SODA ASH

By Dennis S. Kostick

Soda ash, also known as sodium carbonate, is an inorganic chemical that is produced from the mineral trona or sodium carbonate-bearing brines, or from the reaction of primarily salt and limestone in a chemical reaction. This commodity is used in many familiar household products, such as glass, soaps and detergents, paper, textiles, and foods. The United States has the world's largest deposit of trona and represents about one-third of total world soda ash output.

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. Soda ash and the various consumer products it is incorporated into, contribute substantially to the gross domestic product of the United States.

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.)*

The U.S. soda ash industry in 1996 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 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 1996. 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 1996 (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 Korea.

The capacity expansion project between FMC Wyoming Corp. and its partners Nippon Sheet Glass Co., Ltd. and Sumitomo Corp., both of Japan, came on-stream in May that added 635,000 tons (700,000 short tons) of capacity to FMC's existing 2.59 million tons (2.85 million short tons) of capacity (Industrial Minerals, 1996a). The new process takes spent mine tailings in a slurry of soda liquors, which normally were discharged to surface tailing ponds, and injects them underground where the solutions migrate downslope to a natural depression in the mine that acts as a collection sump. The solution becomes enriched in sodium carbonate as it dissolves trona in the floor and pillars in abandoned sections of the mine. The solution is recovered and pumped to the surface and becomes feedstock for the soda ash refinery. The process reportedly will reduce production costs by 30% to 40%. Approximately 210,000 tons of soda ash from the new expansion was schedule to be used in FMC's project with DuPont. Iron chloride and hydrochloric acid wastes at DuPont's New Johnsonville, TN, titanium dioxide plant were to be treated with soda ash to produce iron carbonate and about 200,000 tons of food-grade salt, which will be marketed by North American Salt Co. The project was to come on-stream in mid-1996; however, the startup was delayed because of "normal startup issues," according to company officials. (Chemical Market Reporter, 1996a).

After Solvay Minerals Inc., brought on-stream its 272,000-ton expansion in late 1995, it announced a three-phase $170 million project to add another 1.09 million tons of capacity beginning in 1999 with the third phase to be finished by 2003 (Chemical Market Reporter, 1996b). This would increase its present annual nameplate capacity from 2.09 million tons to 3.18 million tons, making Solvay the second-largest soda ash facility in Wyoming after FMC. Part of Solvay's new capacity will be to replace that lost because of closure of the synthetic soda ash plant in Chiba, Japan, by its joint-venture partner, Asahi Glass Co. The Chiba facility was scheduled to shut down by September 1997.

In early 1996, Rhône-Poulenc S.A. of France sold its U.S. affiliate, Rhône-Poulenc Basic Chemicals Co., for $150 million to Oriental Chemical Industries Co., Ltd., (OCI) of the Republic of Korea. The sale was for the 51% share of the Wyoming soda ash plant; the remaining 49% owned by Union Pacific Resources Co. was unaffected. The sale did not include Rhône-Poulenc's sodium bicarbonate business in Chicago Heights, IL. OCI, which also operates a synthetic soda ash plant in Inchon and has a reported 7% share in North American Chemical Co.'s Searles Lake operation, announced plans to raise capacity at its Wyoming facility by 725,000 tons to 907,000 tons (800,000 short tons to 1 million short tons) per year by 1998 (Chemical Market Reporter, 1996c). The cost of the expansion project

was estimated at $150 million. Although it was not reported, the expansion may be replacement capacity if OCI decides to close its Inchon plant, which has an annual capacity of about 400,000 tons.

On November 21, 1996, Tg Soda Ash, Inc., announced the development of new process technology to produce soda ash from a solution-mined feedstock at its Granger, WY facility. The new technology will utilize dilute solutions from underground mine water and recycled liquors from the soda ash crystallizers. The solutions will collect in an underground mine "lake" for subsequent processing. The feedstock will be steam stripped in a new process to convert some of the sodium bicarbonate contained in the solution to sodium carbonate prior to crystallizing sodium carbonate decahydrate crystals. The process does not use any solvents such as caustic soda or other chemical agents to convert the sodium bicarbonate (The Rocket Miner, 1996).

