

SODA ASH IN THE USA

The soda ash industry in the USA has developed over the past 112 years from the introduction of the revolutionary Solvay Process through the transition to the trona-based processes after World War II. Here ROGER AITALA* Identifies innovation and boldness as continuing characteristics driving this US\$1 billion per year industry.

For centuries the glass industry has depended on sodium carbonate, known commercially as soda ash, as a key ingredient in most types of glass. In turn, the ever-changing soda ash industry has depended on the glass industry as the main market for its product. This interdependence continues today.

During the 18th century, soda ash was made by the LeBlanc Process. In around 1860, a complex, ingenious process was developed by the Solvay brothers of Belgium. This was commercialized in new plants in Couleutt, Belgium and Solvay, New York in 1884. After initial difficulties, Solvay plants quickly displaced the LeBlanc plants because of their technical and economic superiority.

The New York Solvay plant formed part of the early development of the chemical industry in the USA. It underwent a series of renovations and expansions and continued operating until February 1986 using the raw materials salt, limestone, and coal. Over the years the sodium carbonate plant became the nucleus of a major chemical complex. In addition, both in Europe and the United States the original Solvay plants spawned many other plants owned by the original firms or often by new entrants.

From 1940 to 1966, 10 Solvay plants operated in the United States. They were located mainly East of the Mississippi, close to the most densely populated areas and glass manufacturers.

TRONA

In the late 19th century and early 20th century several unsuccessful

attempts were made to commercialize the refining of trona (an ore containing mostly sodium sesquicarbonate) from deposits in Searles Lake, California. Production of soda ash by the American Potash & Chemical Company began there in 1931. Today, an entirely new operation is owned by North American Chemical and produces 10% of American soda ash.

In 1938, during exploration drilling for oil and gas in Sweetwater County, Wyoming, a massive deposit of trona was discovered. In 1947 Westvaco, a division of Food Machinery Corporation (today's FMC), developed a mine and a small plant to calcine the trona to a crude sodium carbonate. By 1953, FMC had improved the process via the sesquicarbonate crystal and built a new plant. FMC introduced the monohydrate process in 1962 and this remains the main process used today. The company's complex reached a nameplate capacity of 3.5 million tons/year of soda ash and equivalents in 1996.

FMC and the other firms which followed them made a brave decision in moving to the Wyoming desert far away from markets and from sources of skilled manpower to launch an industry based on new processes. Thanks to the combined skills of geologists, mining engineers, chemical engineers, and chemists this new industry overcame a variety of difficulties and developed into a stable, growing force. Today, five large trona-refining complexes operate within a relatively small area near Green River, Wyoming.

Most trona in Wyoming occurs in massive, relatively flat,

lacustrine beds, 8ft-10 ft thick. Trona is a very hard rock. Until recently mining was carried out by conventional and, later, mechanized methods, including long-wall mining. Over the years, new mining methods were introduced. This often involved the adaptation of the hard-rock mining techniques developed for coal. Productivity has improved consistently.

ANSAC

USA-based soda ash producers have always exported soda ash, particularly to Latin America, but growth of exports accelerated after the formation of the American Natural Soda Ash Corporation (ANSAC) in 1982. Although the concept of ANSAC was rather simple in principle, its development required vision and perseverance to overcome short term self-interests.

ANSAC controls large fleets of rolling stock to transport a continuous stream of soda ash from Wyoming to shipping terminals on the West Coast and the Gulf Coast. Eight ocean-going vessels transport about 4.5 million tons/year to dedicated receiving terminals throughout the world. ANSAC has also rationalized the overall distribution system.

All American producers also export soda ash individually, mainly to the European Union and to overseas equity-owning companies with soda ash requirements. The main destinations are the Americas and Asia, as shown in the Figure below.

GLOBALISATION

Rapidly expanding exports in the 1980s, largely due to the efforts

by ANSAC, increased the American presence in the global market. American soda ash became the major component of the ocean-going soda ash trade as major importers wanted to insure a dependable, long-term, quality supply, at relatively steady prices.

About 50% of soda ash capacity in the USA is owned by other countries. All the soda ash producers in Wyoming are either fully or partially owned by overseas companies. These international ownerships have contributed to the sustained growth of USA exports.

