production statistics for 110 countries based on reported and estimated information. The reunification of Germany and the dissolution of the former Soviet Union and Yugoslavia in 1992 have modified the list of nations surveyed. World production decreased slightly in 1995 compared with 1994. (*See table 13.*)

The United States remained the world's leading salt-producing nation, representing about one-fifth of total world production. The structure of the U.S. industry has changed throughout the years. In 1970, there were 50 companies operating 95 plants in the United States. Market competition, energy and labor costs, less expensive imports, and an excess of production capacity resulting in the downsizing of the industry through mergers and acquisitions reduced the size of the industry to 28 companies and 64 plants by 1995.

Most countries possess some form of salt production capability with production levels set to meet their own domestic demand requirements with additional quantities available for export. Many developing nations tend to develop their agricultural resources first to feed their population. Development of easily extractable mineral resources follows with salt being one of the first 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.

Canada.—A mine accident occurred on April 28 at Canadian Salt Co., Ltd.'s Mines Saleine underground rock salt operation in the St. Magdalen Islands, Quebec. Ocean water began entering the mine around the mine shaft, which was situated 250 meters below sea level, and continued to flood until mine engineers tried to stabilize the waterflow, which was calculated to be about 240 liters per minute. By May 5, sinkholes formed from 50 meters to 100 meters from the shaft. Rocks and sand were placed within the bottom of the shaft to the lower end of the concrete shaft liner and salt added to saturate the seawater to prevent any new dissolution. Efforts were still underway by yearend to save the mine, which had an annual

capacity of about 1.2 millions tons.⁶ The mine has had a history of major flooding; in November 1980 and February 1982. The mine began operation in 1983 and was operated by (Societe Quebecoise d' Exploitation Miniere (SOQUEM), the Quebec government agency. Canadian Salt bought the mine from SOQUEM in 1988.⁷

Venezuela.—Cargill, Inc., announced it formed a joint venture with Petroquímica de Venezuela, S.A., to produce solar salt at Los Olivitos in Zulia, Venezuela. The company, Productora de Sal C.A., was to produce about 800,000 tons of salt annually, of which about one half will be for domestic use and the remainder exported to markets in the region.⁸

Outlook

Despite the loss of the Retsof Mine that occurred in late 1995, the United States will continue to have adequate sources of salt to satisfy its demand requirements. The supply of salt will come from increases in production capacity at other locations and imports from various salt resources in the Western Hemisphere.

Salt consumption for chlorine production should remain stable for the near future despite efforts to reduce chlorine usage in the United States because of environmental concerns regarding chlorinated paper bleaching chemicals containing chlorine. As some countries close some of the small and inefficient synthetic soda ash plants, such as those that recently closed in Belgium, Colombia, and Germany, consumption of salt feedstock will decline. Japan was scheduled to close two of its synthetic soda ash plants in 1996 and 1997 that use imported solar salt from Australia and Mexico. Salt producers in these countries will evaluate alternative markets to sell into to offset sales to the soda ash industry.

¹Questions and Answers About the Proposed Hampton Corners Mine. Akzo Nobel Salt Inc., 1995, p. 11.

²Chemical Marketing Reporter. Ambar CaCl₂ Plans Advance. V. 248, No. 20, Nov. 27, 1995, p. 5.

———. North American, DuPont Link for Evaporated Salt Facility. June 12, 1995, v. 247, No. 24, p. 3.

⁴The Advocate (Baton Rouge, LA). DOE: Second Hole Found in Salt Dome. Mar. 3, 1995, p. 4B.

⁵Current Industrial Reports, Inorganic Chemicals, MQ28A, First Quarter 1996, p. 7.

⁶The Gazette (Montreal). Magdalens Salt Mine Flooded by Seawater. May 1, 1995, p. A4.

⁷Press Release. Morton Salt Co. Water Inflow Unchecked at Mines Seleine; Company Efforts Switch to Assist Employees and Magdalen Islands Community. May 8, 1995.

⁸Chemical Marketing Reporter. Cargill Enters Salt JV. V. 248, No. 7, Oct. 2, 1995, p. 5.

OTHER SOURCES OF INFORMATION

U.S. Bureau of Mines Publications

Salt. Ch. in Minerals Yearbook, annual.

Salt. Ch. in Mineral Commodity Summaries.

Directory of Companies Producing Salt in the United States, in annual Mineral Industry Surveys.

Salt. Ch. in 1985 Mineral Facts and Problems.

The Material Flow of Salt, IC 9343, 1993, 32 pp.

U.S. Geological Survey Publications

Smith, G. I., Jones, C. L., Culbertson, W. C., Ericksen, G. E., and J. R. Dyni, 1973, Evaporites and Brines in Brobst, D. A., and W. P. Pratt, eds., United States mineral resources: U.S. Geological Survey Professional Paper 820, p. 197-216.

Other Sources

Canadian Minerals Yearbook, Chapter on Salt, annual.

The Chlorine Institute.

Handbook of World Salt Resources. Stanley J. Lefond, 1969, 384 p.

