

SODA ASH

By Dennis S. Kostick

Soda ash is the trade name for sodium carbonate, a chemical refined from the mineral trona or from sodium carbonate-bearing brines (both referred to as natural soda ash) and manufactured from one of several chemical processes (referred to as synthetic soda ash). It is an essential raw material in glass, chemicals, detergents, and other important industrial products. In 1997, soda ash was the 11th largest inorganic chemical in terms of production of all domestic inorganic and organic chemicals, excluding petrochemical feedstocks. Although soda ash represented 2% of the total \$39 billion U.S. nonfuel mineral industry, its use in many diversified products consequently contributed substantially to the gross domestic product of the United States.

Because soda ash is used in flat glass for automobile manufacture and building construction, which are important economic sectors of the domestic economy, monthly soda ash production data are incorporated into monthly economic indicators for industrial production by the Federal Reserve Board that monitor the economic condition of the U.S. economy.

Production

Monthly soda ash production and inventory data are collected by the U.S. Geological Survey (USGS) from monthly, quarterly, and annual voluntary surveys of the U.S. soda ash industry. Of the six soda ash operations to which a survey request was sent, all responded, representing 100% of the total production data shown in this report. (See table 1.)

U.S. production of natural soda ash from California and Wyoming in 1997 increased 5% to a record 10.7 million tons. Based on 12.07 million tons of total nameplate capacity, the U.S. soda ash industry operated at 89% of that capacity. The U.S. soda ash industry in 1997 was composed of six companies; five in Wyoming produced soda ash from underground trona ore, and one in California produced soda ash from sodium carbonate-rich brines. Many foreign synthetic soda ash producers and consumers have now become advocates of having a presence in the U.S. natural soda ash industry. Foreign investment in U.S. soda ash operations has risen from 10% of capacity in 1981, when Société Nationale Elf Aquitaine of France bought Texasgulf Chemical Co., to 51% in 1997. All of the six U.S. companies have either Australian, Belgian, French, South Korean, or Japanese partners. Since the beginning of the European producers' acquisitions of or partnerships in some of the U.S. facilities (Société Nationale Elf Aquitaine of France owning 100% of Tg Soda Ash and Solvay S.A. of Belgium owning 80% of Solvay Minerals Co.), the international competitive situation had begun to change. Approximately 24% of the Wyoming soda ash production capacity is European-owned as of 1997 (Tg Soda Ash with 1.18 million

metric tons and Solvay with 1.67 million tons); a decline from 35% in 1995 when Rhône-Poulenc S.A. of France sold its Wyoming soda ash facility to Oriental Chemical Industries of the Republic of South Korea. (See table 2.)

A total of 209,000 tons of soda ash equivalent was used to manufacture chemical caustic soda in 1997 by FMC, Solvay Minerals, and Tg Soda Ash. The total quantity of trona mined in Wyoming in 1997 was 17.1 million tons. (See table 7.)

Construction began on OCI Chemical Corp.'s soda ash expansion project that will raise total annual production capacity from 2.09 million tons (2.3 million short tons) to 2.81 million tons (3.1 million short tons). The 726,000-ton (800,000 short ton) expansion was being built by Kvaerner Metals' Davy nonferrous division for engineering and construction management for \$140 million. The project was scheduled for completion by December 1998 (Chemical Week, 1997b).

In December, IMC Global, Inc., announced that it would purchase the Harris Chemical Group, Harris' subsidiary Great Salt Lake Minerals, and Harris' Australian affiliate Penrice Soda Products Pty. Ltd. for \$450 million in cash and assume about \$950 million of debt. Harris Chemical, with annual sales of \$850 million, has operations in the United States, Australia, Canada, and Europe, and produces soda ash, sodium sulfate, sodium bicarbonate, boron chemicals, magnesium chloride, potash, and salt. Harris Chemical and Penrice combined have an annual capacity of 2.54 million tons, establishing it as the world's third largest soda ash producer (Chemical Market Reporter, 1997b). IMC Global, which produces phosphate, potash, and salt, has annual sales of about \$3 billion (IMC Global, 1997).

The 50th anniversary of the Wyoming soda ash industry was commemorated in 1997. In 1947, the Westvaco Chemical Corp., now known as FMC Corp., sunk its first mine shaft into the Green River Basin in Wyoming. Since then, about 200 million tons of trona has been produced from this mine and the four others that followed. The USGS organized and co-sponsored the First International Soda Ash Conference along with the U.S. Bureau of Land Management and the Wyoming Geological Survey. This was the first international conference dedicated exclusively to the geology, mining, processing, and marketing of sodium carbonate resources. The meeting was held in Rock Springs, WY, June 10-12, 1997, and was attended by more than 300 people from 15 nations.

Consumption

The USGS collects reported consumption data by end use quarterly from the marketing and sales departments of each company within the industry. Every effort has been made to categorize company sales with the intended end-use sector.

Quarterly reports are often revised in subsequent quarters because of customer reclassifications or other factors. Because all six U.S. soda ash companies respond to the quarterly survey, the data represents 100% of the total reported consumption data found in this report.