U.S. production of natural soda ash from California and Wyoming in 1996 increased slightly to a record 10.2 million tons. Based on 12.07 million tons of total nameplate capacity, the U.S. soda ash industry operated at 85% of total nameplate capacity. Capacity utilization was lower in 1996 compared with that of 1995 because FMC's 635,000 tons of new expansion capacity that came on-stream in May was not fully utilized because of startup problems associated with DuPont's project that would have used about one-third of this quantity.

Cominco American Corp. and Vulcan Chemicals decided to sell Owens Lake Soda Ash Co., their joint-venture at Owens Lake in California. The company terminated plans to construct a 544,000-ton-per-year (600,000 short tons) soda ash facility in 1995 because of delays in obtaining an environmental permit. Several companies evaluated the assets of the project but no buyer was found by yearend (Industrial Minerals, 1996b).

North American Chemical Co.'s subsidiary, White River Nahcolite Minerals, announced plans on June 11 to expand its natural sodium bicarbonate facility near Rifle, CO, by 90,700 tons (100,000 short tons) (North American Minerals News, 1996). The present capacity is 96,200 tons (106,000 short tons). Another nahcolite company, AmerAlia Inc., completed core hole drilling at its Rock School Lease in the Piceance Creek Basin of Colorado. Three nearly horizontal beds of nahcolite were located having an average nahcolite content of 26.5% with a thickness of 510 feet at a depth of 2,020 feet. The company plans to construct a sodium bicarbonate plant by the fall of 1997 with an initial capacity of 45,400 tons (50,000 short tons) (Chemical Market Reporter, 1996d).

A total of 222,000 tons of soda ash equivalent was used to manufacture chemical caustic soda by FMC, Solvay Minerals, and Tg Soda Ash. The total quantity of trona mined in Wyoming in 1996 was 16.3 million tons. *(See table 7.)*

Legislation and Government Programs

Soda ash mined on Federal lands is subject to the Mineral Leasing Act of 1920, which provides royalty payments to the United States Government. In Wyoming, the trona deposit within the Known Sodium Leasing Area is under the jurisdiction of the U.S. Government (administered by the Bureau of Land Management [BLM]), the State, and the Union Pacific Railroad, which was given alternate 0.6-square-kilometer sections (1-square-mile) north and south of the railway it constructed in the 1860's. Of the almost 370,000 hectares (915,000 acres) of total sodium mineral estate, the Federal ownership is 55.7%, Union Pacific, 38.1%; and the State, 6.2%. Sixteen lessees hold 53 active and inactive Federal leases having a total of 75,783 acres. In order to prevent a possible land monopoly, no lessee may hold more than 6,216 hectares (15,360 acres) of Federal land, but may lease more private or State land. The State royalty rate is tied to the Federal rate, which was 5%; however, the private royalty rate varies. One-half of all Federal royalties collected by the Minerals Management Service is disbursed to the Wyoming Government for various State and local programs. A Federal lease is issued for an initial period of 20 years, with 10 year discretionary renewals thereafter.

On February 22, 1996, the Assistant Secretary-Land and Minerals of the U.S. Department of the Interior signed the policy that increased the Federal royalty rate from 5% to 6% for renewed leases and from 5% to 8% for new leases. This resulted in 5 Federal leases remaining at 5% until they are up for renewal, 49 leases at 6%, and 10 leases at 8%. The Federal royalty is based on the quantity of the output of the sodium compounds and other related products at the point of shipment to market. Each Federal lease also has other costs, such as bonds, acreage rental fees, sodium prospecting permit application fees, and permit bonds.

On May 1, 1996, three Federal tracts totaling 1,036 hectares (2,560 acres) that had 88.9 million tons (97.9 million short tons) of trona were offered for lease by the BLM. Two bids met or exceeded the presale estimate of fair market value and were accepted; the third was rejected because it failed to meet fair market value. On September 26, eight more tracts totaling 4,522 hectares (11,174 acres) containing 461 million tons (508 million short tons) were offered for lease. Six bids met or exceeded fair market value estimates and were accepted, generating $10.8 million in bonus bids, of which one-half goes to the State of Wyoming.

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. 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 1996 varied by only 80,000 tons. The discrepancy between the two forms of consumption was 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 (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 distribution of soda ash by end use in 1996 was glass, 48%; chemicals, 27%; soap and detergents, 12%; distributors, 5%; pulp and paper, 3%; flue gas desulfurization and miscellaneous, 2% each, and water treatment, 1%.