Industrial Minerals and Rocks. Salt, D. S. Kostick. Society of Mining Engineers, ed. by D. Carr, 6th ed., 1994.

Salt in Mining Engineering, annual commodity review.

The Salt Institute.

Sodium Chloride. American Chemical Society Monograph.

No. 145, ed. by Dale W. Kaufmann, Reinhold Pub. Corp., 1960, 743 p.

Solution Mining Research Institute.

TABLE 1
SALIENT STATISTICS 1/

(Thousand metric tons and thousand dollars)

	1991	1992	1993	1994	1995
United States:					
Production, total: 2/	36,300	36,000	39,200	40,100	42,100
Brine	18,700	17,600	18,100	18,000	20,600
Rock	11,200	11,400	14,300	15,100	14,000
Solar	2,810	3,220	2,960	3,020	3,540
Vacuum pan and open pan	3,650	3,810	3,860	3,960	3,950
Sold or used by producers	35,900	34,800	38,200	39,700	40,800
Value	\$802,000	\$803,000	\$904,000	\$990,000	\$1,000,000
Exports	1,780	992	688	742	670
Value	\$29,900	\$32,200	\$34,800	\$30,200	\$34,400
Imports for consumption	6,190	5,390	5,870	9,630	7,090
Value	\$87,400	\$87,700	\$100,000	\$151,000	\$114,000
Consumption, apparent 3/	40,300	39,200	43,400	48,600	47,200
Consumption, reported	40,600	39,700	44,400	47,200	46,500
World production	191,000 r/	184,000 r/	187,000 r/	190,000 r/	189,000 e/

e/ Estimated. r/ Revised.

1/ Data are rounded to three significant digits.

2/ Excludes Puerto Rico.

3/ Sold or used plus imports minus exports.

TABLE 2
SALT PRODUCED IN THE UNITED STATES, BY TYPE AND PRODUCT FORM 1/

(Thousand metric tons)

Product form	Vacuum pans and open pans	Solar	Rock	Brine	Total
1994					
Bulk	782 r/	1,820	14,300	18,000	34,900 r/
Compressed pellets	1,010 r/	197	XX	XX	1,210 r/
Packaged	1,880 r/	877	777	XX	3,540 r/
Pressed blocks	287 r/	125	W	XX	454 r/
Total	3,960 r/	3,020	15,100	18,000	40,100 r/
1995					
Bulk	678	2,590	13,500	20,600	37,300
Compressed pellets	1,020	175	XX	XX	1,200
Packaged	1,990	694	494	XX	3,180
Pressed blocks	257	86	66	XX	409
Total	3,950	3,540	14,000	20,600	42,100

r/ Revised. XX Not applicable. W Withheld to avoid disclosing company proprietary data.

1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 3
SALT SOLD OR USED 1/ 2/ IN THE UNITED STATES, BY TYPE AND PRODUCT FORM

(Thousand metric tons and thousand dollars)

Product form	Vacuum pans and open pans		Solar		Rock		Brine		Total	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1994:										
Bulk	772 r/	38,600 r/	1,690	28,300	14,100	276,000	18,000	97,000	34,600	440,000 r/
Compressed pellets	1,010 r/	132,000 r/	196	18,900	NA	XX	XX	XX	1,200 r/	151,000 r/
Packaged:										
Less-than-5-pound units	150 r/	NA	110	NA	--	NA	XX	XX	260 r/	XX
More-than-5-pound units	1,720 r/	NA	766	NA	762	NA	XX	XX	3,250 r/	XX
Total	1,870 r/	251,000 r/	876	48,900	762	56,600	XX	XX	3,510 r/	356,000 r/
Pressed blocks:										
For livestock	158 r/	NA	67	NA	42	NA	XX	XX	267 r/	XX
For water treatment	122 r/	NA	57	NA	(3/)	NA	XX	XX	180 r/	XX
Total	280 r/	27,900 r/	124	10,800	42	4,220	XX	XX	447 r/	43,000 r/
Grand total	3,930 r/	449,000 r/	2,890	107,000	14,900	337,000	18,000	97,000	39,700 r/	990,000 r/
1995:										
Bulk	670	35,000	2,370	35,200	12,500	253,000	20,500	142,000	36,100	465,000
Compressed pellets	1,010	135,000	168	18,900 W	XX	XX	XX	XX	1,180	154,000
Packaged:										
Less-than-5-pound units	108	NA	1	NA	--	NA	XX	XX	109	XX
More-than-5-pound units	1,870	NA	686	NA	464	NA	XX	XX	3,020	XX
Total	1,980	265,000	686	45,400	464	30,600	XX	XX	3,130	341,000
Pressed blocks:										
For livestock	151	NA	68	NA	51	NA	XX	XX	270	XX
For water treatment	105	NA	15	NA	15	NA	XX	XX	135	XX
Total	256	26,200	82	7,690	66	6,470	XX	XX	405	40,300
Grand total	3,920	461,000	3,310	107,000	13,000	290,000	20,500	142,000	40,800	1,000,000

r/ Revised. NA Not available. XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ As reported at salt production locations. The term "sold or used" indicates that some salt, usually salt brine, is not sold but is used for captive purposes by plant or company. Because data do not include salt imported, purchased, and/or sold from inventory from regional distribution centers, salt sold or used by type may differ from totals shown in tables 5 and 6, which are derived from company totals.