U.S. apparent consumption of soda ash was 6.67 million tons in 1997 whereas reported consumption was 6.48 million tons. Reported consumption data and apparent consumption data do not necessarily correspond because reported consumption data are based on actual sales whereas apparent consumption data are the calculated quantity available for domestic consumption based on balancing supplies (production, imports, and inventory adjustments) with external demand (exports). (*See table 3.*)

U.S. apparent consumption and reported consumption in 1997 initially varied by 340,000 tons, which was the largest variance since 1987 when reported consumption was first surveyed. The discrepancy between the two forms of consumption was partially attributed to disagreement between the sources of export data used to derive consumption statistics. The two sources were the Bureau of the Census, which reports exports upon departure from the U.S. ports, and the soda ash producers, which consider a shipment as exported when their export association, the American Natural Soda Ash Corp. (ANSAC), takes consignment of the product at California or Wyoming plant sites. Transit times between the plant and port, which can take about 2 to 3 weeks before the cargo is actually exported, and carryover export inventories contribute to the discrepancy between reported and apparent consumption as well. The biggest reason for the discrepancy was that several export transactions were missing from Bureau of the Census data. Using export statistics from the Journal of Commerce's Port Import-Export Reporting Service, an additional 159,000 tons of soda ash exports were located. After adjustments to the export record were made, the difference between apparent consumption and reported consumption was reduced to 180,000 tons, a part of which may be attributed to rail shipment delays to Mexico.

The distribution of soda ash by end use in 1997 was glass, 49%; chemicals, 26%; soap and detergents, 12%; distributors, 5%; flue gas desulfurization, 3%; pulp and paper and miscellaneous, 2% each; and water treatment, 1%.

Glass.—Glass manufacture represented about 49% of domestic soda ash consumption, with the container sector comprising 49%; flat, 35%; and specialty and fiber, 8% each. According to Bureau of the Census data, production of glass containers declined from 8.88 million tons (9.79 million short tons) in 1996 to 8.73 million tons (9.62 million short tons) in 1997, primarily because of the beverage sector which continued to decline because more soft drinks were packaged in plastic containers than glass bottles. Production of glass containers for the beer industry increased 1.9% in 1997 from 3.66 million tons to 3.72 million tons.

The glass recycling rate in 1997 remained the same at about 38%, of which postconsumer cullet was estimated at 24% of this rate with the remainder being in-house scrap. Some municipalities have started to terminate their glass collection programs because the price of clean, sorted cullet has declined, thereby making it less attractive to recyclers. Another reason is that breakage during collection has affected the quality of material

sold to glass container manufacturers.

Chemicals.—Soda ash is used to manufacture many sodium-base inorganic chemicals, including sodium bicarbonate, sodium chromates, sodium phosphates, and sodium silicates.

According to data from the Bureau of the Census, production of sodium bicarbonate increased from 440,000 tons in 1996 to 473,000 tons in 1997. The estimated end-use distribution for sodium bicarbonate consumption was household products, 30%; animal feed, 20%; food and beverages, 17%; chemicals, 12%; pharmaceuticals, 8%; fire extinguishers, 3%; and miscellaneous, 10%. Combined capacity for the domestic sodium bicarbonate industry in 1997 was 597,000 tons. The distribution of capacity by producer was Church & Dwight Co., 390,000 tons; Rhône-Poulenc Basic Chemicals Co., 65,000 tons; FMC Corp., 64,000 tons; North American Chemical Co., 64,000 tons; and Natrium Products, 14,000 tons (Chemical Market Reporter, 1997d).

Sodium phosphates are another important sector of the chemical industry that uses soda ash. There are several sodium phosphate-bearing compounds; unfortunately, most of the data that are available are withheld by the Bureau of the Census because of the number of respondents required to publish statistics. However, an estimate of the distribution of industrial phosphates by end use is detergent builders and cleaners, 44%; miscellaneous, 26%; food and beverage, 19%; metal treatment, 6%; and water treatment, 5%. Market conditions for sodium phosphates began to improve by yearend 1996 and were expected to continue to rise 1997 and 1998.

Soaps and Detergents.—Detergents is the third largest use of soda ash. Soda ash is used as a builder to emulsify oil stains, reduce the redeposition of dirt during washing and rinsing, provide alkalinity for cleaning, and soften laundry water. In addition, soda ash is a component of sodium tripolyphosphate, another major builder in detergent formulations, but soda ash consumption has been decreasing because phosphatic detergents can contribute to the environmental problems of eutrophication. Many regions of the nation have adopted phosphate limitations or bans. These areas represented about 40% of the U.S. population; however, after more than a decade of declining use, sales of sodium tripolyphosphate-base detergents are increasing in South America.

In response to the environmental issue, detergent manufacturers began reformulating their detergents to make compact and superconcentrated products. These reformulations require sodium silicates and synthetic zeolites, which are made from soda ash. Liquid detergents, which do not contain any soda ash, compete with powdered detergents and command 49% of the household laundry detergent market in 1997, up from only 15% in 1978.

High-energy (HE) washing machines that have been used in Europe have started to be introduced into the United States. These machines use less water and require highly soluble detergents that do not redeposit soil on clothes. Detergent builders, such as sodium tripolyphosphate and soda ash, are preferred in the HE machines because they have high absorption rates that can retain the ingredients necessary to increase solubility and dissolution rates (Chemical Week, 1997c).

