

# Industrial applications and market forecast of Caustic Soda

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### In brief

With the growth in industries including soaps, detergents, pulp & paper, and aluminum, the demand for caustic soda has increased significantly worldwide. The global caustic soda market will be registering an average annual rate of 5 percent.

With the growth in industries including soaps, detergents, pulp & paper, and aluminum, the demand for caustic soda has increased significantly worldwide. The global caustic soda market will be registering an average annual rate of 5 percent. The market for caustic soda is dominated by the Asia Pacific region, especially India and China. It is estimated that the North American market will grow at a faster pace even beyond 2024.

### What is caustic soda?

Caustic soda is the common name of sodium hydroxide (NaOH). It is corrosive and caustic and derives its common name from this property. It is a waxy and white solid in its pure form and forms aqueous solutions easily as it readily absorbs water.

Caustic soda is widely used in soaps, candles, homemade biodiesel, paper industries, frosting glass, and has numerous food and chemical applications. It should be kept in sealed containers as it reacts with water very quickly. The growth in demand for caustic soda in India will be driven primarily by the expanding textile industry.

### Processes Involved in the production of Caustic Soda

A variation of the electrolytic chloralkali process is used in the production of caustic soda. One of the most popular methods of producing caustic soda is through the Castner-Kellner process. However, make sure to use a safe and sealed cabin like the one offered by Storemasta to keep the components and chemical products for this process safe. This is because they can be corrosive and potentially dangerous if left in the open.

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### Castner-Kellner Process

Following are the various steps involved in the Castner-Kellner process: -

- Principle - By the electrolysis of NaCl (aqueous solution), NaOH (caustic soda) is prepared.
  - Equipment - Castner-Kellner cell which is a rectangular steel tank lined with ebonite. Titanium is at the anode. Cathode is the layer of mercury at the tank's bottom.
1. Ionization of NaCl-  $2\text{NaCl} \rightarrow 2\text{Na} + 2\text{Cl}^-$
  2. As the current flows through the brine, migration of negative and positive ions takes place towards their respective electrodes.
  3. Reaction at Cathode-

- $2\text{Na}^+ + 2\text{e}^- \rightarrow 2\text{Na}$
- $\text{Na} + \text{Hg} \rightarrow \text{Na}/\text{Hg}$
- $\text{Na}^+$  ions are discharged due to high voltage.

#### 4. Reaction at anode-

- $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$

#### 5. Formation of NaOH

- The amalgam thus formed moves to other chambers, where it reacts with water and produces NaOH in the liquid state. Evaporation of this solution results in the formation of solid NaOH or caustic soda.

- $2\text{Na}/\text{Hg} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2 + 2\text{Hg}$

The caustic soda thus produced is very pure.

## Industrial applications and increasing demand for caustic soda

Caustic soda is used in various industries, and the demand is expected to grow further. It is predicted that more than 266,000 tons of caustic soda will be manufactured in 2020 by GACL and NALCO, which are the two biggest manufacturers for caustic soda in Asia. Caustic soda has various industrial applications, including:

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- An extensive application is in industries of household products like soaps and detergents. It is used in the production of raw materials to clean drains and ovens.
- Production of various chemicals also uses caustic soda due to its reactive and corrosive nature. The chemicals can be both organic and inorganic.
- Caustic soda is also used in various other industries to produce alumina, pulp & paper, textiles, and water treatment. The rising use of tissue papers in homes has increased the demand for pulp and paper industries. The demand for caustic soda has also increased in the paper industry due to the increased use of printing and writing paper.
- With technological investment and increased development, the demand for caustic soda in the textile industry increases.
- It quickly reacts with aluminum and zinc because of its strong alkali nature and reactivity. This results in demand for caustic soda in metallurgical applications as well.
- The development of the alumina extraction industry has also led to the growth of the global caustic soda market.
- The use of caustic soda is also associated with the automotive industry because of its use in alumina smelting. Alumina is widely used in cars as it results in lightweight vehicles.

Caustic soda is used mainly in the pulping and bleaching process of the paper and pulp industry. It is also used in de-inking of waste paper and water treatment. The primary end-use industry application of caustic soda is in the production of alumina from bauxite. It is also utilized in the manufacturing of many chemicals. It is used to produce solvents, synthetic fibers, plastics, coating, dyes, and pharmaceuticals acting as an intermediate or a reactant in the process. It is also used in saponification and the manufacturing of surfactants for detergents.

## Market forecast of Caustic Soda

The global caustic soda market is predicted to grow at a CAGR of 5 percent by 2020 to reach \$2.42 billion.

The global caustic soda market will expand rapidly in the coming years. The Asia Pacific region has been the dominant region for the consumption of caustic soda. It has been estimated to grow further in the next few years due to high demand across the textile industry in countries like China, India, Taiwan, and Vietnam. China is the hub for the chemical processing industry in the Asia Pacific region and is also the biggest producer and consumer of caustic soda globally. India closely follows China as the second-biggest consumer of caustic soda in the Asia Pacific region. Still, the demand growth in India slowed down significantly due to demonetization in the years 2016-2017.

Organic and inorganic chemical formulations in 2017 formed 21 percent of the overall caustic soda demand globally. Demand for caustic soda in the North American market is also predicted to grow in the next few years. This is due to an increased demand for household products. The Middle East and Africa will grow at a moderate rate, whereas Latin America will observe slower growth rates over the next few years.

Low water levels in the European region have reduced the quantity of caustic soda produced.

Caustic soda is a highly corrosive substance and harms the environment. This acts as a massive impediment to the growth of the caustic soda market. Another significant constraint in expanding the caustic soda market is the high cost of investment in setting up a manufacturing plant. In such cases, importing caustic soda is much cheaper than manufacturing, which results in a fall in the supply of caustic soda from domestic suppliers.

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