SODA ASH

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Soda ash is the trade name for sodium carbonate, a chemical refined from the mineral trona or sodium-carbonate-bearing brines (both referred to as "natural soda ash") or 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 1998, in terms of production, soda ash was the 11th largest inorganic chemical of all domestic inorganic and organic chemicals, excluding petrochemical feedstocks. Although soda ash represented only 2% of the total \$39 billion U.S. nonfuel mineral industry, its use in many diversified products 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, which monitors the 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. A survey request was sent to each of the six soda ash operations, all of which responded, representing 100% of the total production data shown in this report (table 1).

In 1998, U.S. production of natural soda ash from California and Wyoming decreased by 6%, to 10.1 million metric tons. On the basis of 13.02 million tons of total nameplate capacity, the U.S. soda ash industry operated at 78% of total nameplate capacity. The U.S. soda ash industry comprised six companies—five in Wyoming that produced soda ash from underground trona ore and one in California that produced soda ash from sodium carbonate-rich brines. Many foreign synthetic soda ash producers and consumers have become advocates of having a presence in the U.S. natural soda ash industry. Foreign investment in U.S. soda ash operations rose to 46% of capacity in 1998 from 10% in 1981, when Société Nationale Elf Aquitaine of France bought Texasgulf Chemical Co. The six U.S. companies have partners from Belgium, France, the Republic of Korea, or Japan. Since the beginning of the European producers' acquisitions of or partnerships in some U.S. facilities (Elf Aquitaine owning 100% of Tg Soda Ash, Inc. and Solvay S.A. of Belgium owning 80% of Solvay Minerals Inc.), the international competitive situation began to change. As of 1998, approximately 22% of the Wyoming soda ash production capacity was European-owned (Tg Soda Ash with 1.18 million tons and Solvay Minerals with 1.67 million tons); this was a decline from 35% in 1995 when Rhône-Poulenc S.A. of France sold its Wyoming soda ash facility to Oriental Chemical Industries Co., Ltd. of the Republic of Korea (table 2). A total of 180,000 tons of soda ash equivalent was used to manufacture chemical caustic soda (table 7) in 1998 by Wyoming Corp. (FMC), Tg Soda Ash, and Solvay Minerals, which ceased chemical caustic production in August. With only two producers reporting, the USGS was forced to terminate publishing of chemical caustic statistics to avoid disclosure of individual company proprietary data. The total quantity of trona mined by the five companies in Wyoming in 1998 was 16.5 million tons. The Asian economic problems that started in late 1998, which reduced U.S. soda ash production and export sales, began to affect the domestic producers beginning in February when Solvay Minerals announced that it would delay its expansion by 18 months or until the export market improved. The first phase of the 1.09million-ton (1.2-million-short-ton), \$170 million expansion would come on-stream in mid-1999 with 363,000 tons (400,000 short tons) of capacity, and the final phase, to be completed by 2003 (Chemical Week, 1998b).

OCI Chemical Corp.'s soda ash expansion project, completed in November, raised 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 built by Kvaerner Metals Co.'s Davy nonferrous division for engineering and construction management for \$140 million. Because of the downturn in U.S. soda ash export sales, OCI postponed plans to hire 40 workers for the expansion project and used the time to refurbish about 816,000 tons (900,000 short tons) of older existing capacity at its Wyoming facility (Chemical Market Reporter, 1998a). This temporarily reduced the plant's total capacity to 2.0 million tons (2.2 million short tons); this idle capacity is, however, included in the company's total 1998 nameplate capacity, as shown in table 2 because it will be brought back into service once demand improves.

With declining sales and prices within the U.S. soda ash industry, FMC announced plans to help strengthen the industry and improve operating economics by issuing a letter of intent to purchase its Wyoming competitor, Tg Soda Ash which had been offered for sale by its parent company, Atochem North America, Inc. Discussions regarding the final sales price, lease arrangements, union agreements, etc., had not been concluded by yearend and would continue into 1999.