Stocks

Yearend stocks of dense soda ash in domestic plant silos, warehouses, terminals, and on teamtracks amounted to 271,000 tons. Producers indicate that a potential supply problem could exist when inventories fall below 180,000 tons. Most consumers of soda ash do not have storage facilities to accommodate large quantities of soda ash and must rely on suppliers to provide the material on a timely basis.

Transportation

The merger between the Union Pacific and the Southern Pacific railroads in 1996 resulted in major service disruptions in the western United States in 1997 that affected soda ash deliveries in the fourth quarter of the year. In certain areas of the country, and all over the United States especially in the Gulf Coast region, congested rail lines caused extended transit times for shipments that lead to unpredictable return times for rail cars. This affected many other commodities more severely than it did soda ash. The problem was estimated to continue well into 1998 (Chemical and Engineering News, 1997a).

Prices

About 39% of U.S. soda ash production is exported with the remainder for domestic consumption. In the domestic market, the large volume buyers of soda ash are primarily the major glass container manufacturers, whose purchases are seasonal (more beverage containers made in second and third quarters for summertime beverage consumption). Soda ash sales to the flat glass sector are usually dependent on the state of the economy because the largest use of flat glass is in automobile manufacture and residential housing and commercial building construction. These two major industrial sectors are especially sensitive to changing economic conditions. If construction starts and automobile sales are up, soda ash sales will proportionally follow.

The average annual value for bulk, dense natural soda ash, f.o.b. Green River, WY, and Searles Valley, CA, was \$85.15 per ton (\$77.25 per short ton), which was a 6% decrease over that of 1996. The value is not a "price;" it is the value of the combined revenue of California and Wyoming bulk dense soda ash sold on an f.o.b. plant basis at list, spot, or discount prices, on long-term contracts, and for export, divided by the quantity of soda ash sold. The list prices quoted in trade journals or by producers differ from the annual average values reported to and by the USGS. This value may or may not correspond to the posted list prices. The list price for Wyoming bulk, dense soda ash was raised effective July 1, 1995, or as contracts permit, to \$105 per short ton from \$98 per short ton. The California price for the comparable product also increased by \$7 per ton; from \$123 per short ton to \$130 per short ton. (See table 4.)

Effective October 1, 1997, FMC Corp., increased its off-list price for soda ash by \$8 per ton on all grades of soda ash. Solvay followed next with most of the other producers following; however, the price increase attempt was unsuccessful because of the decline in domestic demand by yearend (Chemical Market

Reporter, 1997c).

Foreign Trade

U.S. soda ash exports increased 9% in 1997 to 4.19 million tons, which was a record. U.S. exports to 48 countries, on a regional basis, were as follows: Asia, 47%; South America, 18%; North America, 17%; Europe, 7%; the Middle East, 4%; Africa and Oceania, 3% each; and Central America, 1%. Shipments to the Caribbean were negligible. The average "free alongside ship" value was \$130.55 per ton in 1997 compared with \$132.29 per ton in 1996. The top 10 countries that represented 67% of total U.S. soda ash exports were, in decreasing order and percent of total, Mexico (11%), Japan (10%), Indonesia (9%), the Republic of Korea (7%), Thailand (7%), Canada (6%), Taiwan (5%), Brazil (5%), Chile (4%), and Malaysia (3%). (See tables 5 and 6.)

Preliminary analysis of reported consumption and reported consumption data indicated that there was a discrepancy of nearly 340,000 tons, primarily because of differing export data. Based on industry sources and data from the Journal of Commerce's Port Import-Export Reporting Service, U.S. soda ash exports in 1997 were under reported to the U.S. Bureau of the Census. Several missing entries were noted for the customs districts of San Diego, CA; Portland, OR; and Longview, WA. The following are 12 additional major export transactions that should be included in the final 1997 export statistics. Export f.a.s. values were estimated based on similar transactions to those countries through the same ports near that time period. The additional entries are: Belgium, 15,363 tons through San Diego, CA, in January by ANSAC for \$1,351,000; Brazil, 8,040 tons through Longview, WA, in October by ANSAC for \$1,039,000 and 8,035 tons through Portland, OR, in October by ANSAC at \$1,039,000; Poland, 15,018 tons through San Diego, CA, in July by ANSAC at \$1,352,000; South Africa, 23,580 tons through San Diego, CA, in July by ANSAC at \$2,924,000; Thailand, 16,765 tons through San Diego, CA, in August by ANSAC at \$2,453,000 and 17,806 tons through San Diego, CA, in December by Asahi Glass at \$2,434,000; and Venezuela, 14,476 tons through San Diego, CA, in January by ANSAC at \$2,453,000; 12,082 tons through San Diego, CA, in September by ANSAC at \$1,329,000; 3,980 tons through San Diego, CA, in September by FMC at \$437,800; 4,000 tons through San Diego, CA, in October by FMC at \$440,000; and 20,050 tons through San Diego, CA, in October by ANSAC at \$2,206,000. Total revisions amounted to an additional 159,195 tons, with an estimated f.a.s. value of \$19,457,800.

