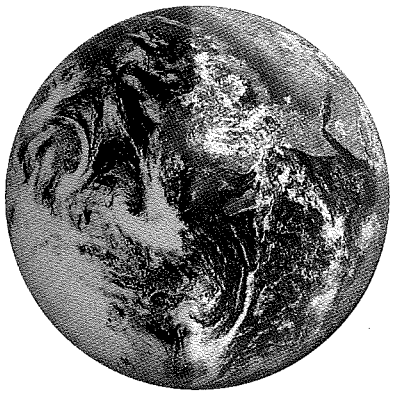
CHLORINE



DOES

A WORLD

OF GOOD

THE CHLORINE INSTITUTE

Since 1924, the Chlorine Institute has been the center of the chlor-alkali industry's efforts to ensure safety, health and environmental protection. The Institute's members have locations in nearly every state and Canadian province. They account for 99 percent of U.S. and Canadian production of chlorine and related alkali chemicals. That adds up to about 25 million tons of chlorine and caustic soda a year. It's a $5 billion business, employing more than 30,000 Americans and Canadians.

CHLORINE: A KEY TO MODERN LIVING

Chlorine opens doors to thousands of societal and public health benefits. Each time you drive your car, drink a glass of water, wear vinyl rain gear, take vitamins or put on perfume, chlorine is working for you.

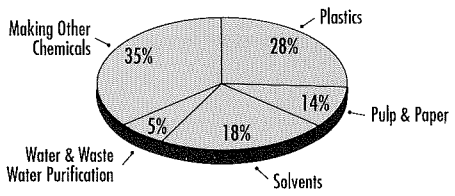
Did you know that when you read your newspaper or have your clothes dry-cleaned that you're taking advantage of chlorine's benefits? Chlorine strengthens and brightens our paper. It's also used in deodorants, paints, dyes, cosmetics, tires, photographic film, floor coverings, plaster, gasoline, textiles, airplanes and even rocket fuel! Chlorine is a cornerstone of today's standard of living.

Chlorine is often referred to in the scientific community as a building block. In fact, *Chemical & Engineering News* proclaimed chlorine "the single material on which production of other

chemicals most depends." That explains why chlorine ranks among the top 10 in volume of all chemicals produced in the world. And chemicals are an extremely large U.S. export product and play an important role in U.S. trade deficit reduction.

HOW CHLORINE IS USED

Every year, approximately 12 million tons of chlorine are produced in North America. The greatest volume of chlorine (35 percent) is used in the production of other important chemicals, including those used to make pharmaceuticals. Plastics (particularly polyvinyl chloride or PVC) consume more than 25 percent of the yearly output. A significant amount of chlorine is used to produce solvents for metalworking, dry cleaning and electronics (18 percent). More than 10 percent of chlorine is used for pulp and paper bleaching.



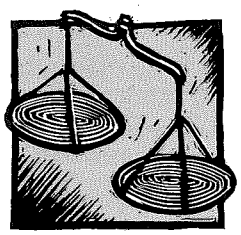
Chlorine also is widely used in drinking water purification and waste-water disinfection.

WHAT IS CHLORINE?

Chlorine, one of our planet's basic elements, is a gas at room temperature. It usually is found in nature only in combination with other materials, such as sodium. Together, chlorine and sodium form table salt (sodium chloride). Plants and animals have the chlorine atom within their biological systems. Chlorine also is part of myriad manufactured products.

The most common method of making chlorine is by passing an electric current through a saltwater solution. The solution separates into chlorine and two other useful products—sodium hydroxide (also known as caustic soda or lye) and hydrogen.

CHLORINE'S PROPERTIES



Chlorine is two-and-a-half times heavier than air. Liquid chlorine is one-and-a-half times heavier than water.

Chlorine is nearly colorless in low concentrations. As concentration increases, it takes on a greenish-yellow hue. Liquid chlorine is amber.

Chlorine has a pungent odor that is easily detectable at very low concentrations (less than one-part chlorine per million parts of air).

Chlorine is neither explosive nor flammable. However, it reacts readily with many materials and can support combustion as does oxygen. It is only slightly soluble in water.