Glass.—Glass manufacture represented about 48% of domestic soda ash consumption, with the container sector comprising 51%; flat, 33%; and specialty and fiber, 8% each. According to Bureau of the Census data, production of glass containers declined from 9.71 million tons (10.70 million short tons) in 1995 to 8.82 million tons (9.72 million short tons) in 1996, primarily because of the beverage sector which continued to decline because more soft drinks were packaged in plastic containers than glass bottles. Glass containers for the beer industry increased from 38% of total container glass in 1995 to 43% in 1996. Glass for the wine bottling industry rose from 10% to 12% during the same time period.

The glass recycling rate remained the same at about 37%, of which postconsumer cullet was estimated at 24% of this rate with the remainder being in-house scrap. Some municipalities have started to terminate 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.

Based on Bureau of the Census data with between 11% to 19% of the data being estimated, flat glass production decreased about 1.5% which contradicts the 3% increase noted from the soda ash end-use survey. Guardian Industries Corp. brought on-stream a new float glass plant at Dewitt, IA, in 1996 that will increase flat glass production and soda ash consumption in the future. The demand for window glass for automobiles and residential and commercial building construction has been increasing since 1990.

Anchor Glass Container Corp., which had been the second largest glass container manufacturer in the United States, was offered for sale by Vitro S.A. of Mexico, its parent corporation. Vitro reportedly needed capital because of depressed economic conditions in Mexico and the sagging glass container market within the United States. Vitro filed for bankruptcy protection and was negotiating to sell its assets, which were listed at $1.2 billion with liabilities of $951 million, to Ball-Foster Glass Container Co. for $365 million and the transfer of certain liabilities (Industrial Minerals, 1996c).

Chemicals.—Soda ash is used to manufacture many sodium-base inorganic chemicals, including sodium bicarbonate, sodium chromates, sodium phosphates, and sodium silicates. Part of the 2% increase in reported consumption of soda ash in the chemicals sector from 1995 to 1996 was because 222,000 tons of soda ash equivalent was consumed to produce liquid chemical caustic soda that was used in various downstream applications. Chemical caustic soda caters to certain Western markets that are fairly distant from electrolytic caustic soda plants. Although low-priced caustic soda has had a negative affect on soda ash sales, chemical caustic soda sales remain strong.

According to data from the Bureau of the Census, production of sodium bicarbonate increased from 418,000s ton in 1995 to 432,000 tons in 1996. 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%.

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 phospates by end use is detergent builders and cleaners, 44%; miscellaneous, 26%; food and beverage, 19%; metal treatment, 6%; and water treatment, 5% (Chemical Market Reporter, 1996e). Market conditions for sodium phosphates began to improve by yearend and were expected to continue to rebound in 1997 and 1998.

Demand for sodium silicates appeared strong in 1996 as producers ran at about 88% of capacity; however, some plants closed to consolidate and raise individual plant operating rates at other sites. About 1.15 million tons of sodium silicates were produced in 1996.

Sodium chromates, another important use for soda ash, remained flat during 1996 with little optimism for growth in the next few years. The industry has been adversely affected by legislation that restricted the quantity of chrome used in manufacturing industrial enamels, particularly medium chrome yellow that is used in traffic paints.

Soaps and Detergents.—Detergents are 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 may contribute to the environmental problem of eutrophication. Many regions of the nation have adopted phosphate detergent limitations or bans. These areas represent about 40% of the U.S. population. In response to the environmental issue, detergent manufacturers began reformulating 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 40% of the household laundry detergent market, up from only 15% in 1978. With the October 1 price increase announcement by the soda ash producers, detergent formulators threatened to convert back to caustic soda because its price had been declining since the third quarter (European Chemical News, 1996a).

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.

Prices

About 38% 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 $91.05 per ton ($82.60 per short ton), which was an 11% increase over that of 1995. 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, 1996, Solvay Minerals increased its off-list price for soda ash by $5 per ton, not to exceed the list price of $105 per ton in bulk and $153 per ton in 100-pound bags. Although many of the other producers followed, the price increase attempt was not successful by yearend (Chemical Market Reporter, 1996f).