Solvay S.A. reversed its position in April in the antidumping investigation by the European Commission, which is the administrative section of the European Union (EU), by withdrawing its support for the renewal of the duties on imports of U.S. soda ash. The antitrust authority in the Italian government contended that Solvay controlled about 80% of the Italian soda ash market because it owned and operated a soda ash plant at Rosignano, Italy, and imported about 8% of its demand requirements from Bulgaria, which had just sold a 60%-share of its soda ash industry to Solvay. With its Bulgarian acquisition and partnership with Sisecam, the Turkish soda ash producer,

Solvay now had access to new markets in the Mideast, Turkey, the Persian Gulf, and Central Asia and, therefore, agreed to a compromise and dropped its support for imposing the antidumping duties (Chemical Week, 1997d). Although Akzo Nobel and Harris Chemical withdrew their support earlier in the year, Brunner Mond, Europe's second largest soda ash producer, and Sodawerk Strassfurt opposed Solvay's action and sought to continue the investigation and have duties levied. Without Solvay's support, it was unlikely the duties would remain in place. On October 21, 1997, the European Chemical Industry Council issued a statement based on the EU Commission's October 15 decision that removed the definitive antidumping duties on imports of U.S. soda ash into the EU. The duties had been in place since October 1995 (European Chemical Industry Council, 1997).

Although the United States exported 284,000 tons of soda ash to Europe in 1997, the material was not subject to the antidumping duties because there is a provision in the legislation that permits soda ash to enter duty free as long as that quantity is incorporated into products (such as glass) of total comparable contained weight that are exported by that country. Therefore, there is no effect on the European market and no injury to the European soda ash producers.

The Indian Monopolies and Restrictive Trade Practices Commission (MRTPC) that received a complaint in 1996 by the Alkali Manufacturers Association of India, which represents all the domestic soda ash producers, formally declared in June 1997 that ANSAC was a cartel and would be enjoined from shipping to India. The Commission determined that ANSAC violated the provisions of the country's restrictive trade practices laws and further shipping by them allegedly would adversely affect Indian soda ash production and result in the ultimate closure of facilities and large-scale unemployment. ANSAC appealed to the Supreme Court in India on August 5, requesting that the Court overturn the order from the MRTPC (European Chemical News, 1997a). ANSAC had the support of the All India Glass Manufacturing Federation, which contended that the Indian soda ash producers acted as a monopoly to collectively increase soda ash prices (Industrial Minerals, 1997b).

World Review

The largest consumers of soda ash tend to be the developed nations; however, these countries also usually have lower growth rates compared with developing countries that have greater demands for consumer products. Although the production and consumption quantities vary among the countries, the end-use patterns are basically the same (e.g., glass, chemicals, and detergents are the major sectors). Although the United States is the largest soda ash-producing country in the world, foreign ownership in the U.S. soda ash industry is presently 51% of nameplate capacity. (See table 8.)

Nine countries have the capacity to produce more than 1 million tons annually. They are, in descending order, the United States, China, Russia, India, Germany, France, Japan, Poland, and the United Kingdom. Bulgaria, Romania, and the Ukraine have production installations that had been rated at about 1

million tons; however, adverse economic conditions have caused these nations to produce below their design capacities. Recent acquisitions or joint ventures with major European soda ash producers having soda ash manufacturing expertise should reverse this situation in the next few years. Most of these soda ash-producing countries have large populations that require consumer products made with soda ash. The lesser developed nations tend to have greater soda ash demand and higher rates of growth as soda ash-consuming industries are developed. In 1997, world soda ash production was estimated at 32.1 million tons, which was a 4% increase over that of 1996.

Brazil.—The dumping investigation against the United States, Bulgaria, Poland, Romania, and Spain that began in September 1996 continued through 1997. The sole soda ash producer in Brazil, Companhia Nacional de Alcalis, alleged that soda ash imports from the United States was sold below normal values, thereby causing financial hardships to the company. The investigation continued into 1998.

Bulgaria.—The Bulgarian State-owned company, Sodi Devnya, that offered a 60% share of its 1.2 million-ton-per-year soda ash operation for sale in 1996 was finally sold in January to Solvay S.A., for \$160 million and a pledge to invest an additional \$67 million during the next 5 years. In April, Solvay announced it would share part of its 60% ownership with the Turkish company Sisecam, which is a soda ash producer and glass manufacturer. Both companies would work under a production-sharing agreement that would allow each company to market its own product rather than a full joint-venture partnership. Solvay's 60% share of Sodi Devnya will be held by a holding company made up of Solvay (75%) and the European Bank for Reconstruction and Development (25%). Sisecam would acquire 25% of Solvay's 75% share, or about 19% of the total transaction and 11% of the plant in total (Industrial Minerals, 1997c). This acquisition and arrangement with Sisecam caused Solvay to drop its support for imposing antidumping duties on imported U.S. soda ash by the EU Commission (Chemical Week, 1997d).

Germany.—Solvay S.A. of Belgium announced plans to increase capacity for dense soda ash production by constructing a second densification unit at its Bernburg site for \$9.5 million. The first unit was built in 1991 and has an annual capacity of 360,000 tons; the second unit will be rated at 540,000 tons, and is scheduled to be on-stream in October 1998 (Chemical and Engineering News, 1997b).