3/ Less than 1/2 unit.

TABLE 4
SALT SOLD OR USED 1/ 2/ BY PRODUCERS IN THE UNITED STATES, BY STATE

(Thousand metric tons and thousand dollars)

State	1994		1995	
	Quantity	Value	Quantity	Value
Kansas	2,660	108,000	2,770	113,000
Louisiana	13,500	140,000	14,700	177,000
New York	6,060	233,000	4,480	185,000
Texas	8,040	70,500	9,110	85,000
Utah	1,680	56,700	2,160	54,800
Other Eastern States 3/	6,390 r/	314,000 r/	6,270	316,000
Other Western States 4/	1,470	67,800	1,370	68,500
Total	39,700 r/	990,000 r/	40,800	1000000
Puerto Rico e/	45	1,500	45	1,500

e/ Estimated. r/ Revised.

1/ Data are rounded to three significant digits; may not add to totals shown.

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

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

4/ Includes Arizona, California, Nevada, New Mexico, and Oklahoma.

TABLE 5
DISTRIBUTION OF DOMESTIC AND IMPORTED 1/ 2/ DATA BY PRODUCERS IN THE UNITED STATES
BY END USE AND TYPE

(Thousand metric tons)

End use	Standard industrial classification	Vacuum pans and open pans		Solar		Rock		Salt in brine		Grand total 3/	
		1994	1995	1994	1995	1994	1995	1994	1995	1994	1995
Chemical:											
Chloralkali producers	2812	36	32	228	492	770	823	16,200	18,700	17,300	20,100
Other chemical	28 (excludes 2812, 2899)	401	378	299	279	384	291	17	136	1,100	1,090
Total		437	410	528	772	1,160	1,110	16,200	18,800	18,400	21,100
Food processing industry:											
Meat packers	201	226	228	65	62	119	119	(4/)	(4/)	410	410
Dairy	202	110	112	5	5	3	4	--	--	117	122
Canning	2091, 203	196	194	82	86	62	51	2	2	342	332
Baking	205	142	143	1	1	13	12	--	--	157	155
Grain mill products	204 (excludes 2047)	102	109	19	8	54	57	--	--	175	174
Other food processing	206-208, 2047, 2099	237	230	29	30	31	33	(4/)	1	297	293
Total		1,010	1,020	201	192	282	274	2	3	1,500	1,480

See footnotes at end of table.

TABLE 5-Continued
DISTRIBUTION OF DOMESTIC AND IMPORTED 1/ 2/ DATA BY PRODUCERS IN THE UNITED STATES
BY END USE AND TYPE

(Thousand metric tons)

End use	Standard industrial classification	Vacuum pans and open pans		Solar		Rock		Salt in brine		Grand total 3/	
		1994	1995	1994	1995	1994	1995	1994	1995	1994	1995
General industrial:											
Textiles and dyeing	22	226	219	53	48	20	18	5	5	304	290
Metal processing	33, 34, 35, 37	11	12	30	30	198	193	--	--	239	236
Rubber	2822, 30 (excludes 3079)	3	3	1	(4/)	4	3	25	60	33	67
Oil	13, 29	37	35	209	219	80	69	960	2,090	1,290	2,420
Pulp and paper	26	15	9	52	61	76	65	7	17	150	152
Tanning and/or leather	311	10	10	35	32	37	32	--	--	82	74
Other industrial		59	58	236	234	223	259	3	2	521	552
Total		360	347	615	625	638	639	1,000	2,180	2,610	3,790
Agricultural:											
Feed retailers and/or dealers-mixers	5159	227	223	357	373	490	446	--	--	1,070	1,090
Feed manufacturers	2048	66	68	87	88	324	250	(4/)	1	478	468
Direct-buying end user	02	9	9	12	12	37	44	(4/)	--	58	71
Total		301	300	456	474	851	740	(4/)	1	1,610	1,630
Water treatment:											
Government (Federal, State, local)	2899	18	18	70	73	122	107	3	4	213	201
Commercial or other	2899	18	13	71	61	132	129	7	9	227	212
Total		36	30	141	134	253	235	10	13	440	413
Ice control and/or stabilization:											
Government (Federal, State, local)	9621	4	2	1,070	512	13,900	11,400	10	6	15,000	12,000
Commercial or other		2	2	111	68	1,310	962	--	--	1,430	1,060
Total		5	4	1,180	580	15,200	12,300	10	6	16,400	13,100
Distributors:											
Agricultural distribution	5191	320	318	208	182	314	227	--	--	842	726
Grocery wholesalers and/or retailers	514, 54	525	539	297	232	112	76	--	--	934	847
Institutional wholesalers and end users	58, 70	82	84	29	28	33	26	(4/)	(4/)	144	139
Water-conditioning distribution	7399	131	135	309	356	65	72	--	--	505	563
U.S. Government resale	9199	1	1	5	3	8	7	--	--	13	11
Other wholesalers and/or retailers	5251	711	680	665	597	968	635	(4/)	(4/)	2,340	1,910
Total		1,770	1,760	1,510	1,400	1,500	1,040	1	(4/)	4,780	4,200
Other n.e.s. 5/		199	169	253	155	869	661	150	95	1,470	1,080
Grand total		4,120	4,030	4,890	4,330	20,700	17,000	17,400	21,100	47,200	46,500

1/ Data are rounded to three significant digits; may not add to totals shown.