On April 1, IMC Global Inc. acquired North American

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Chemical Co.'s soda ash facility at Searles Lake, CA, the White River Nahcolite operation in Colorado, the Penrice Soda Products synthetic soda ash plant in Australia, the marketing agreement with the Novacarb synthetic soda ash operation in France, and the Matthes & Weber synthetic soda ash plant in Germany from the Harris Chemical Group. The \$1.4 billion transaction (\$450 million cash and assume \$950 million of debt) also included Harris' North American Salt Co. operations in the United States, Domtar of Canada, and Salt Union of England. The U.S. chemical operations were renamed IMC Chemicals, Inc. (Fertilizer Markets, 1998). To offset part of the debt it absorbed, IMC Global reached an agreement by yearend to sell a major share of its soda ash and boron businesses for \$520 million to Mincorp L.L.C., which was affiliated with Citicorp Venture Capital, Ltd. (CVC) of the United States. A Europe-based spinoff of CVC was associated with the CVC-Brunner Mond Co., Ltd. joint venture, in which the soda ash operations in Kenya, the Netherlands, and the United Kingdom were acquired (IMC Global, 1998).

In June, American Soda L.L.P., Inc., a joint-venture partnership of the Williams Sodium Products Co. (a whollyowned subsidiary of The Williams Companies, Inc.) and American Alkali, Inc., announced plans regarding a proposed \$400 million soda ash and sodium bicarbonate operation in western Colorado. The companies intended to solution mine nahcolite, which is naturally-occurring sodium bicarbonate. A 25-kilometer (42 mile) underground pipeline would transport the solution to American Soda's processing plant at the former Unocal oil shale facility near Parachute (Denver Post, 1998). The company will employ about 150 people when the plant is fully operable, which was scheduled for January 1, 2001.

Early in 1998, the plastic and glass packaging operations of British Tire and Rubber (BTR) were sold for \$3.6 billion to Owens-Illinois, which as the largest glass container manufacturer in North America and South America. BTR was the parent company of Australian Consolidated Industries (ACI), which owned a 25% share of the General Chemical Corp.'s Wyoming soda ash facility. Because of the ACI connection, Owens-Illinois became a joint venture partner with General Chemical, one of several soda ash suppliers with which Owens-Illinois dealt. BTR was the world's largest supplier of polyethylene terephthalate plastic packaging (Chemical Week, 1998a).

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 responded to the quarterly survey, the data represented 100% of the total reported consumption data found in this report.

In 1998, U.S. apparent consumption of soda ash was 6.56 million tons; reported consumption was, 6.55 million tons (table 3). Reported consumption data and apparent

consumption data do not necessarily correspond because reported consumption data were based on actual sales, whereas apparent consumption data were the calculated quantity available for domestic consumption based on balancing supplies (production, imports, and inventory adjustments) with external demand (exports).

In 1998, U.S. apparent consumption and reported consumption differed by only 10,000 tons, which was very small. 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. A comparison of export statistics from the Journal of Commerce's Port Import-Export Reporting Service and the Bureau of the Census export data showed a high degree of comparability in both sets of data. The only adjustment to the trade statistics was with soda ash shipments to Switzerland that were erroneously reported by the Bureau of the Census.

In 1998, the distribution of soda ash by end use was glass, 49%; chemicals, 27%; soap and detergents, 11%; distributors, 5%; flue gas desulfurization, 3%; pulp and paper and water treatment, 2% each; and other, 1%.

Glass.—Glass manufacture represented about 49% of domestic soda ash consumption; the container sector comprised 50%; flat, 34%; and specialty and fiber, 8% each. According to Bureau of the Census data, production of glass containers increased by 2% to 8.91 million tons (9.83 million short tons) in 1998 from 8.73 million tons (9.62 million short tons) in 1997. All sectors, except for liquor container sales, rose in response to increased demand for these packaged products. Production of glass containers for liquor use declined primarily because more distilled spirits were packaged in plastic containers than glass bottles, especially in the 1.75-liter category.

In 1998, the glass recycling rate remained the same as that of 1997 at about 38%, of which postconsumer cullet was estimated to be 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 sodiumbase 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 by 4% to 491,000 tons in 1998 from 473,000 tons in 1997 (Bureau of the Census, 1998). The estimated end-use distribution for sodium bicarbonate consumption was household products, 30%; animal feed, 20%;

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food and beverages, 17%; chemicals, 12%; pharmaceuticals, 8%; fire extinguishers, 3%; and miscellaneous, 10%. Combined capacity for the domestic sodium bicarbonate industry was 597,000 tons. The distribution of capacity by producer was Church & Dwight Co., 390,000 tons; Rhodia, Inc. (formerly Rhône-Poulenc Basic Chemicals Co.), 65,000 tons; FMC, 64,000 tons; IMC Chemicals, (formerly North American Chemical), 64,000 tons; and Natrium Products, 14,000 tons. Rhodia announced that it would terminate sodium bicarbonate production at its Chicago Heights, IL, facility by yearend (Chemical Market Reporter, 1998b).