Indonesia.—State-owned PT Pupuk Kaltim announced plans to construct a \$200 million ammonium nitrate plant and increase capacity of a soda ash plant under construction. The soda ash plant was designed to produce 150,000 tons of soda ash annually; however, the expansion was expanded to meet the local soda ash demand of approximately 400,000 tons per year (Chemical Week, 1997a).

Japan.—Following the closure of Tosoh's synthetic soda ash plant in 1996, Asahi Chemical Co., closed its synthetic soda ash plant at Chiba in September 1997. The plant had a capacity of about 200,000 tons per year (European Chemical News, 1997d).

Netherlands.—Brunner Mond PLC acquired the synthetic soda ash facility in Delfzijl from Akzo Nobel in December. The addition of the Delfzijl plant, which has an annual capacity of

375,000 tons, increased Brunner Mond's total world capacity to 1.7 million tons and firmly placed the company as Europe's second largest soda ash producer (Chemical Market Reporter, 1997a). Akzo had been searching for either a partner or a buyer for its soda ash business since 1994, when the facility was almost sold to Rhone-Poulenc (European Chemical News, 1997b).

United Kingdom.—Because of increased demand for sodium bicarbonate for food-grade and technical-grade product, Brunner Mond PLC commissioned its sodium bicarbonate plant by its Winnington, England, soda ash facility in June. The additional capacity increased output by 25% to 30%, or about 20,000 tons annually, to a total of 100,000 tons for the installation (Industrial Minerals, 1997a). The expansion will make the facility among the largest plants in Europe. Brunner Mond's Lostock facility is slated to have its low-chloride soda ash plant onstream in the third quarter of 1998. For some uses, soda ash with a low-sodium chloride content is preferred over that of traditional synthetic soda ash (European Chemical News, 1997c).

Outlook

The economic problems in Asia that began in late 1997 will have a direct impact on U.S. soda ash exports. It is estimated that exports to Asia in 1998 will be about 300,000 tons to 400,000 tons less than that of 1997. With the scheduled completion by mid-1998 of at least one major flat glass manufacturing facility in Brazil, U.S. soda ash producers are hopeful that the South American market will remain strong and partially offset any loss to the Asian sector.

The domestic railroad problem was expected to continue through the first quarter of 1998 causing further delays in soda ash deliveries to several customers, especially to those in Mexico. Many railcars remain stranded near the Mexican border awaiting transit.

Several analysts within the soda ash industry shared the opinion that there is excess soda ash production capacity in the world that has adversely affected prices worldwide. One method to counter the problem with excess capacity is through consolidations within the world soda ash industry. This effort began in 1997 with the acquisition of Akzo Nobel's small soda ash plant by Brunner Mond, and this trend will continue in 1998 as smaller producers merge with larger soda ash manufacturers with some smaller plants being closed to reduce overall capacity.

Domestic soda ash consumption will probably increase in 1998 as FMC increases its shipments of soda ash to DuPont's titanium dioxide plant in Tennessee. About 230,000 tons of soda ash will be required annually for this use. Domestic apparent consumption for 1997 is forecast at 6.6 million tons.

A competitor to certain glass container products is emerging that has the potential to further decrease soda ash consumption in glass container manufacture the way polyethylene terephthalate (PET) did in the early 1980's. A new plastic, polyethylene naphthalate (PEN), has been introduced and test-marketed in

parts of the world that would compete in packaging markets where PET plastic has not been suitable and glass remained the packaging product of choice. PEN's high performance properties make it ideal for hot filled products (i.e. jams, jellies, vegetables, and pet and baby foods) and in beverage containers (i.e., carbonated sodas, beers, and wines) where enhanced oxygen and carbon dioxide resistance is required. It also screens ultraviolet light to extend the product's shelf life and preserve the drink's natural flavors. Although PEN was first synthesized in 1945, it has only been commercially available since 1990 but its feedstock, 2, 6-naphthalene dicarboxylic acid (NDC), was expensive and in short supply.

Amoco Chemical Co. brought on-stream the nation's only NDC manufacturing plant in early 1996 but only operated at about one-half of its full design capacity of 27,000 tons per year. The facility is scheduled to operate at full capacity by early 1998, which should make NDC more affordable and available for PEN manufacture. Within the next decade, PEN is forecast to displace glass in some of the glass container sectors, especially the food jar, beverage, beer, and wine categories.

Domestic soda ash is expected to grow between 1.0% to 1.5% per year, while world demand is forecast at 2.0% to 3% annually for the next several years. The majority of the increase in soda ash consumption will be in Asia and South America.