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

3/ Because data include salt imported, produced, and/or sold from inventory from regional distribution centers, 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 show in table 6 because of changes in inventory and/or incomplete data reporting.

4/ Less than 1/2 unit.

5/ Includes exports.

TABLE 6
DISTRIBUTION OF DOMESTIC AND IMPORTED EVAPORATED AND ROCK SALT 1/ 2/
IN THE UNITED STATES, BY DESTINATION

(Thousand metric tons)

Destination	1994				1995			
	Evaporated				Evaporated			
	Vacuum pans and open pans	Solar	Rock	Total	Vacuum pans and open pans	Solar	Rock	Total
Alabama	56	(3/)	92	149	59	1	86	146
Alaska	(3/)	4	(3/)	4	(3/)	5	(3/)	5
Arizona	11	90	2	102	47	93	3	143
Arkansas	42	3	87	132	46	2	64	112
California	145	758	2	905	146	758	2	906
Colorado	12	76	52	140	12	80	53	145
Connecticut	14	13	230	257	11	20	125	156
Delaware	3	31	29	62	3	6	13	22
District of Columbia	1	15	11	27	(3/)	1	3	4
Florida	75	150	34	258	70	147	42	259
Georgia	69	49	57	175	63	65	52	180
Hawaii	1	3	--	4	1	2	--	3
Idaho	8	84	1	93	9	94	3	106
Illinois	333	167	1,920	2,420	302	160	1,460	1,920
Indiana	217	79	859	1,160	212	79	674	965
Iowa	180	69	469	718	182	76	478	736
Kansas	75	36	536	422	73	38	329	440
Kentucky	56	5	529	590	57	7	417	481
Louisiana	45	2	367	413	45	2	330	377
Maine	8	29	250	288	9	3	178	190
Maryland	76	447	227	750	72	94	234	400
Massachusetts	33	25	568	626	33	10	352	395
Michigan	248	28	1,720	2,000	240	26	1,550	1,810
Minnesota	139	182	513	834	155	192	941	1,290
Mississippi	23	(3/)	237	261	23	1	241	265
Missouri	129	44	576	749	114	44	522	680
Montana	1	44	3	48	1	44	3	48
Nebraska	75	38	159	272	72	38	158	268
Nevada	2	237	11	251	2	247	14	263
New Hampshire	5	4	102	111	5	62	99	166
New Jersey	131	234	523	889	124	197	225	546
New Mexico	6	49	1	55	8	47	1	56
New York	206	164	3,170	3,540	202	58	2,300	2,560
North Carolina	218	68	105	390	211	65	70	346
North Dakota	5	28	9	43	5	39	9	53
Ohio	368	45	2,090	2,500	379	39	1,950	2,370
Oklahoma	31	19	61	111	31	20	68	119
Oregon	13	130	131	274	13	131	1	145
Pennsylvania	217	187	1,900	2,310	196	99	1,350	1,640
Rhode Island	8	10	101	119	10	36	9	55
South Carolina	49	7	12	67	48	11	8	67
South Dakota	31	53	26	110	29	45	34	108
Tennessee	71	3	579	653	71	4	552	627
Texas	183	137	258	578	184	138	225	547
Utah	7	347	W	354	8	247	43	298
Vermont	5	1	254	261	6	1	193	200
Virginia	95	161	193	449	88	81	158	327
Washington	26	240	(3/)	266	30	501	(3/)	531
West Virginia	12	3	183	199	12	2	186	200
Wisconsin	230	104	1,180	1,510	233	100	918	1,250
Wyoming	(3/)	25	2	27	(3/)	24	2	26
Other 4/	128	161	302	592	78	46	288	412
Total 5/	4,120	4,890	20,700	29,500	4,030	4,330	17,000	25,400

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to three significant digits; may not add to totals shown.

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

3/ Less than 1/2 unit.

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

5/ Because data include salt imported, purchased and/or sold from inventory from regional distribution centers, 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 7
SALT YEAR END PRICES 1/

	1994	1995
Salt, evaporated, common:		
80-pound bags, carlots or truckloads:		
North, works, 80 pounds	\$4.02	\$4.02
Bulk, same basis, per ton	60.00-61.20	60.00-61.20
Salt, chemical grade, same basis: North, works, 80 pounds	4.30	4.30
Salt, rock, medium, coarse:		
Same basis, 80 pounds	2.70	2.70
Bulk, same basis, per ton	18.00-25.00	18.00-25.00
Sodium chloride, U.S.P.: Granular bags, per pound	.29	.29

Sources: Chemical Marketing Reporter. Current Prices of Chemicals and Related Materials, v. 247, No. 1, Jan. 2, 1995, p. 32; and v. 249, No. 1, Jan. 1, 1996, p. 32.