Sodium phosphates were another important sector of the chemical industry that used soda ash. Although several sodium phosphate-bearing compounds were available, most of the available data were withheld by the Bureau of the Census because of the necessary number of respondents required to publish statistics. The distribution of industrial phosphates by end use was, however, estimated as follows: detergent builders and cleaners, 44%; miscellaneous, 26%; food and beverage, 19%; metal treatment, 6%; and water treatment, 5%.

Soaps and Detergents.—Detergents were the third largest use of soda ash. Soda ash was used as a builder to emulsify oil stains, to reduce the redeposition of dirt during washing and rinsing, to provide alkalinity for cleaning, and to soften laundry water. In addition, soda ash was a component of sodium tripolyphosphate (STPP), another major builder in detergent formulations. Soda ash consumption has been decreasing because phosphatic detergents can contribute to eutrophication, an environmental problem. Many regions of the nation have adopted phosphate limitations or bans, affecting about 40% of the U.S. population. A strong U.S. economy boosted demand for industrial and institutional cleaners and automatic dishwashing detergents in the past couple of years. New technology incorporating enzymes in dishwashing detergents and a move toward liquid cleansers may, however, adversely affect STPP consumption in the future. In 1998, the estimated distribution of STPP was automatic dishwashing detergents, 45%; industrial and institutional cleaners, 31%; food uses, 13%; and miscellanous industrial uses, 11% (Chemical Market Reporter, 1998c).

In response to the environmental issue, detergent manufacturers changed formulations to make compact and superconcentrated products. These reformulations required sodium silicates and synthetic zeolites, which are made from soda ash. Liquid detergents, which do not contain any soda ash, competed with powdered detergents and commanded 49% of the household laundry detergent market in 1997 compared with 15% in 1978.

Stocks

Yearend 1998 stocks of dense soda ash in domestic plant silos, warehouses, and terminals and on teamtracks amounted to 273,000 tons. Producers indicated that a potential supply problem could exist when inventories fall below 180,000 tons. Most consumers of soda ash did not have the storage facilities to accommodate large quantities of soda ash and had to rely on suppliers to provide the material on a timely basis.

Prices

About 36% of U.S. soda ash production was exported with the remainder for domestic consumption. In the domestic market, the large volume buyers of soda ash were primarily the major glass container manufacturers, whose purchases were seasonal (more beverage containers made in second and third quarters for summertime beverage consumption). Soda ash sales to the flat glass sector were usually dependent on the state of the economy because the largest use of flat glass was in automobile manufacture and residential housing and commercial building construction. These two major industrial sectors were especially sensitive to changing economic conditions. If construction starts and automobile sales are up, then 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 \$83.00 per metric ton (\$75.30 per short ton), which was a 3% decrease compared with that of 1997. The value is not a price; but rather 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 differed 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. The California price for the comparable product also increased by \$7 per ton; to \$130 per short ton from \$123 (table 4).

Foreign Trade

The problems in the Asian economies that began in late 1997 continued throughout 1998. In 1998, Asia accounted for 39% of total U.S. soda ash exports, representing 14% of domestic production compared with 49% and 17%, respectively, in 1994. The economic problems lasted longer than most market analysts had forecast, resulting in several delays in domestic soda ash capacity expansions (Chemical Market Reporter, 1998a).