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TABLE 1
SALIENT SODA ASH STATISTICS 1/

(Thousand metric tons and thousand dollars)

	1993	1994	1995	1996	1997
United States:					
Production 2/	8,960	9,320	10,100	10,200	10,700
Value 2/	\$734,000	\$724,000	\$829,000	\$926,000	\$915,000
Value, average annual:					
Per short ton	\$74.34	\$70.44	\$74.50	\$82.60	\$77.25
Per metric ton	\$81.95	\$77.65	\$82.12	\$91.05	\$85.15
Production, Wyoming trona	14,500	14,600	16,500	16,300	17,100
Exports	2,800	3,230	3,570	3,840	4,190
Value	\$376,000	\$406,000	\$445,000	\$508,000	\$547,000
Imports for consumption	89	79	83	107	101
Value	\$17,100	\$12,100	\$12,000	\$14,700	\$13,400
Stocks, Dec. 31: Producers'	274	203	306	271	259
Consumption:					
Apparent	6,350	6,240	6,510	6,470	6,670
Reported	6,280	6,260	6,500	6,390	6,480
World: Production	29,500	29,500 r/	31,000 r/	30,900 r/	32,100 e/

e/ Estimated. r/ Revised.

1/ Data are rounded to three significant digits.

2/ Natural only, soda liquors and purge liquors converted to soda ash equivalent are as follows: 1993--85,100 tons; 1994--92,000 tons; 1995--105,000 tons; 1996 and 1997 withheld to avoid disclosing company proprietary data.

TABLE 2
U.S. PRODUCERS OF SODA ASH IN 1997

(Million short tons, unless otherwise noted)

Company	Plant nameplate capacity	Plant location	Source of sodium carbonate
FMC Wyoming Corp. 1/	3.55	Green River, WY	Underground trona.
General Chemical (Soda Ash) Partners 2/	2.40	do.	Do.
North American Chemical Co. 3/	1.45	Trona, CA	Dry lake brine.
OCI Chemical Corp. 4/	2.30	Green River, WY	Underground trona.
Solvay Minerals Inc. 5/	2.30	do.	Do.
Tg Soda Ash Inc. 6/	1.30	Granger, WY	Do.
Total	13.30		
Total	million metric tons	12.07	

1/ Formed joint venture (20%) in February 1996 with Sumitomo Corp. and Nippon Sheet Glass Co., Ltd., both of Japan.

2/ A joint venture between General Chemical Corp. (51%), Australian Consolidated Industries International (ACI-25%), and TOSOH Wyoming Inc. of Japan (24%), which purchased part of ACI's share in June 1992.

3/ Oriental Chemical Industries Co. Ltd. of Korea as a partner had 27% equity share, but was reduced to about 7% in 1993.

4/ Rhône-Poulenc of France sold its 51% share to Oriental Chemical Industries Co. Ltd. (OCI) of Korea on February 29, 1996; Union Pacific Resources Co. owns 49%.

5/ Solvay Soda Ash Joint Venture is owned by Solvay S.A. of Belgium (80%) and Asahi Glass Co. of Japan (20%), which became a partner in February 1990. Capacity increase of 272,000 tons (300,000 short tons) installed December 1995.

6/ Owned by Texasgulf Inc., subsidiary of Société Nationale Elf Aquitaine of France (100%).

TABLE 3
REPORTED CONSUMPTION OF SODA ASH IN THE UNITED STATES, BY END USE, BY QUARTERS 1/

(Metric tons)

SIC code	End use	1996 total	1997				Total
			First quarter	Second quarter	Third quarter	Fourth quarter	
32	Glass:						
3221	Container	1,550,000	378,000	384,000	388,000	384,000	1,530,000
3211	Flat	1,010,000	239,000	283,000	278,000	286,000	1,090,000
3296	Fiber	236,000	61,200	66,900	65,700	63,700	258,000
3229	Other	247,000	62,600	58,200	61,800	66,100	249,000
	Total	3,040,000	741,000	792,000	794,000	799,000	3,130,000
281	Chemicals	1,690,000	414,000	446,000	418,000	426,000	1,700,000
284	Soaps and detergents	785,000	191,000	192,000	183,000	184,000	750,000
26	Pulp and paper	183,000	33,700	34,600	35,700	38,800	143,000
2899	Water treatment 2/	86,500	20,300	20,700	21,500	20,600	83,100
	Fluegas desulfurization	152,000	43,500	40,700	55,400	54,700	194,000
	Distributors	314,000	85,800	81,000	76,900	81,600	325,000
	Other	145,000	50,900	46,500	30,700	31,300	159,000
	Imports 3/	107,000	27,000	26,200	25,400	22,000	101,000
	Total domestic consumption	6,390,000	1,580,000	1,650,000	1,620,000	1,640,000	6,480,000
	Exports 4/	3,930,000	975,000	1,110,000	1,100,000	1,180,000	4,380,000
	Canada	226,000	70,200	76,900	47,700	57,500	252,000
	Total industry sales 5/	10,300,000	2,550,000	2,770,000	2,720,000	2,820,000	10,900,000
	Total sales from plants	10,100,000	2,490,000	2,680,000	2,650,000	2,760,000	10,600,000
	Total production	10,200,000	2,540,000	2,750,000	2,670,000	2,780,000	10,700,000

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

2/ Includes soda ash equivalent from soda liquors and purge liquors sold to powerplant for water treatment. Sales of mine water are excluded.

3/ Data are from the Bureau of the Census and may vary from the quantity reported by the producer/importer. Actual imports are proprietary data but have been distributed into appropriate end-use categories and included in "Total domestic consumption."