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

(Dollars per metric ton)

Product form	Vacuum pans and open pans	Solar	Rock	Brine
1994:				
Bulk	\$50.00 r/	\$16.74	\$19.54	\$5.40
Compressed pellets	131.04 r/	96.06	XX	XX
Packaged	133.87 r/	55.85	74.26	XX
Average 2/	115.35 r/	34.77	22.33	5.40
Pressed blocks	99.71 r/	87.38	99.27	XX
1995:				
Bulk	52.24	14.86	20.16	6.91
Compressed pellets	133.07	112.71	XX	XX
Packaged	133.72	66.06	66.04	XX
Average 2/	118.63	30.85	21.80	6.91
Pressed blocks	102.26	93.35	97.48	XX

r/ Revised. XX Not applicable.

1/ Net selling value, f.o.b. plant, excluding container costs.

2/ Salt value data previously reported were an aggregate value per ton of bulk, compressed pellets, and packaged salt. For time series continuity, an average of these three types of product forms is presented, which is based on the aggregated values and quantities of the product form for each type of salt shown in table 3.

TABLE 9
U.S. EXPORTS OF SALT, BY COUNTRY 1/

(Thousand metric tons and thousand dollars)

Country	1994		1995	
	Quantity	Value	Quantity	Value
Angola	2	125	--	--
Argentina	2	63	(2/)	56
Bahamas, The	1	185	1	209
Bahrain	3	352	(2/)	80
Belgium	3	81	1	85
Brazil	1	57	1	370
Canada	573	20,300	558	24,000
China	(2/)	18	2	115
Colombia	2	80	(2/)	168
Denmark	1	28	(2/)	22
El Salvador	1	132	1	117
Finland	(2/)	21	1	85
France	1	29	2	108
Gabon	8	345	(2/)	213
Germany	2	68	(2/)	18
Haiti	2	53	(2/)	37
Honduras	1	74	1	127
India	--	--	1	120
Italy	3	142	(2/)	29
Jamaica	2	152	(2/)	90
Japan	4	225	2	633
Korea, Republic of	1	362	21	635
Kuwait	1	177	(2/)	111
Mexico	80	3,040	36	2,120
Oman	1	28	(2/)	25
Panama	3	342	1	69
Peru	(2/)	8	2	78
Philippines	2	55	1	47
Russia	2	92	(2/)	36
Saudi Arabia	21	1,870	5	882
Singapore	(2/)	116	21	1,170
Suriname	1	49	1	159
Sweden	7	208	(2/)	75
Taiwan	4	177	(2/)	243
United Arab Emirates	1	210	1	168
United Kingdom	2	231	2	236
Venezuela	2	58	1	833
Other	2	663	7	829
Total	742	30,200	670	34,400

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Less than 1/2 unit.

Source: Bureau of the Census.

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

(Thousand metric tons and thousand dollars)

District	1994		1995	
	Quantity	Value	Quantity	Value
Anchorage, AK	(2/)	4	(2/)	15
Baltimore, MD	6	829	(2/)	181
Boston, MA	(2/)	14	--	--
Buffalo, NY	62	2,790	95	4,830
Charleston, SC	(2/)	26	(2/)	95
Chicago, IL	(2/)	43	(2/)	11
Cleveland, OH	290	5,600	324	8,800
Columbia-Snake, OR	(2/)	10	(2/)	18
Detroit, MI	50	3,530	29	3,520
Duluth, MN	(2/)	22	(2/)	29
El Paso, TX	3	132	1	78
Great Falls, MT	4	275	5	359
Houston, TX	28	1,520	5	1,940
Laredo, TX	72	2,620	32	1,890
Los Angeles, CA	10	827	32	2,290
Miami, FL	5	528	3	477
Mobile, AL	(2/)	62	1	64
New Orleans, LA	7	694	3	533
New York, NY	12	735	8	760
Nogales, AZ	3	149	2	70
Norfolk, VA	3	492	1	23
Ogdensburg, NY	24	861	7	863
Pembina, ND	1	166	1	164
Philadelphia, PA	(2/)	44	(2/)	14
Portland, ME	(2/)	11	(2/)	35
St. Albans, VT	(2/)	3	(2/)	7
St. Louis, MO	(2/)	26	(2/)	16
San Diego, CA	2	139	2	56
San Francisco, CA	38	1,120	23	1,130
San Juan, PR	(2/)	5	(2/)	69
Savannah, GA	2	326	2	655
Seattle, WA	18	623	4	361
Tampa, FL	1	50	1	106
Other 3/	99	5,930	89	4,960
Total	742	30,200	670	34,400

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Less than 1/2 unit.

3/ Unknown, but assumed to be rail and/or truck shipments to Canada through various points of entry.

Source: Bureau of the Census.