DISCOVERING CHLORINE'S USES

Chlorine's potential was recognized only a few years after its discovery in 1774 by Swedish pharmacist Carl Wilhelm Scheele. During the late 1700s, the French realized chlorine's usefulness as a fabric whitener when dissolved in water. Experimentation with chlorine continued through the 1800s. However, not until the early 20th century did scientists discover chlorine's many health and societal benefits, especially in water disinfection.

In 1908, Jersey City, N.J. began to use chlorine on a large scale to treat its water. Soon after, other major cities around the country began to purify water with chlorine. The public health benefits of chlorination quickly became known. After chlorine's introduction into the public water supply, deaths from typhoid in the United States dropped dramatically from 25,000 in 1900 to less than 20 in 1960 to virtually none today.

TAP INTO GOOD HEALTH

Because the vast majority of the U.S. and Canadian drinking water supply is disinfected by chlorine, more than 200 million Americans and Canadians consume chlorinated water daily. Chlorine plays a vital role in public health. In fact, it is generally recognized that our safe, chlorinated, water supply is one of the most important public health advances of the 20th century.

In addition to its power to disinfect, chlorine also controls the color, taste and odor of drinking water. Thanks to chlorine, safe and clean drinking water is at our fingertips.

OTHER HEALTH BENEFITS

Chlorine improves human health in other ways, too. Chlorine-based compounds are used in the production of medicines to treat diseases such as malaria and leukemia. Chlorine disinfects swimming pools, and chlorine compounds are widely used to maintain hospital cleanliness. And thanks to chlorine-based agricultural chemicals, society can count on a plentiful source of reasonably priced fruits and vegetables.

PVC VINYL—THE MOST VERSATILE PLASTIC

Today, more than a quarter of all chlorine is used in the production of vinyl (polyvinyl chloride or PVC) and other plastic materials such as polyurethanes and polycarbonates.

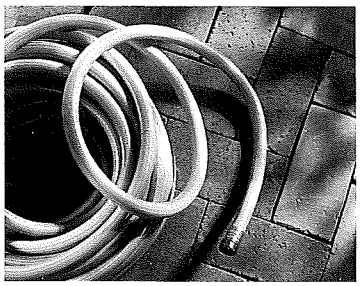
Vinyl is composed of two simple building blocks: chlorine, derived from common salt, and ethylene, from crude oil.

Vinyl is durable and resistant to abrasion, corrosion and moisture. The world's second largest-selling plastic, vinyl also is easy to clean, stain resistant and can be colored throughout. In addition to its durability and versatility, PVC is economical—another reason why cost-conscious builders frequently choose it over other construction materials.

PVC's Many Uses

In construction, vinyl is found in water pipes, house siding, gutters, floor tile, electrical wire and cable insulation, window treatments and wall coverings.

Flexible vinyl film is a leading packaging material for wrapping meats and produce and for tamper-proofing over-the-counter medications and food products. It also is used in parts for appliances and automobiles and in shower curtains, window shades, garden hoses and credit cards.

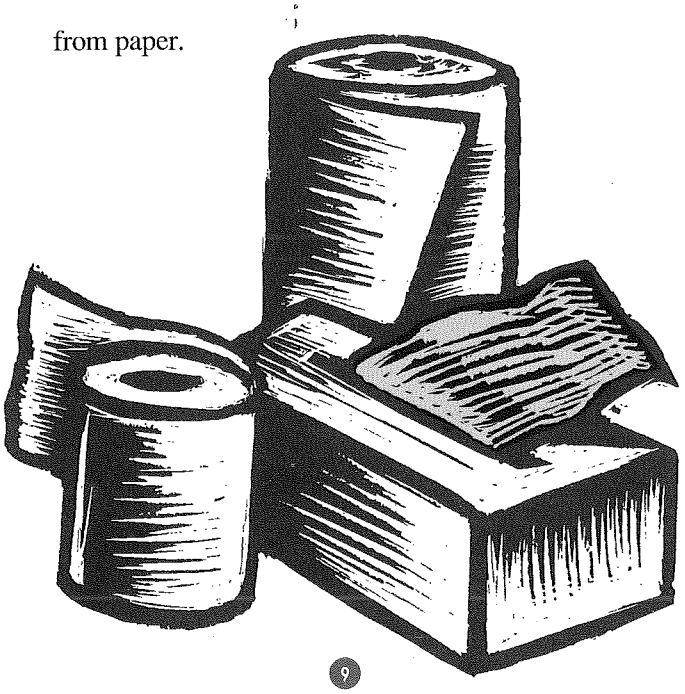


And in the field of medicine, vinyl is used for blood bags, heart catheters and medical tubing.