4/ As reported by producers. Includes Canada. Data may not necessarily agree with that reported by the Bureau of the Census for the same periods.

5/ Represents soda ash from domestic origin (production and inventory changes) and imports and for exports. Includes soda ash sold by coproducers and distributed by purchasers into appropriate end-use categories.

TABLE 4
SODA ASH YEAREND PRICES

	1996	1997
Sodium carbonate (soda ash):		
Dense, 58%, Na ₂ O 100-pounds, paper bags, carlot, works, f.o.b.	per short ton \$153.00	\$153.00
Bulk, carlot, same basis tons	do. 105	105
Light 58%, 100-pounds, paper bags, carlot same basis	do. 158	158
Bulk, carlot, same basis tons	do. 110	110

Sources: Chemical Market Reporter. Current Prices of Chemicals and Related Materials, v. 251, no. 1, January 6, 1997, p. 28, and v. 253, no. 1, January 5, 1998, p. 28.

TABLE 5
REGIONAL DISTRIBUTION OF U.S. SODA ASH EXPORTS, BY CUSTOMS DISTRICTS, IN 1997 1/

(Metric tons)

Customs districts	North America	Central America	South America	Caribbean	Europe	Middle East	Africa	Asia	Oceania	Total	Percent of total
Atlantic:											
Baltimore, MD	--	--	--	--	165	--	--	--	--	165	--
Miami, FL	--	18	145	18	--	--	--	--	--	181	--
New York, NY	--	108	--	--	618	6	--	--	--	732	--
Norfolk, VA	--	--	--	--	1,090	--	--	--	--	1,090	--
Savannah, GA	--	--	--	--	53	--	--	--	--	53	--
Washington, DC	13	--	--	--	--	--	--	--	--	13	--
Gulf:											
Houston-Galveston, TX	--	384	93,900	11,300	8,940	4,220	--	--	--	119,000	3
New Orleans, LA	--	81	61	--	307	--	--	--	--	449	--
Port Arthur, TX	--	--	186,000	3,500	--	--	5,930	--	--	196,000	5
Pacific:											
Columbia-Snake River	--	21,300	376,000	--	260,000	171,000	52,900	1,760,000	93,600	2,740,000	65
Longview, WA	--	--	8,040	--	--	--	--	--	--	8,040	--
Los Angeles, CA	--	--	137	--	--	37	--	242	802	1,220	--
Portland, OR	--	--	8,040	--	--	--	--	--	--	8,040	--
San Diego, CA	5,890	5,830	93,400	--	31,100	--	48,700	204,000	10,000	398,000	9
San Francisco, CA	--	--	--	--	40	--	--	--	2,170	2,210	--
Seattle, WA	10,100	--	--	--	--	--	--	7,520	--	17,600	--
North Central:											
Chicago, IL	68	--	--	--	21	--	--	--	--	89	--
Cleveland, OH	89	--	--	--	--	--	--	--	--	89	--
Detroit, MI	160,000	--	--	--	480	--	--	--	--	161,000	4
Duluth, MN	180	--	--	--	--	--	--	--	--	180	--
Great Falls, MT	14,500	--	--	--	--	--	--	--	--	14,500	--
Pembina, ND	10,300	--	--	--	--	--	--	--	--	10,300	--
Northeast:											
Buffalo, NY	36,400	--	--	--	--	--	--	--	--	36,400	1
Ogdensburg, NY	4,310	--	--	--	--	--	--	--	--	4,310	--
St. Albans, VT	287	--	--	--	--	--	--	--	--	287	--
Southwest:											
Laredo, TX	462,000	--	--	--	--	--	--	--	--	462,000	11
Unknown:	12,200	--	--	--	--	--	--	--	--	12,200	--
Total	716,000	27,700	766,000	14,800	303,000	176,000	108,000	1,970,000	107,000	4,190,000	100
Percent of total	17	1	18	--	7	4	3	47	3	100	--

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

Source: Bureau of the Census as adjusted by the U.S. Geological Survey using trade data and information from the Journal of Commerce.

TABLE 6
U.S. EXPORTS OF SODA ASH, BY COUNTRY 1/

(Thousand metric tons)