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

(Thousand metric tons and thousand dollars)

Country	1994		1995	
	Quantity	Value	Quantity	Value
Australia	--	--	143	2,123
Bahamas, The	1,184	16,667	896	11,938
Brazil	220	2,479	76	857
Canada	3,656	67,721	2,984	55,336
Chile	1,918	22,970	861	11,539
China	(2/)	45	23	435
Egypt	--	--	29	360
France	1	635	2	752
Germany	2	428	(2/)	456
Ireland	4	248	35	355
Israel	1	452	(2/)	252
Italy	37	778	15	364
Korea, Republic of	3	633	3	644
Mexico	2,118	30,655	1,662	22,230
Netherlands	70	1,514	59	1,772
Netherlands Antilles	212	3,805	158	2,576
Spain	188	1,739	144	1,381
United Kingdom	14	216	1	136
Other	2	266	2	461
Total	9,630	151,251	7,093	113,967

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Less than 1/2 unit.

Source: Bureau of the Census.

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

(Thousand metric tons and thousand dollars)

District	1994		1995	
	Quantity	Value	Quantity	Value
Anchorage, AK	3	119	15	247
Baltimore, MD	1,170	18,600	485	8,390
Boston, MA	747 r/	10,900	486	5,920
Buffalo, NY	46	1,820	12	551
Charleston, SC	87	1,830	71	1,960
Chicago, IL	535	10,700	468	11,500
Cleveland, OH	89	2,190	109	2,390
Columbia-Snake, OR	357	4,280	378	5,570
Dallas-Fort Worth, TX	(2/)	2	--	--
Detroit, MI	1,190	23,200	1,160	21,000
Duluth, MN	159	2,550	228	3,700
El Paso, TX	(2/)	2	--	--
Great Falls, MT	1	71	1	73
Honolulu, HA	(2/)	2	(2/)	7
Houston, TX	(2/)	72	(2/)	93
Laredo, TX	--	--	1	146
Los Angeles, CA	114	2,150	118	2,220
Miami, FL	(2/)	27	(2/)	29
Milwaukee, WI	682	12,700	643	10,300
Minneapolis, MN	--	--	(2/)	49
New Orleans, LA	223	3,020	209	2,710
New York, NY	1,650	21,100	971	12,900
Norfolk, VA	175	2,490	76	1,140
Ogdensburg, NY	95	3,770	20	641
Pembina, ND	20	443	9	250
Philadelphia, PA	752	8,530	376	4,420
Portland, ME	595	7,870	519	7,540
Providence, RI	202	2,090	71	820
St. Albans, VT	8	453	3	296
St. Louis, MO	(2/)	13	(2/)	16
San Diego, CA	(2/)	40	1	54
San Francisco, CA	(2/)	80	(2/)	123
San Juan, PR	22	787	8	391
Savannah, GA	41	572	56	860
Seattle, WA	374	5,140	316	3,970
Tampa, FL	197	2,860	237	3,330
Wilmington, NC	95	830	52	360
Total	9,630	151,000	7,090	114,000

r/ Revised.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Less than 1/2 unit.

Source: Bureau of the Census.

TABLE 13
SALT: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Thousand metric tons)

Country 3/	1991	1992	1993	1994	1995 e/
Afghanistan (rock salt) e/	12	12	13	13	13
Albania e/	55	5	10	10	10
Algeria (brine and sea salt)	207 r/	180 r/	179 r/	178 r/	178
Angola e/	40	20	30	30	30
Argentina:					
Rock salt e/	(4/)	(4/)	1	1	1
Other salt	943	952	1,033	1,000 e/	1,000
Total e/	943	952	1,030	1,000	1,000
Armenia e/	XX	100	50	40	50
Australia (brine salt and marine salt)	7,791	7,693	7,737	7,685 r/	8,480 5/
Austria:					
Brine salt	698	662	695	700 e/	700
Rock salt e/	1 5/	1	1	1	1
Total e/	699 5/	663	696	701	701
Azerbaijan e/	XX	50	40	30	20
Bahamas, The	1,096	809	850 e/	900 e/	900
Bangladesh (marine salt) e/ 6/	300	320	340	350	350
Belarus e/	XX	360	300	263 r/ 5/	219 5/
Benin (marine salt) e/	(4/)	(4/)	(4/)	(4/)	(4/)
Bolivia e/	(4/ 5/	(4/)	(4/)	(4/)	5 5/
Bosnia and Herzegovina e/	XX	70	50	50	50
Botswana 7/	3	54	98	186 r/	208 5/
Brazil:					
Marine salt	3,703	4,030	4,780 r/	4,670 r/	4,700
Rock salt	1,200	1,231	1,400 r/	1,373 r/	1,400
Total	4,903	5,261	6,180 r/	6,043 r/	6,100
Bulgaria	1,970 r/	1,000 r/	650 r/	700 r/	700
Burkina Faso e/	7	7	7	7	7
Burma e/ 8/	260	260	260	260	260
Cambodia e/	40	40	40	40	40
Canada	11,993	11,171	10,900	11,700 r/	10,893 5/
Cape Verde e/	4	4	4	4	4
Chile	1,676	1,672	1,443	3,178 r/	3,000
China e/	24,100	28,100	29,500	29,700	25,000
Colombia:					
Marine salt	482	317	199 r/	358 r/	282
Rock salt	219	230	201 r/	207 r/	268 5/
Total	701	547	400	565 r/	550
Costa Rica (marine salt) e/	50	50	45	45	47
Croatia	XX	29 r/	30 r/	30 r/	28
Cuba e/	200	185	185	175	180
Czech Republic e/	XX	XX	180	180	180
Czechoslovakia 9/	207	200 e/	XX	XX	XX
Denmark (sales)	550	528	591	583 r/	576 5/
Dominican Republic (rock salt)	11	12 e/	12	10 e/	11
Egypt	1,240 r/	1,096 r/	986 r/	1,008 r/	1,000
El Salvador (marine salt) e/	15 5/	20	30 r/	30 r/	30
Eritrea: e/ 10/					
Marine salt	XX	XX	25	206 r/	253
Rock salt	XX	XX	1	2	2
Total	XX	XX	26 5/	208 r/ 5/	255 5/
Ethiopia: e/ 6/					
Marine salt	85	100 r/	45	-- r/	--
Rock salt	8	10 r/	8 r/	5 r/	5
Total	93	110 r/	53 r/	5 r/	5
France:					
Brine salt	1,000 e/	1,651	1,310	1,658 r/	1,500
Marine salt	1,200 e/	1,156	1,200 e/	1,123 r/	1,200
Rock salt	800 e/	103	116 e/	143 r/	150
Salt in solution	3,500 e/	3,206	4,355 r/	4,612 r/	4,500
Total	6,500 e/	6,116	6,980 r/ e/	7,536 r/	7,350