In 1998, total U.S. soda ash exports decreased by almost 13% to 3.66 million tons. U.S. exports to 44 countries, on a regional basis, were as follows: Asia, 39%; South America, 22%; North America, 20%; Europe, 10%; the Middle East and Africa, 3% each; and Central America and Oceania, 1% each (table 6). Shipments to the Caribbean were negligible. The average "free alongside ship" value was \$130.66 per ton in 1998 compared with \$130.51 per ton in 1996. The top 10 countries, representing 67% of total U.S. soda ash exports, were, in decreasing order and percent of total, Mexico, 14%; Japan, 8%; the Republic of Korea, Taiwan, 7%, each; Canada, Indonesia, Venezuela, 6% each; Brazil, 5%; Chile, and Thailand, 4% each. About 58% of all U.S. soda ash exports were through the Columbia-Snake River custom district; the Laredo, TX, custom district was the second largest port, with 14% of the total (table 5).

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Imports of soda ash decreased by 18% to 83,000 tons. The majority came from Canada, where General Chemical Corp. operated a synthetic soda ash plant in Amherstburg, Ontario.

In midyear, the Alkali Manufacturers Association of India alleged that Sinochem, the Chinese chemical export association, had shipped soda ash to Indian glass customers at less than the prevailing market price. This action came a year after the Indian Monopolies and Restrictive Trade Practices Commission (MRTPC) had alleged that ANSAC had done the same thing. Several U.S. Senators, the U.S. Trade Representative, and the Assistant Secretary of State for South Asian Affairs petitioned Indian officials to reevaluate the situation and to reverse their position regarding ANSAC (American Natural Soda Ash Corp., 1998a). Sinochem refuted the dumping claim, indicating that it only represented the affairs of one or two Chinese soda ash manufacturers and that other Chinese soda ash suppliers had exported material to India during the same period with no action being taken against them. MRTPC issued a ban on future Sinochem imports but indicated that it would allow other Chinese soda ash companies to continue to ship (Industrial Minerals, 1998).

World Review

The largest consumers of soda ash tended to be the developed nations; however, these countries also usually had lower growth rates compared with developing countries, which have greater demands for consumer products. Although the production and consumption quantities varied among the countries, the end-use patterns were basically the same; that is, glass, chemicals, and detergents were the major sectors. Although the United States was the largest soda-ash-producing country in the world, foreign ownership in the U.S. soda ash industry was 46% of nameplate capacity (table 8).

Nine countries have the capacity to produce more than 1 million tons per year. They are, in descending order, the United States, China, Russia, India, Germany, France, and the United Kingdom. Bulgaria, Romania, and Ukraine had production installations that were rated at about 1 million tons; adverse economic conditions have, however, 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 sodaash-producing countries have large populations that require consumer products made with soda ash. The less developed nations tend to have higher soda ash demands and higher growth rates as soda-ash-consuming industries are developed. In 1998, world soda ash production was estimated to be 31.7 million tons, which was a 3% increase compared with that of

Brazil.—The dumping investigation against Bulgaria, Poland, Romania, Spain, and the United States, which began in September 1996 continued into 1998. The sole soda ash producer in Brazil, Companhia Nacional de Alcalis, alleged that soda ash imports from the United States were sold below normal values, thereby causing financial hardship to the company. In March 1998, Brazil's Commercial Defense

Council voted to end the investigation against ANSAC citing that there was insufficient evidence to show dumping (American Natural Soda Ash Corp., 1998b).

China.—Several Chinese soda ash producers met to establish a unified export corporation for soda ash similar to that of the United States. The proposed new corporation would consist of eight of the leading exporting companies in Lianyungang, Tangshan, Tianjin, and Weifang. By forming an export association, the Chinese soda ash producers anticipate exports will grow and raise soda ash export prices by \$15 to \$20 per ton (Xinhua News Agency, 1998).

India.—Tata Chemicals will invest \$7 million to increase soda ash capacity by 100,000 tons per year at its plant in Mithapur. When completed, the facility's total nameplate capacity will be 850,000 tons per year (Chemical Week, 1998c).

Turkey.—Sisecam completed its second phase expansion project in Mersin that raised its total annual capacity to 750,000 tons. Along with its affiliate Sisecam Bulgaria Ltd., the company was the 10th largest soda ash producer in the world (Sisecam annual report, accessed January 19, 1999, at URL http://www.sisecam.com/eng/annual7.htm).

United Kingdom.—Brunner Mond was acquired on September 21 by Soda Ash Investments plc, which was established by CVC Capital Partners Ltd. and CVC. Soda Ash Investments was later renamed Brunner Mond Group plc. The £180 million venture was financed through an equity contribution from funds managed by CVC Capital Partners Europe Ltd., and CVC, bank debt, and the issue of both pound sterling and U.S. dollar denominated senior subordinated notes (Brunner Mond Co., Ltd. 1998).