Foreign Trade

U.S. soda ash exports increased 8% in 1996 to 3.84 million tons, which set another record. U.S. exports to 50 countries, on a regional basis, were as follows: Asia, 46%; South America, 21%; North America, 16%; Europe, 6%; Africa and the Middle East, 4% each; Oceania, 2%; Central America, 1%; and the Caribbean, negligible. The average "free alongside ship" value was $132.29 per ton in 1996 compared with $124.65 per ton in 1995. The top 10 countries that represented 71% of total U.S. soda ash exports were, in decreasing order, Indonesia, Mexico, Japan, the Republic of Korea, Thailand, Canada, Venezuela, Brazil, Taiwan, and the South Africa. *(See tables 5 and 6.)*

On July 13, the European Commission, which is the administrative section of the European Union (EU), was requested by FMC Wyoming Corp., General Chemical Corp., North American Chemical Co., and OCI Chemical Corp., to conduct an interim review of the antidumping duties imposed on the industry earlier. The four U.S. soda ash companies cited that the enlargement of the EU with the addition of Austria, Finland, and Sweden alters the basis for antidumping allegations (Chemical and Engineering News, 1996). European producers challenged the request stating that the three new countries account for only 5% of EU soda ash consumption. Furthermore, Austria and Finland previously had voted in favor of the antidumping duties. The four U.S. companies presently are subject to antidumping duties ranging from 2.5% to 8.9% as well as an import duty of 7.3%. European soda ash producers proposed raising prices that caused an intensive lobbying effort on behalf of the U.S. soda ash producers by European glass producers. Despite that the price increases were the first in 3 years, the glass industry petitioned the Commission to eliminate the antidumping duties on U.S. soda ash imports citing the European soda ash producers have improved their market position and no longer need import protection (Chemical Market Reporter, 1996g). The Commisson continued its investigation through the end of 1996 and may release its decision in 1997.

Although the United States exported 222,000 tons of soda ash to Europe in 1996, 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.

Despite a 30% import duty, ANSAC exported about 22,000 tons of soda ash in August to India that resulted in a protest by the Indian Monopolies and Restrictive Trade Practices Commission. The complaint was initiated by the Alkali Manufacturers Association of India, which represents all the domestic soda ash producers. The Commission determined that ANSAC violated the provisions of the country's restrictive trade practices laws and passed an order banning ANSAC, but not its individual members, from shipping to India (Industrial Minerals, 1996d). ANSAC also was involved in an antidumping suite by Brazil in September.

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). The United States is the largest soda ash-producing country in the world. *(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. 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.

Solvay S.A. of Belgium announced plans to expand soda ash production capacity at its plant in Rosignano, Italy, which will be increased to 1 million tons per year by 1998. Solvay recently completed capacity expansion in Torrelavega, Spain from 900,000 tons to 950,000 tons and in Povoa, Portugal from 180,000 tons to 230,000 tons. These increases raise Solvay's total European capacity to 4.2 million tons (Press Release - Solvay S.A., 1996).

Australia.—On April 1, 1996, D. George Harris and Associates purchased Penrice Soda Products Pty. Ltd., of Osborne. The purchase includes the synthetic soda ash plant with an annual capacity of 385,000 tons of soda ash and 24,000 tons of sodium bicarbonate, the solar salt facility of Penrice Saltfields Products at Dry Creek, and the limestone quarry of Penrice Quarry Products in Angaston. Although terms of the agreement were not disclosed by either party, the Australian press estimated the transaction at $81.5 million. Penrice had sales of $80 million in 1995 (Industrial Minerals, 1996e).

Bulgaria.—In an effort to raise $1 billion from the sale of some of its chemical, refining, and industrial enterprises, the Bulgarian State-owned company, Sodi Devnya, offered a 60% share of its 1.2-million-to-per-year soda ash operation for sale. Among the interested parties were Solvay S.A., LG Chemicals, Brunner Mond & Co., D. George Harris and Associates, General Chemical Corp., Anglovaal Ltd., and several Nordic and East European firms (Industrial Minerals, 1996f). General Chemical offered $160 million, which was $40 million higher than the second highest bid (European Chemical News, 1996b). By yearend, General Chemical reversed its decision to acquire the soda ash plant that allowed Solvay to become the apparent winner; however, a final decision was expected by February 28, 1997 (Chemical Market Reporter, 1996h).

Botswana.—Severe rains damaged the walls of the evaporation ponds and diluted the brines at the soda ash facility at Sua Pan of Botswana Ash, the successor company of the refinanced Soda Ash Botswana. A two-month stockpile of soda ash was available to meet the temporary demand by its customers. Production was reduced to about one-half of what had been produced but still far below its production capacity. The majority of the output had been marketed in South Africa, which began importing soda ash from ANSAC in the United States (Industrial Minerals, 1996g).