Country	1996		1997		Country	1996		1997	
	Quantity	Value (thousands)	Quantity	Value (thousands)		Quantity	Value (thousands)	Quantity	Value (thousands)
Argentina	92	\$13,000	103	\$14,500	Malaysia	76	\$11,500	121	\$18,000
Australia	56	6,610	81	10,100	Mexico	367	39,600	468	54,000
Belgium	72	10,200	74	8,250	New Zealand	19	2,210	26	2,910
Bolivia	6	1,050	6	972	Nigeria	5	500	6	598
Brazil	209	27,300	199	26,500	Panama	4	580	2	304
Canada	236	21,800	248	23,000	Peru	24	3,920	26	4,190
Chile	123	17,000	156	21,600	Philippines	94	13,200	102	14,200
China	45	6,210	105	13,700	Poland	15	1,430	15	1,350
Colombia	98	14,200	96	14,400	Saudi Arabia	134	14,000	123	12,400
Costa Rica	4	617	8	1,220	Singapore	17	2,340	12	1,620
Croatia	34	3,310	32	3,100	South Africa	164	22,200	102	12,800
Dominican Republic	4	710	4	645	Spain	78	8,050	64	6,410
Ecuador	6	816	10	1,660	Taiwan	182	26,200	208	28,900
El Salvador	3	438	2	339	Thailand	285	41,300	283	40,500
France	--	--	82	8,870	Trinidad and Tobago	7	1,510	6	873
Germany	1	104	(2/)	(2/)	Turkey	19	1,970	19	1,880
Guatemala	15	2,320	16	2,410	United Arab Emirates	10	1,020	20	2,030
India	23	2,060	--	--	United Kingdom	(2/)	(2/)	16	1,870
Indonesia	414	59,700	396	57,000	Uruguay	2	344	3	406
Ireland	2	220	1	64	Venezuela	227	36,000	167	26,500
Israel	23	2,790	32	3,620	Vietnam	--	--	5	711
Jamaica	4	693	5	899	Other 3/	1	187	1	170
Japan	327	43,200	435	56,200	Total	3,840	508,000	4,190	547,000
Korea, Republic of	311	45,900	306	45,300					

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

2/ Less than 1/2 unit, included with "Other."

3/ Includes Ghana (1996), Honduras (1996), Hong Kong, the Netherlands, Russia, Suriname (1997), Sweden (1996), and Uzbekistan (1996).

Source: Bureau of the Census, as adjusted by the U.S. Geological Survey, using Journal of Commerce trade data and information.

TABLE 7
U. S. PRODUCTION OF SODIUM COMPOUNDS, BY MONTH 1/

(Metric tons)

	1996			1997		
	Soda ash	Caustic soda 2/	Wyoming trona 3/	Soda ash	Caustic soda 2/	Wyoming trona 3/
January	762,000	14,000	1,480,000	866,000	19,500	1,460,000
February	814,000	17,000	1,360,000	766,000	19,200	1,270,000
March	789,000	18,900	1,360,000	912,000	19,100	1,530,000
April	855,000	16,900	1,320,000	837,000	14,700	1,480,000
May	876,000	17,600	1,370,000	937,000	13,900	1,550,000
June	885,000	20,400	1,250,000	971,000	17,200	1,440,000
July	850,000	20,000	1,430,000	912,000	20,800	1,290,000
August	847,000	17,600	1,320,000	896,000	16,800	1,460,000
September	857,000	22,000	1,350,000	862,000	20,100	1,370,000
October	909,000	20,400	1,460,000	936,000	17,000	1,300,000
November	859,000	18,900	1,270,000	908,000	17,700	1,460,000
December	866,000	18,500	1,330,000	940,000	13,200	1,520,000
Total	10,200,000	222,000	16,300,000	10,700,000	209,000	17,100,000

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

2/ As soda ash equivalent.

3/ Includes solution mined trona.

TABLE 8
SODA ASH: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Thousand metric tons)

Country	1993	1994	1995	1996	1997 e/
Australia e/	300	300	300	300	300
Austria e/	150	150	200	200	150
Belgium e/ 3/	300	--	--	--	--
Bosnia and Herzegovina e/	20	15	15	15	15
Botswana	126	174	202	119 r/	170
Brazil e/	200	200	200	200	200
Bulgaria	259	451 r/	796 r/	800 r/	800
Canada e/	305	300	300	300	300
China e/	5,270	5,680	5,820	6,390	7,000
Colombia e/ 4/	121	--	--	--	--
Egypt e/	51	51	51	51	51
France	1,222	1,123	1,120 e/	1,100 e/	1,000
Germany	1,586	1,380	1,400 e/	1,400 e/	1,400
India e/	1,500	1,500	1,500	1,500	1,500
Italy e/	500	500	500	500	500
Japan	1,056	1,050	1,049	926 r/	820
Kenya 5/	145	226	218	223 r/ e/	220
Korea, Republic of e/	310	310	310	320	320
Mexico e/	440 6/	290	290	290	290
Netherlands e/	400	400	400	400	400
Pakistan	186	185	200 r/ e/	215 r/	220
Poland	815	997	1,019	909 r/ e/	950
Portugal e/	150	150	150	150	150
Romania	371	449	504 r/	500 r/ e/	500
Russia	1,992	1,585	1,823	1,500 r/ e/	1,700
Spain e/	500	500	500	500	500
Taiwan	89	128	128	128 e/	128
Turkey e/	385	385	385	400 r/	400
Ukraine e/	800	660	475	375 r/	367 7/
United Kingdom e/	1,000	1,000	1,000	1,000	1,000
United States 5/	8,960	9,320	10,100	10,200	10,700 7/
Total	29,500	29,500 r/	31,000 r/	30,900 r/	32,100

e/ Estimated. r/ Revised.

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 April 21, 1998. Synthetic unless otherwise specified.

3/ Plant at Couillet closed by yearend 1993.

4/ Plant closed in 1993.

5/ Natural only.

6/ Includes natural and synthetic. Estimated production of natural soda ash for 1993 was 160,000 metric tons. Natural soda ash operation closed in August 1993.

7/ Reported figure.