Uzbekistan.—A new soda ash plant using Solvay technology was proposed by Kungrad Soda Complex and Mannesmann Seiffert of Germany for construction in Kungrad, Uzbekistan. The 190,000-ton-per-year facility was scheduled to come onstream by late 2001. Financed by Berliner Bank, Deutsche Bank, and Dresdner Bank, the \$600 million operation will also produce caustic soda, chlorine, and salt (Chemical Week, 1998d).

Outlook

The economic problems in Asia that began in late 1997 had a direct impact on U.S. soda ash exports in 1998 and will continue into 1999. By yearend 1998, some economic problems in Brazil were noted that could affect U.S. exports in the following year.

The partial restructuring of the global soda ash industry that began in 1997 and continued into 1998 will also continue into 1999 as the outcome of the FMC acquisition of Tg Soda Ash and the IMC-CVC partnership should be resolved. 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 this problem would be through consolidations within the world soda ash industry. Another would be for some producers to close their smaller plants to reduce overall capacity and to improve overall operating economics and sales

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prices.

Domestic soda ash is expected to grow between 1.0% and 1.5% per year, and world demand is forecast to range from 2.0% to 3% per year for the next several years. Despite the current problems in the Asian economies, the majority increase in soda ash consumption in the future will be in Asia and South America. An important development to monitor that will affect the future of the U.S. soda ash export market will be the proposed development of the Chinese export association, which has the potential to reduce U.S. export sales severely.

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

TABLE 1 SALIENT SODA ASH STATISTICS 1/

(Thousand metric tons and thousand dollars, except value per ton)

1994	1995	1996	1997	1998
9,320	10,100	10,200	10,700	10,100
\$724,000	\$829,000	\$926,000	\$915,000	\$842,000
\$70.44	\$74.50	\$82.60	\$77.25	\$75.30
\$77.65	\$82.12	\$91.05	\$85.15	\$83.00
14,600	16,500	16,300	17,100	16,500
3,230	3,570	3,840	4,190	3,660
\$406,000	\$445,000	\$508,000	\$547,000	\$478,000
79	83	107	101	83
\$12,100	\$12,000	\$14,700	\$13,400	\$10,800
203	306	271	259	273
6,240	6,510	6,470	6,620	6,560
6,260	6,500	6,390	6,480	6,550
29,600 r/	31,100 r/	31,200 r/	32,600 r/	31,700 e
	9,320 \$724,000 \$70.44 \$77.65 14,600 3,230 \$406,000 79 \$12,100 203	9,320 10,100 \$724,000 \$829,000 \$70.44 \$74.50 \$77.65 \$82.12 14,600 16,500 3,230 3,570 \$406,000 \$445,000 79 83 \$12,100 \$12,000 203 306 6,240 6,510 6,260 6,500	9,320 10,100 10,200 \$724,000 \$829,000 \$926,000 \$70.44 \$74.50 \$82.60 \$77.65 \$82.12 \$91.05 14,600 16,500 16,300 3,230 3,570 3,840 \$406,000 \$445,000 \$508,000 79 83 107 \$12,100 \$12,000 \$14,700 203 306 271 6,240 6,510 6,470 6,260 6,500 6,390	9,320 10,100 10,200 10,700 \$724,000 \$829,000 \$926,000 \$915,000 \$70.44 \$74.50 \$82.60 \$77.25 \$77.65 \$82.12 \$91.05 \$85.15 14,600 16,500 16,300 17,100 3,230 3,570 3,840 4,190 \$406,000 \$445,000 \$508,000 \$547,000 79 83 107 101 \$12,100 \$12,000 \$14,700 \$13,400 203 306 271 259 6,240 6,510 6,470 6,620 6,260 6,500 6,390 6,480

e/ Estimated. r/ Revised.