France.—Rhône-Poulenc S.A. announced a divestiture program to raise $1 billion to $1.5 billion to reduce the company's debt through selling its chemical commodity businesses, which included soda ash. As a result, Rhône-Poulenc sold its Wyoming natural soda ash operation to OCI of the Republic of Korea and its 600,000-ton-per-year synthetic soda ash plant in Nancy, France, which was managed by a wholly owned subsidiary of Rhône-Poulenc Chimie, Novacarb, to the Harris Chemical Group, which owned a natural soda ash plant in California, and synthetic soda ash plants in Australia and Germany. Harris Chemical will market the materia,l while Novacarb will continue to operate the plant through 1998, when Harris will acquire the entire operation (Chemical Market Reporter, 1996i; European Chemical News, 1996c).

Japan.—Tosoh Corp. of Japan closed its 320,000-ton plant in Shinnanyo, Yamaguchi Prefecture, in September 1996 and imported soda ash from its U.S. joint-venture operation in Wyoming. Tosoh Wyoming Inc. owns 24% of the General Chemical Corp. facility. Tosoh has about 200,000 tons of the total Japanese soda ash market, which is about 1.3 million tons.

Poland.—As part of a plan to privatize its state-owned chemical operations, Poland sold a 75% share in Janikosoda S.A. and Soda Matwy S.A., the two synthetic soda ash plants with a combined annual capacity of 1 million tons, to Ciech, the Polish chemical trading company. Ciech agreed to purchase the facilities for $78 million and invest another $128.5 million over the next 10 years (Industrial Minerals, 1996h).

Saudi Arabia.—The Arabian Mining and Manufacturing Co. awarded a contract to Hitachi Zozen Corp. and Marubeni Corp., both of Japan, to construct a synthetic soda ash facility near Jubail. The plant will have an annual capacity of 264,000 tons of light and dense soda ash, 90% of which will be consumed locally with the remainder for export. The $176 million project is expected to be in operation by mid-1998. Akzo Nobel of the Netherlands will provide the technology. Total cost of the project was estimated at $267 million, of which $107 million will come from a loan from the Saudi Industrial Development Fund and the balance from commercial banks (European Chemical News, 1996d).

Turkey.—Discussions resumed between Rio Tinto Zinc (RTZ) and FMC Corp. with Etibank, the state mining agency regarding developing the trona deposit at Beypazari, near Ankara. Negotiations with various U.S. companies have occurred during the past 13 years but talks with these two companies were suspended when the present political coalition came into office in June 1996 when Etibank announced it would

develop the deposit itself. The proposed project would cost about $400 million for a 1 million-ton-per-year soda ash operation. (MEED, 1996).

Outlook

Exports will continue to be the driving force behind increasing U.S. soda ash production capacity, especially to countries that are joint-venture partners with U.S. companies. Some of these countries will continue to evaluate the economics of closing certain synthetic soda ash facilities and importing soda ash from their U.S. subsidiaries. Total U.S. exports are forecast to increase an additional 400,000 tons in 1997, especially to Asia and South America. Joint-venture partnerships with developing nations involving new technology will stimulate economies in those countries and increase soda ash sales. The automotive manufacturing industry in South America is expanding considerably. Chrysler, Peugeot, Renault, Mercedes-Benz, Honda, and Toyota announced they will construct new assembly plants while Ford, General Motors, and Volkswagon will expand existing facilities. This will require a lot of new flat glass for automotive windows for the estimated 2 million vehicles that are planned to be manufactured by the end of this century.

Owens-Corning Fiberglass Co., announced plans to form a partnership with China for fiberglass insulation manufacture. Asahi Glass Co. of Japan formed a joint venture to produce flat glass in Song Be, Vietnam. Asahi also invested between $56 million to $66 million to expand flat glass production at Teplice in the Czech Republic. Saint-Gobain is scheduled to bring on-stream in 1998 a float glass plant in Ravong, Thailand, with an annual capacity of 350,000 tons of glass. Other flat glass projects are scheduled for construction in Brazil, Germany, and Indonesia that will require soda ash, the majority of which should be supplied from the United States.

Domestic soda ash consumption should rise in 1997 as FMC increases its shipments of soda ash to DuPont's titanium dioxide plant in Tennessee. Reportedly, about 230,000 tons of soda ash will be required annually for this use. Domestic apparent consumption for 1997 is forecast at 6.5 million tons.