All soda ash plants are capital-intensive, but Solvay plants tend to be even more so than trona-based plants, especially when the cost of the limestone, salt, coal and their distribution is included. New trona-based plants are generally more economical than new Solvay plants.

Although some Solvay plants were built in Eastern Europe and in China after World War II, in recent years all of the world's trona-based soda ash plants have been

established in the United States. This trend is expected to continue into the next century because Wyoming has abundant reserves of trona, gas, and oil sufficient to meet foreseeable world needs. Hosting the major, massive, high-assay, trona deposit in the world, Wyoming will continue to be the main source of trona-based soda ash.

EXTRACTION TECHNIQUES

Continuing the tradition of boldness and innovation, American producers have recently developed different extraction techniques. FMC's new post-mechanical solution mining and Tg Soda Ash's use of mine waters are two such examples. In both cases, innovative refining techniques have been developed for the liquid feed and these should reduce mining costs and solid and gas wastes.

As with Solvay plants, the USA's soda ash producers have been gradually integrating downstream into derivatives such as sodium bicarbonate, chemical

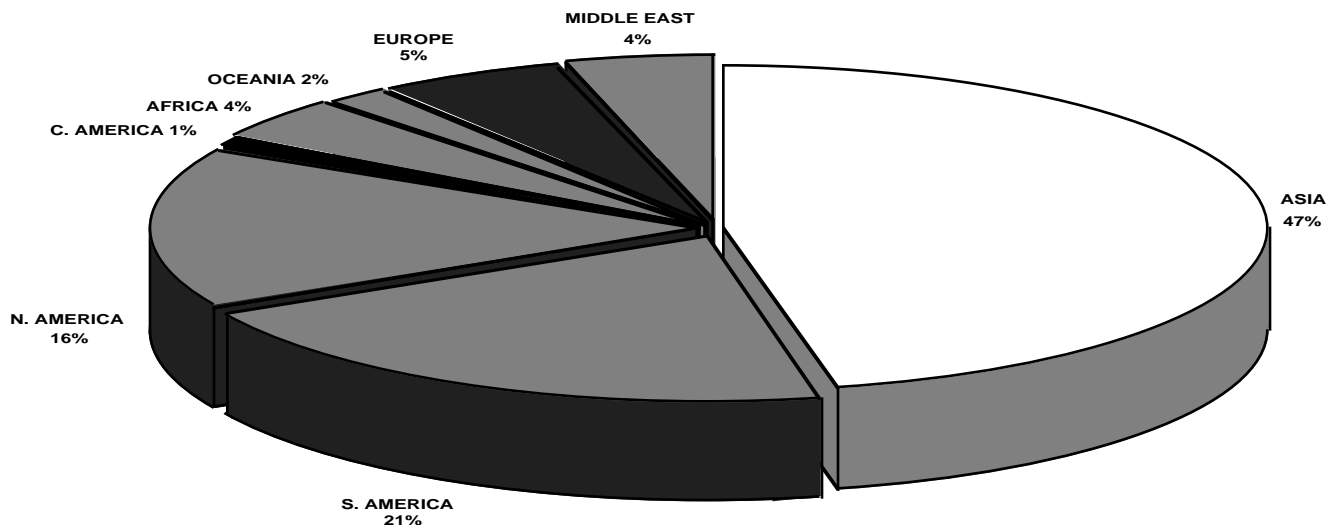
caustic soda, and sodium phosphates.

According to the United States Geological Survey (U.S.G.S.), American soda ash producers have increased annual production from 6 million tons in 1966 to 11.24 million in 1996.

Today, the effective capacity of the USA soda ash industry is 12.7 million tons/year. Production is currently 11.5 million tons/year, of which 4.5 million tons are exported.

American producers are proceeding with another round of expansions. Annual production capacity may increase by 3 million tons to a total of around 15 million tons by the millennium.

Once again, the industry is making a bold move through its plans for large scale expansion. The trend towards reduction in international trade tariffs and the increasing demand for soda ash by the rapidly growing consumer classes throughout the world are contributing to a positive outlook.



American Soda Ash Exports to World Regions in 1996

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