TABLE 2 U.S. PRODUCERS OF SODA ASH IN 1998

(Million short tons, unless otherwise noted)

	Plant nameplat	e	Source of	
Company	capacity	Plant location	sodium carbonate	
FMC Wyoming Corp. 1/	3.55	Green River, WY	Underground trona.	
General Chemical (Soda Ash) Partners 2/	2.65	do.	Do.	
IMC Chemical Co. 3/	1.45	Trona, CA	Dry lake brine.	
OCI Chemical Corp. 4/	3.10	Green River, WY	Underground trona.	
Solvay Minerals Inc. 5/	2.30	do.	Do.	
Tg Soda Ash, Inc. 6/	1.30	Granger, WY	Do.	
Total	14.35			
Total million metric tons	13.02			

- 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. An expansion was completed in 1998.
- 3/IMC Global acquired North American Chemical Co. in April 1998; operation renamed. An agreement to sell a majority share
- to Mincorp L.L.C. (a joint venture with Citicorp Venture Capital) was signed in December 1998.
- 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%. An 800,000 ton expansion, brought on-stream in November 1998, increased plant capacity to 3.1 million short tons; however, the company planned to take 900,000 tons out of service temporarily for equipment refurbishment.
- 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%).

^{1/} Data are rounded to three significant digits.

^{2/} Natural only, soda liquors and purge liquors converted to soda ash equivalent are as follows: 1994-92,000 tons; 1995-

^{105,000} tons; 1996 to 1998 data withheld to avoid disclosing company proprietary data.

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

(Metric tons)

		•		1998		
SIC	1997	First	Second	Third	Fourth	
Code End use	Total	quarter	quarter	quarter	quarter	Total
32 Glass:						
3221 Container	1,530,000	394,000	417,000	413,000	389,000	1,610,00
3211 Flat	1,090,000	257,000	278,000	277,000	287,000	1,100,00
3296 Fiber	258,000	61,800	64,900	66,500	67,100	260,00
3229 Other	249,000	60,800	60,200	65,300	58,000	244,00
Total	3,130,000	773,000	820,000	821,000	801,000	3,220,000
281 Chemicals	1,700,000	418,000	439,000	454,000	450,000	1,760,00
284 Soaps and detergents	750,000	175,000	173,000	186,000	171,000	704,00
Pulp and paper	143,000	32,700	32,500	35,200	33,400	134,00
2899 Water treatment 2/	83,100	21,800	25,600	29,100	27,200	104,00
Fluegas desulfurization	209,000 r/	57,500	48,900	49,700	57,900	214,00
Distributors	325,000	77,100	79,000	79,200	81,400	317,00
Other	145,000 r/	28,700	22,100	35,700	15,100	102,00
Imports 3/	101,000	19,700	20,700	22,800	19,700	82,90
Total domestic consumption	6,480,000	1,580,000	1,640,000	1,690,000	1,640,000	6,550,00
Exports 4/	4,380,000	902,000	962,000	891,000	900,000	3,650,00
Canada	252,000	39,400	72,000	37,500	49,100	198,00
Total industry sales 5/	10,900,000	2,490,000	2,600,000	2,580,000	2,540,000	10,200,00
Total sales from plants	10,600,000	2,420,000	2,510,000	2,510,000	2,450,000	9,890,00
Total production	10,700,000	2,540,000	2,560,000	2,520,000	2,530,000	10,100,00

r/ Revised.

- 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 powerplants 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

(Per short ton)

1997	1998
\$153.00	\$153.00
105	105
158	158
110	110
	\$153.00 105 158

Sources: Chemical Market Reporter. Current prices of chemicals and related materials, v. 253, no. 1, January 5, 1998, p. 28, and v. 255, no. 1, January 4, 1999, p. 36.

TABLE 5 REGIONAL DISTRIBUTION OF U.S. SODA ASH EXPORTS, BY CUSTOMS DISTRICTS, IN 1998 1/

(Metric tons)