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Soda ash and sodium sulfate. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.

[1]Prior to January 1996, published by the U.S. Bureau of Mines.

TABLE 1
SALIENT SODA ASH STATISTICS 1/

(Thousand metric tons and thousand dollars)

	1992	1993	1994	1995	1996
United States:					
Production 2/	9,380	8,960	9,320	10,100	10,200
Value 2/	$837,000	$734,000	$724,000	$829,000	$926,000
Value, average annual:					
Per short ton	$80.93	$74.34	$70.44	$74.50	$82.60
Per metric ton	$89.21	$81.95	$77.65	$82.12	$91.05
Production, Wyoming trona	14,900	14,500	14,600	16,500	16,300
Exports	2,960	2,800	3,230	3,570	3,840
Value	$434,000	$376,000	$406,000	$445,000	$508,000
Imports for consumption	72	89	79	83	107
Value	$12,800	$17,100	$12,100	$12,000	$14,700
Stocks, Dec. 31: Producers'	371	274	203	306	271
Consumption:					
Apparent	6,360	6,350	6,240	6,510	6,470
Reported	6,320	6,280	6,260	6,500	6,390
World: Production	30,700	29,500	29,300 r/	30,300 r/	30,400 e/

e/ Estimated. NA Not available.

1/ Data are rounded to three significant digits.

2/ Natural only, soda liquors and purge liquors converted to soda ash equivalent are as follows: 1992, 121,000 tons; 1993, 85,100 tons; 1994, 92,000 tons; 1995, 105,000 tons; and 1996 withheld to avoid disclosing company proprietary data.

TABLE 2
U.S. PRODUCERS OF SODA ASH IN 1996

(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 Feb. 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 of Korea as a partner had 27% equity share, but was reduced to about 7% in 1993.

4/ Rhone-Poulenc of France sold its 51% share to Oriental Chemical Industries (OCI) of Korea on Feb. 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 Feb. 1990. Capacity increase of 272,000 tons (300,000 short tons) installed Dec. 1995.

6/ Owned by Texasgulf Inc., subsidiary of Societe 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	1995 total	1996 First quarter	1996 Second quarter	1996 Third quarter	1996 Fourth quarter	1996 Total
32	Glass:						
3221	Container	1,690,000	372,000	409,000	392,000	379,000	1,550,000
3211	Flat	979,000	218,000	252,000	261,000	275,000	1,010,000
3296	Fiber	214,000	59,500	58,600	58,600	59,700	236,000
3229	Other	248,000	66,100	60,700	60,100	60,300	247,000
	Total	3,130,000	716,000	780,000	771,000	773,000	3,040,000
281	Chemicals	1,650,000	385,000	411,000	444,000	446,000	1,690,000
284	Soaps and detergents	783,000	204,000	190,000	201,000	191,000	785,000
26	Pulp and paper	186,000	49,900	50,000	42,800	40,400	183,000
2899	Water treatment 2/	108,000	19,000	21,700	24,100	21,700	86,500
	Fluegas desulfurization	130,000	36,100	35,100	44,000	36,700	152,000
	Distributors	323,000	77,600	79,900	76,500	80,200	314,000
	Other	185,000	35,700	37,100	35,100	37,300	145,000
	Imports 3/	82,700	25,000	25,700	27,400	28,800	107,000
	Total domestic consumption	6,500,000	1,520,000	1,600,000	1,640,000	1,630,000	6,390,000
	Exports 4/	3,600,000	903,000	987,000	1,040,000	1,000,000	3,930,000
	Canada	180,000	52,500	50,500	57,700	65,500	226,000
	Total industry sales 5/	10,100,000	2,430,000	2,590,000	2,680,000	2,630,000	10,300,000
	Total sales from plants	9,760,000	2,320,000	2,620,000	2,610,000	2,590,000	10,100,000
	Total production	10,100,000	2,370,000	2,620,000	2,550,000	2,630,000	10,200,000

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

		1995	1996
Sodium carbonate (soda ash):			
Dense, 58%, Na2O 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 Marketing Reporter. Current Prices of Chemicals and Related Materials. V.249, No. 1, Jan. 1, 1996, p. 32, and V. 251, No. 1, Jan. 6, 1997. p. 28.