See footnotes at end of table.

TABLE 13--Continued
SALT: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Thousand metric tons)

Country 3/	1991	1992	1993	1994	1995 e/
Germany:					
Marine salt	563	571	558	801 r/	800
Rock salt and other	14,307	12,137	12,130	9,731 r/	10,000
Total	14,870	12,708	12,688	10,532 r/	10,800
Ghana e/	50	50	50	50	50
Greece e/	150	125	100	152 r/	150
Guatemala e/	100	100	100	100	100
Honduras e/	30	30	30	25	25
Iceland e/	3	4 5/	5	5	4
India: e/					
Marine salt	9,500	9,500	9,500	9,500	9,500
Rock salt	3	3 4/	3 4/	3	3
Total	9,500	9,500	9,500	9,500	9,500
Indonesia e/	610	630	650	650	670
Iran 11/	901	1,018 r/	720	1,050 r/	936 5/
Iraq e/	120	250	300	300	250
Israel	1,115	1,102	1,122	1,120 e/	1,200
Italy:					
Brine salt and rock salt	3,504	3,211	3,150 r/	3,300 r/	2,800
Marine salt, crude e/ 12/	450	610	580	600	600
Total	3,954	3,821	3,730 r/	3,900 r/	3,400
Jamaica	17 r/	21 r/	18 r/	18 r/	18
Japan	1,374 r/	1,405	1,378	1,387	1,400
Jordan	57	56	26	26 e/	25
Kenya (crude salt) e/	102	102	75 5/	75	74
Korea, North e/	580	590	590	600	600
Korea, Republic of	696	772	750 e/	760 e/	770
Kuwait	--	1 r/	41 r/	45 r/ e/	45
Laos (rock salt) e/	8	8	8	8	8
Lebanon e/	3	3	3	3	3
Leeward and Windward Islands e/	5	1	1	1	1
Libya e/	12	12	12	12	12
Madagascar e/	30	30	30	30	30
Mali e/	5	5	5	5	5
Malta (marine salt) e/	(4/)	(4/)	(4/)	(4/)	(4/)
Martinique e/	200	200	200	200	200
Mauritania e/	6	6	6	6	6
Mauritius e/	6	6	6	6	6
Mexico	7,533	7,395	7,490	7,458	7,670 5/
Mongolia	1 r/	(4/)	14 r/	1 r/	1 5/
Morocco (rock salt)	109	165	170	177 r/	175
Mozambique (marine salt) e/	40	40	40	40	40
Namibia (marine salt) 13/	141	115	116	316 r/	300
Nepal 14/	7	7	7	7 e/	7
Netherlands	3,417	3,628	3,500 e/	3,500 e/	3,500
Netherlands Antilles e/	350	350	300	350	350
New Zealand e/	80	80	80	80	50
Nicaragua (marine salt) e/	15	15	15	15	15
Niger e/	3	3	3	3	3
Pakistan: 6/					
Marine salt	12	10	14	13	17
Rock salt	769	853	895	847 r/	935
Total	781	863	909	860 r/	952
Panama (marine salt) e/	18	20	20	20	22
Peru e/	200	238 5/	238	238	238
Philippines (marine salt)	493	496	535	540 e/	540
Poland:					
Rock salt	556	582	718	750 r/	700
Other salt	3,284	3,305	3,099	3,324 r/	3,300
Total	3,840	3,887	3,817	4,074 r/	4,000

See footnotes at end of table.

