

## Chlorine's Important Co-product: Caustic Soda

SOAPS AND DETERGENTS

Info...

Turning Salt

COTTON FABRICS

...AND MANY OTHER PRODUCTS

Caustic soda (sodium hydroxide), often referred to as caustic or lye, is the principal product that accompanies chlorine production. (For more details on chlorine, please see the insert *Chlorine Chemistry's Role in our Daily Lives*.)

# Chlorine's Important Co-product: Caustic Soda

Insoluble metal hydroxides, formed by reaction of caustic soda with wastewater metals, are removed physically as part of the wastewater pre-treatment process.

Caustic soda also may be used to neutralize acid mine drainage.

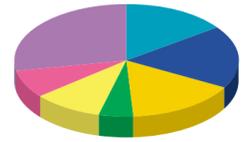
Caustic soda is co-generated with chlorine by electrolysis of sodium chloride brine using one of three most common industrial manufacturing technologies. (For more details, please see the insert *Chlor-Alkali Manufacturing Processes*.) In the electrolysis process, it is simultaneously produced in a fixed ratio of 1 tonne of chlorine and 1.12 tonnes of caustic. In 1998, worldwide production capacity of caustic soda was approximately 54 million metric tonnes.

Caustic soda is used in a wide variety of industrial applications. It is valued for its neutralizing power and is used to control and remediate acidic environmental pollution. As such, it is used in many processes for acid control, neutralization of waste acids and gas scrubbing.

In addition, like chlorine, it is used as an intermediate to produce numerous other products, such as sodium phenolate used in antiseptics and in producing aspirin and amyl alcohol used in the production of pharmaceuticals. (Please see inside for a detailed look at the end products.)

When air and water contact newly exposed sulphur-containing minerals during mining operations, the minerals rapidly oxidize, releasing damaging quantities of acidity, metals and other chemical components to the environment. Acid mine drainage is a major environmental hazard. Caustic soda is particularly effective for neutralizing low flows of acid mine drainage in remote locations and for treating flows having high manganese content.

### Caustic Soda End Uses



### Helping keep us clean

Caustic soda plays a significant role in the manufacture of powder soaps, bar soaps and detergents, with a considerable amount being used in the production of industrial and specialty soaps. Developing countries have a high demand for caustic soda since, in some countries, bar soaps are used almost

exclusively to wash clothes and for personal hygiene. Specialty soaps include oven and food preparation equipment cleaners, heavy-duty dishwashing detergents, industrial floor cleaners, metal cleaners, paint strippers and many other applications.

### Numerous diverse uses

Caustic soda is used in the production of cotton fabrics to help improve fibre strength and absorption of dyes. It is estimated that about 90 percent of cotton is treated using caustic soda. It also has a variety of uses in the food industry, to refine animal and vegetable oils to remove fatty acids and to peel potatoes, fruits and vegetables. In addition, it is used in the production of pulp and paper and aluminium. Significant amounts of caustic soda are also used for industrial and municipal water treatment.

### Helping in pollution control

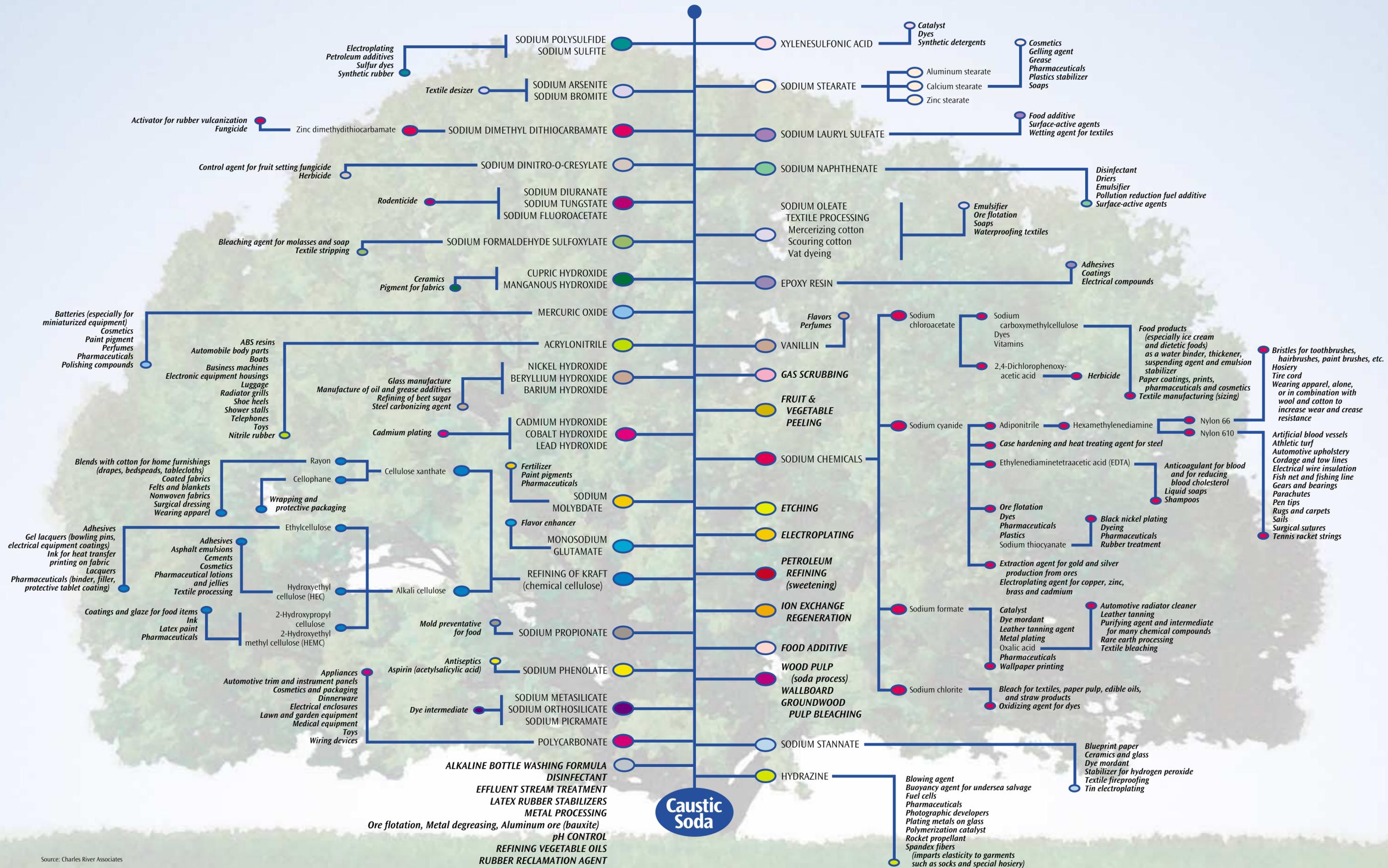
Because caustic soda is an alkaline compound, it is the chemical opposite of acids and is capable of neutralizing them. The neutralization reaction produces water and salt. Caustic scrubbers are air pollution control devices designed to make use of the alkaline properties of caustic soda. These systems neutralize acid gas stack emissions, thus helping to contribute to a cleaner environment.

In addition, metal plating facilities, for example, produce wastewater containing concentrations of dissolved heavy metals that must be removed prior to wastewater release to municipal sewers or receiving waters. This is typically accomplished by adding an alkaline chemical, such as caustic soda, to the wastewater.



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# Caustic Soda Chemistry and End Product Uses



Source: Charles River Associates