TABLE 5
REGIONAL DISTRIBUTION OF U.S. SODA ASH EXPORTS, BY CUSTOMS DISTRICTS, IN 1996 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	--	--	--	--	315	--	--	--	--	315	--
Charleston, SC	--	--	--	--	383	--	--	--	--	383	--
Miami, FL	--	--	36	39	--	--	--	--	--	75	--
New York, NY	--	--	--	--	1,730	--	16	2,090	--	3,840	--
Philadelphia, PA	--	--	34	--	--	--	--	--	--	34	--
Savannah, GA	--	7	--	--	--	--	--	--	--	7	--
Wilmington, NC	--	--	--	--	778	--	--	--	--	778	--
Gulf:											
Houston-Galveston, TX	--	21	1,890	2,930	7	--	--	500	--	5,350	--
New Orleans, LA	5	--	--	--	--	--	--	--	--	5	--
Port Arthur, TX	--	--	229,000	12,000	12,300	22,600	32,000	--	--	308,000	8
Pacific:											
Columbia-Snake River	--	20,900	346,000	--	164,000	137,000	74,600	1,530,000	74,400	2,340,000	61
Los Angeles, CA	--	--	--	--	--	--	--	326	319	645	--
San Diego, CA	13,100	4,920	211,000	--	42,500	6,760	62,000	242,000	--	583,000	15
San Francisco, CA	--	--	--	--	68	--	--	40	242	350	--
Seattle, WA	10,000	--	--	--	--	--	--	608	--	10,700	--
North Central:											
Detroit, MI	137,000	--	--	--	167	--	--	--	--	137,000	4
Duluth, MN	51	--	--	--	--	--	--	--	--	51	--
Great Falls, MT	16,500	--	--	--	--	--	--	--	--	16,500	--
Pembina, ND	10,000	--	--	--	--	--	--	--	--	10,000	--
Northeast:											
Buffalo, NY	41,900	--	--	--	--	--	--	--	--	41,900	1
Ogdensburg, NY	1,310	--	--	--	124	--	--	--	--	1,440	--
St. Albans, VT	1,220	--	--	--	--	--	--	--	--	1,220	--
Southwest:											
Laredo, TX	354,000	--	--	--	--	--	--	--	--	354,000	9
Nogales, AZ	89	--	--	--	--	--	--	--	--	89	--
Unknown:	17,900	--	--	--	--	--	--	--	--	17,900	--
Total	603,000	25,800	788,000	15,000	222,000	166,000	169,000	1,770,000	74,900	3,840,000	100
Percent of total	16	1	21	--	6	4	4	46	2	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)

	1995		1996			1995		1996	
Country	Quantity	Value (thousands)	Quantity	Value (thousands)	Country	Quantity	Value (thousands)	Quantity	Value (thousands)
Argentina	121	$15,400	92	$13,000	Japan	339	$41,800	327	$43,200
Australia	31	3,570	56	6,610	Korea, Republic of	277	39,300	311	45,900
Belgium	23	3,910	72	10,200	Malaysia	78	11,200	76	11,500
Belize	6	1,010	- -	- -	Mexico	397	35,900	367	39,600
Bolivia	4	726	6	1,050	New Zealand	20	2,270	19	2,210
Brazil	233	31,400	209	27,300	Nigeria	- -	- -	5	500
Canada	187	15,700	236	21,800	Panama	4	575	4	580
Chile	78	10,500	123	17,000	Peru	19	3,010	24	3,920
China	50	6,260	45	6,210	Philippines	103	13,200	94	13,200
Colombia	86	12,300	98	14,200	Poland	- -	- -	15	1,430
Costa Rica	16	2,330	4	617	Saudi Arabia	65	5,820	134	14,000
Croatia	27	3,650	34	3,310	Singapore	26	3,450	17	2,340
Dominican Republic	3	515	4	710	South Africa	112	13,900	164	22,200
Ecuador	11	1,370	6	816	Spain	97	9,350	78	8,050
El Salvador	4	715	3	438	Taiwan	198	26,600	182	26,200
France	5	702	- -	- -	Thailand	263	36,000	285	41,300
Germany	(2/)	(2/)	1	104	Trinidad and Tobago	35	1,970	7	1,510
Guatemala	18	3,020	15	2,320	Turkey	- -	- -	19	1,970
India	- -	- -	23	2,060	United Arab Emirates	16	1,580	10	1,020
Indonesia	343	46,600	414	59,700	Uruguay	5	641	2	344
Iran	25	2,230	- -	- -	Venezuela	210	32,200	227	36,000
Ireland	(2/)	(2/)	2	220	Other 3/	1	174	1	187
Israel	33	4,080	23	2,790	Total	3,570	445,000	3,840	508,000
Jamaica	2	682	4	693					