TABLE 13--Continued
SALT: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Thousand metric tons)

Country 3/	1991	1992	1993	1994	1995 e/
Portugal:					
Marine salt e/	125	125	125	125	125
Rock salt	525	592	525 r/	519 r/	545 5/
Total e/	650	717	650 r/	644 r/	670
Romania:					
Rock salt	1,000	966 r/	808 r/	892 r/	302 5/
Other salt	2,260 r/	1,590	1,380 r/	1,310 r/	1,300 5/
Total	3,260 r/	2,556 r/	2,188 r/	2,202 r/	1,602 5/
Russia	XX	3,600 r/	2,200 r/	2,000 r/	2,000
Senegal e/	102	110	117	117	120
Serbia and Montenegro	XX	47	39	32	16
Sierra Leone e/	200	200	200	200	100
Slovakia e/	XX	XX	70	70	70
Slovenia e/	XX	8	8	8	8
Somalia e/	1	1	1	1	1
South Africa 13/	665	702	613	414 r/	313 5/
Spain:					
Marine salt and other evaporated salt e/	900	900	900	900	900
Rock salt	3,172 r/	2,705 r/	2,505	2,500 e/	2,500
Total e/	4,070 r/	3,610 r/	3,410	3,400	3,400
Sri Lanka	53	122	43	56 r/	60
Sudan e/	75	75	75	75	75
Switzerland e/	250	276 5/	300	300	300
Syria	74 r/	84 r/	113 r/	127	130
Taiwan (marine salt)	195	26	176	186 r/	221 5/
Tanzania	78 r/	78 r/ e/	18 r/	17 r/	7 5/
Thailand:					
Rock salt	125	213	262	288 r/	381 5/
Other e/	100	100	100	100	100 5/
Total e/	225	313	362	388 r/	481
Tunisia (marine salt)	441	460	435	415 r/	400
Turkey	1,438	1,418	1,426	1,353 r/	1,400
Turkmenistan e/	XX	700	600	500	500
Uganda e/	5	5	5	5	5
U.S.S.R. 15/	14,000 e/	XX	XX	XX	XX
Ukraine e/	XX	4,400	4,000	3,500	3,000
United Kingdom:					
Brine salt e/ 16/	1,319 5/	1,200	1,200	1,300	1,300
Rock salt	1,635	1,500 e/	1,500 e/	1,700 r/	1,800
Other salt 16/	3,874	3,401	4,086 r/	4,004 r/	4,000
Total e/	6,828 5/	6,100	6,790 r/	7,000 r/	7,100
United States including Puerto Rico:					
United States:					
Brine	18,700 r/	17,600	18,100	18,000	20,600 5/
Rock salt	11,200 r/	11,400 r/	14,300	15,100	14,000 5/
Solar salt	2,810 r/	3,220 r/	2,960 r/	3,020	3,540 5/
Vacuum pan salt	3,650 r/	3,810 r/	3,860	3,700	3,950 5/
Puerto Rico e/	41	45 5/	45	45	45
Total e/	36,400 r/	36,100 r/ 5/	39,300 r/	39,800	42,100
Venezuela	430	318	370 e/	400 e/	3,500
Vietnam e/	350	350	350	375	375
Yemen	116 r/	107 r/	110 r/	110 r/	110
Yugoslavia: 17/					
Brine salt	220 e/	XX	XX	XX	XX
Marine salt	70 e/	XX	XX	XX	XX
Rock salt	100 e/	XX	XX	XX	XX
Total	390 e/	XX	XX	XX	XX
Grand total	191,000 r/	184,000 r/	187,000 r/	190,000 r/	189,000

See footnotes at end of table.

TABLE 13--Continued
SALT: WORLD PRODUCTION, BY COUNTRY 1/ 2/

e/ Estimated. r/ Revised. XX Not applicable.

1/ World totals, U.S. data, and estimated data are rounded to three significant digits; may not add to totals shown.

2/ Table includes data available through Aug. 13, 1996.

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

4/ Less than 1/2 unit.

5/ Reported figure.

6/ Year ending June 30 of that stated.

7/ From natural soda ash production.

8/ Brine salt production as reported by the Burmese Government in metric tons, was as follows: 1991--46,835; 1992--46,509; 1993--58,915; 1994--58,612 (revised); and 1995--81,156.

9/ Dissolved Dec. 31, 1992.

10/ Eritrea production was included in Ethiopia until independence in May 1993.

11/ Year beginning Mar. 21 of that stated.

12/ Does not include production from Sardinia and Sicily, estimated at 200,000 metric tons annually.

13/ South Africa's decline and Namibia's increase in 1994 are due to production from Walvis Bay now included under Namibia.

14/ Year ending July 15 of that stated.

15/ Dissolved in Dec. 1991.

16/ Data captioned "Brine salt" for the United Kingdom are the quantities of salt obtained from the evaporation of brines; that captioned "Other salt" is the salt content of brines used for purposes other than production of salt.

17/ Dissolved in Apr. 1992.