PAPER PRODUCTION

Chlorine and chlorine-based products have been used by the pulp and paper industry for many years to efficiently and economically make a variety of high-quality paper products.

Chlorine helps produce strong, soft paper for personal-care products like facial and toilet tissues and disposable diapers. Chlorine also helps dissolve impurities and removes unpleasant odors from paper.



CHLORINE AND THE ENVIRONMENT

The chlorine industry acknowledges its responsibility to protect the environment. That responsibility extends beyond chlorine production sites to the air, the water and communities we all share.

That's why the chlorine industry plays a proactive role in environmental protection—by setting rigorous guidelines for itself and working hard to reduce to an absolute minimum any risk to the the work place or surrounding communities. Chlorine plants closely monitor air and water quality. Water is tested before it returns to its natural waterways, and valves and pipes are regularly checked for emissions. These safety checks are industry-wide routines.

INDUSTRY SAFEGUARDS

The chlorine industry takes safety very seriously throughout the chlorine lifecycle—from production to transport to final use. The chlorine industry develops and implements extensive safety measures to protect communities, employees and the environment.

Employees' commitment to safety is reflected in the industry's excellent track record. Employees undergo comprehensive safety training that enables them to detect unsafe conditions on the job. They constantly are on the lookout for potentially dangerous situations. Chlorine companies also safeguard employee health by providing employees with frequent medical examinations and work-place air-monitoring tests.

The chlorine industry fosters an open and constructive relationship with government agencies to establish industry-wide regulations.

For example, the chlorine industry works with U.S. and Canadian federal transportation authorities to ensure the safe transport of chlorine. Chlorine is transported in specially designed containers that have valves and fittings designed to rigorous guidelines helping ensure leak-proof delivery of chlorine.

CHLOREP

In spite of the precautions taken, the chlorine industry recognizes that chlorine emergencies still can occur. The industry has developed the Chlorine Emergency Plan (CHLOREP) to deal with them. Some 250 trained teams of employees at chlorine plants around the United States and Canada are ready to respond quickly to any chlorine emergency seven days a week, 24 hours a day. All CHLOREP team members are trained experts, equipped with special emergency kits designed to seal leaks in chlorine containers.

CHLOR-ALKALI CHEMICAL USES FROM ADHESIVES TO ZIRCONIUM

Adhesives
Aerospace Parts
Air Conditioning
Aircraft
Air Pollution Control
Aluminum Making
Anesthetics
Antifreeze
Appliance Coatings
Artificial Joints
Auto Making
Bactericides
Bleaches
Brake Fluids
Ceramics
Conveyer Belts
Cosmetics
Crop Protection
Deodorant
Detergents
Disinfectants
Dispersants
Drinking Water
Dry cleaning
Dyes
Electrical Cable
Electronics
Explosives
Fire Extinguishers
Flame Retardants
Floor Coverings
Food Additives
Food Processing
Fumigants
Gasoline
Germicides
Glass Making
Hose
Household Cleaners
Hydraulic Fluids
Hygienic Packaging
Insulation
Leather Processing
Machinery Oils
Medical Implants
Medications
Metal Processing
Mining
Missiles
Mothproofing
Nuclear Reactors
Oil Processing
Paints
Paper Making
Perfumes
Photographic Film
Pigments
Pipe
Plaster
Plastics
Protective Coatings
Rain Gear
Refrigeration
Rocket Fuels
Sanitizing
Sealants
Sewage Treatment
Soft Drinks
Solvents
Steel Making
Swimming Pool Treatment
Synthetic Rubber
Textiles
Tires
Toys
Transmission Fluid
Vitamins
Wall Coverings
Wood Preservatives
Zirconium for Heat-Resistant Metals

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