	North	Central	South			Middle					Percent
Customs districts	America	America	America	Caribbean	Europe	East	Africa	Asia	Oceania	Total	of total
Atlantic:											
Baltimore, MD					779					779	(2/)
Miami, FL		67	71	124						262	(2/)
New York, NY					19					19	(2/)
Philadelphia, PA					917					917	(2/)
Savannah, GA		36								36	(2/)
Gulf:											
Houston-Galveston, TX		41	960					-		1,000	(2/)
New Orleans, LA		604	369							973	(2/)
Port Arthur, TX			297,000	10,500	18,300		11,800			338,000	9
Pacific:											
Columbia-Snake River		35,900	251,000		315,000	125,000	99,900	1,260,000	46,000	2,130,000	58
Los Angeles, CA								95		95	(2/)
San Diego, CA	7,770	17,100	259,000		38,700			151,000		473,000	13
San Francisco, CA					60			18		78	(2/)
Seattle, WA	10,500							-		10,500	(2/)
North Central:											
Chicago, IL					25					25	(2/)
Cleveland, OH	90							-		90	(2/)
Detroit, MI	135,000				997					136,000	4
Duluth, MN	280									280	(2/)
Great Falls, MT	10,900							-		10,900	(2/)
Pembina, ND	13,200							-		13,200	(2/)
Northeast:											
Buffalo, NY	28,100									28,100	1
Ogdensburg, NY	1,100									1,100	(2/)
Southwest:											
Laredo, TX	504,000							_		504,000	14
Unknown:	10,000							_		10,000	(2/)
Total	720,000	53,700	807,000	10,700	374,000	125,000	112,000	1,410,000	46,000	3,660,000	100
Percent of total	20	1	22	(2/)	10	3	3	39	1	100	XX

XX Not applicable.

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

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

^{2/} Less than 1/2 unit.

$\label{eq:table 6} TABLE~6$ U.S. EXPORTS OF SODA ASH, BY COUNTRY 1/

(Thousand metric tons)

		1997		1998			
	Quantity	-//1		Quantity	1//0		
	(thousands	Value 2/	Unit	(thousands	Value 2/	Unit	
Country	metric tons)	(thousands)	value	metric tons)		value	
Argentina	103	\$14,500	\$141.16	102	\$14,700	\$144.72	
Australia	81	10,100	125.37	32	3,770	117.96	
Belgium	74	8,250	111.43	115	14,300	124.29	
Bolivia	6	972	155.52	2	371	176.67	
Brazil	199	26,500	133.07	202	27,000	133.84	
Canada	248	23,000	92.37	209	19,300	92.40	
Chile	156	21,600	138.29	152	22,200	146.68	
China	105	13,700	130.13	51	5,710	111.19	
Colombia	96	14,400	150.02	99	15,500	155.88	
Costa Rica	8	1,220	151.10	14	2,320	165.27	
Croatia	32	3,100	98.12	8	1,050	127.89	
Dominican Republic	4	645	171.95	(3/)	15	145.05	
Ecuador	10	1,660	160.87	11	1,900	166.33	
El Salvador	2	339	169.58	4	712	178.00	
France	82	8,870	108.76	139	14,400	103.89	
Guatemala	16	2,410	154.75	32	5,090	160.73	
Indonesia	396	57,000	144.08	228	32,100	140.41	
Ireland	1	64	108.66				
Israel	32	3,620	112.22				
Jamaica	5	899	164.23	2	314	152.40	
Japan	435	56,200	129.10	306	40,800	133.25	
Korea, Republic of	306	45,300	147.95	241	34,000	140.94	
Malaysia	121	18,000	149.29	101	14,900	147.78	
Mexico	468	54,000	115.53	511	57,400	112.23	
New Zealand	26	2,910	113.07	14	1,550	109.99	
Nigeria	6	598	100.78	12	1,190	100.70	
Panama	2	304	144.21	4	547	136.75	
Peru	26	4,190	158.58	21	3,400	162.48	
Philippines	102	14,200	139.25	73	10,000	138.09	
Portugal				10	1,330	131.67	
Poland	15	1,350	90.13				
Russia	(3/)	53	110.00	1	101	110.01	
Saudi Arabia	123	12,400	100.53	97	10,500	108.25	
Singapore	12	1,620	135.33	11	1,430	128.08	
South Africa	102	12,800	125.46	100	12,600	125.67	
Spain	64	6,410	100.87	90	9,510	106.24	
Taiwan	208	28,900	139.06	249	34,500	138.47	
Thailand	283	40,500	143.12	146	21,100	144.35	
Trinidad and Tobago	6	873	156.59	8	1,400	165.31	
Turkey	19	1,880	99.08				
United Arab Emirates	20	2,030	101.14	28	2,730	97.53	
United Kingdom	16	1,870	115.33	11	1,610	148.15	
Uruguay	3	406	145.00	2	330	150.71	
Venezuela	167	26,500	158.41	216	36,000	166.56	
Vietnam	. 5	711	142.20	4	343	85.70	
Other 4/	1	96 1		1	213	166.36	
Total	4,190	547,000	130.51	3,660	478,000	130.66	

r/ Revised.