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 The Bahamas (1995), Bahrain (1995), Barbados (1995), Finland (1995), Ghana (1996), Honduras (1996), Hong Kong, Federated States of Micronesia '(1995), the Netherlands, Russia, Sweden (1996), the United Kingdom, 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)

	1995			1996		
	Soda ash	Caustic soda 2/	Wyoming trona	Soda ash	Caustic soda 2/	Wyoming trona
January	840,000	15,900	1,460,000	762,000	14,000	1,480,000
February	698,000	11,400	1,220,000	814,000	17,000	1,360,000
March	867,000	15,600	1,490,000	789,000	18,900	1,360,000
April	837,000	18,200	1,360,000	855,000	16,900	1,320,000
May	843,000	16,600	1,380,000	876,000	17,600	1,370,000
June	816,000	10,100	1,350,000	885,000	20,400	1,250,000
July	860,000	13,500	1,440,000	850,000	20,000	1,430,000
August	840,000	20,300	1,380,000	847,000	17,600	1,320,000
September	845,000	18,500	1,430,000	857,000	22,000	1,350,000
October	870,000	17,000	1,390,000	909,000	20,400	1,460,000
November	876,000	12,800	1,270,000	859,000	18,900	1,270,000
December	907,000	14,500	1,320,000	866,000	18,500	1,330,000
Total	10,100,000	184,000	16,500,000	10,200,000	222,000	16,300,000

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

2/ As soda ash equivalent.

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

(Thousand metric tons)

Country	1992	1993	1994	1995	1996 e/
Albania e/	(3/)	--	--	--	--
Australia e/	300	300	300	300	300
Austria e/	150	150	150	200	200
Belgium e/ 4/	375	300	-- r/	-- r/	--
Bosnia and Herzegovina e/	25	20	15	15	15
Botswana	124	126	174	202	100
Brazil e/	200	200	200	200	200
Bulgaria	517	259	300 e/	300 e/	300
Canada e/	305	305	300	300	300
China e/	4,500	5,270	5,680	5,820	6,390
Colombia e/ 5/	121	121	-- r/	-- r/	--
Czechoslovakia 6/	100 e/	XX	XX	XX	XX
Egypt e/	51	51	51	51	51
France	1,100	1,222	1,123 r/	1,120 r/	1,100
Germany	1,639 r/	1,586 r/	1,380	1,400 e/	1,400
India e/	1,500	1,500	1,500	1,500	1,500
Italy e/	600	500	500	500	500
Japan	1,057	1,056	1,050	1,049 r/	1,050
Kenya 7/	186	145	226 r/	218 r/	220
Korea, Republic of e/	300	310	310	310	320
Mexico e/ 8/	440	440	290 r/	290 r/	290
Netherlands e/	400	400	400	400	400
Pakistan	146 e/	186	185 r/	180 e/	185
Poland	929	815	997	1,019 r/	1,000
Portugal e/	150	150	150	150	150
Romania	452	371	449 r/	350 e/	350
Russia	2,679 r/	1,992 r/	1,585 r/	1,823 r/	1,460
Spain e/	500	500	500	500	500
Taiwan	91 r/	89 r/	128 r/	128 r/	128
Turkey e/	385	385	385	385	390
Ukraine e/	1,000	800	660	475	425
United Kingdom e/	1,000	1,000	1,000	1,000	1,000
United States 7/	9,380	8,960	9,320	10,100	10,200 9/
Total	30,700	29,500	29,300 r/	30,300 r/	30,400

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 Apr. 21, 1997. Synthetic unless otherwise specified.

3/ Less than 1/2 unit. Plant at Vlora reportedly closed in 1993.

4/ Plant at Couillet closed by yearend 1993.

5/ Plant closed in 1993.

6/ Dissolved on Dec. 31, 1992.

7/ Natural only.

8/ Includes natural and synthetic. Estimated production of natural soda ash, in metric tons, was as follows: 1992--160,000 and 1993--160,000. Natural soda ash operation closed in Aug. 1993.

9/ Reported figure.