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

 $^{1/\,\}mbox{Data}$ are rounded to three significant digits; may not add to totals shown.

^{2/} F.a.s. value.

^{3/} Less than 1/2 unit.

 $^{4\!/}$ Includes Germany, Hong Kong, the Netherlands (1997), and Suriname.

 ${\bf TABLE~7} \\ {\bf U.~S.~PRODUCTION~OF~SODIUM~COMPOUNDS,~BY~MONTH~1/} \\$

(Metric tons)

		1997			1998	
		Caustic	Wyoming		Caustic	Wyoming
	Soda ash	soda 2/	trona 3/	Soda ash	soda 2/	trona 3/
January	866,000	19,500	1,460,000	889,000	15,600	1,570,000
February	766,000	19,200	1,270,000	861,000	18,500	1,450,000
March	912,000	19,100	1,530,000	786,000	19,800	1,520,000
April	837,000	14,700	1,480,000	818,000	13,500	1,320,000
May	937,000	13,900	1,550,000	899,000	15,300	1,410,000
June	971,000	17,200	1,440,000	838,000	17,700	1,410,000
July	912,000	20,800	1,290,000	842,000	11,600	1,360,000
August	896,000	16,800	1,460,000	833,000	W	1,300,000
September	862,000	20,100	1,370,000	849,000	W	1,070,000
October	936,000	17,000	1,300,000	831,000	W	1,320,000
November	908,000	17,700	1,460,000	858,000	W	1,390,000
December	940,000	13,200	1,520,000	840,000	W	1,430,000
Total	10,700,000	209,000	17,100,000	10,100,000	180,000	16,500,000

- W Withheld to avoid disclosing company proprietary data; included in "Total."
- 1/ Data are rounded to three significant digits; may not add to totals shown.
- 2/ As soda ash equivalent.
- 3/ Includes solution mined trona.

 ${\bf TABLE~8}$ SODA ASH: ESTIMATED WORLD PRODUCTION, BY COUNTRY 1/2/

(Thousand metric tons)

Country	1994	1995	1996	1997	1998
Australia	300	300	300	300	300
Austria	150	200	200	150	150
Bosnia and Herzegovina	15	15	15	15	15
Botswana	174 3/	202 3/	119 3/	200 r/3/	200
Brazil	200	200	200	200	200
Bulgaria	451 3/	796 3/	800 3/	800	800
Canada	300	300	300	300	300
China	5,814 r/ 3/	5,997 r/3/	6,693 r/3/	7,258 r/3/	7,200 3/
Egypt	51	51	51	51	50
France	1,123 3/	1,120	1,100	1,053 r/3/	1,000
Germany	1,380 3/	1,400	1,400	1,400	1,400
India	1,500	1,500	1,500	1,500	1,500
Italy	500	500	500	500	500
Japan	1,050 3/	1,049 3/	926 3/	801 r/3/	800
Kenya 4/	226 3/	218 3/	223	230 r/	200
Korea, Republic of	310	310	320	320	300
Mexico	290	290	290	290	290
Netherlands	400	400	400	400	400
Pakistan	185 3/	200	215 3/	220	220
Poland	997 3/	1,019 3/	909	950	950
Portugal	150	150	150	150	150
Romania	449 3/	504 3/	537 r/ 3/	548 r/ 3/	550
Russia	1,585 3/	1,823 3/	1,500	1,700	1,600
Spain	500	500	500	500	500
Taiwan	128 3/	128 3/	128	128	127
Turkey	385	385	400	500 r/3/	500
Ukraine	660	475	375	367 3/	375
United Kingdom	1,000	1,000	1,000	1,000	1,000
United States 4/	9,320 3/	10,100 3/	10,200 3/	10,700 3/	10,100 3/
Total	29,600 r/	31,100 r/	31,200 r/	32,600 r/	31,700

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 19, 1999. Synthetic unless otherwise specified.

^{3/} Reported figure.

^{4/} Natural only.