MICHAEL P. WALLS
VICE PRESIDENT
REGULATORY & TECHNICAL AFFAIRS

June 24, 2019

Mr. Adam Fischer
Legislative Clerk
Committee on Energy and Commerce
2125 Rayburn House Office Building
Washington, D.C. 20515

Re: Questions for the Record Dated June 5, 2019

Dear Mr. Fischer:

Attached are my responses to the additional questions for the record following the Subcommittee on Environment and Climate Change May 8, 2019 on a proposed ban on asbestos for all uses, including uses in the chlor-alkali industry.

Please let me know if you have any questions.

Sincerely,

Attachment

cc: Energy and Commerce Committee Chairman Frank Pallone
Energy and Commerce Committee Ranking Member Greg Walden
Subcommittee on Environment and Climate Change Chairman Paul Tonko
Subcommittee on Environment and Climate Change Ranking Member John Shimkus

Subcommittee on Environment and Climate Change
Hearing on
"Ban Asbestos Now: Taking Action to Save Lives and Livelihoods"
May 8, 2019

Mr. Mike Walls, Vice President of Regulatory and Technical Affairs
American Chemistry Council

The Honorable John Shimkus (R-IL)

1. You provided some brief information on the economic impacts that H.R. 1603 would have on the chlor-alkali industry. Since more than one-third of our nation's domestic chlorine and caustic soda production is predicated on the use of asbestos diaphragm technology, please provide, if available, a more comprehensive economic analysis of the impact of H.R. 1603 if it were to become enacted.

   RESPONSE: Attachment A summarizes the results of the American Chemistry Council's analysis of the economic impact of a proposed ban on asbestos use in the chlor-alkali industry. As noted in my testimony, we estimate the impact of such a ban to jeopardize more than 155,000 jobs, and $63 billion in manufacturing output.

   Significantly, a ban on asbestos use in chlor-alkali production would materially affect disaster relief, notably where a steady-supply of chlorine-based products are necessary for disinfection to protect public health. Attachment B details some of the recent examples where the industry's products have helped aid in recovery from natural disasters.

2. Please provide a full description of the chlor-alkali manufacturing process which uses asbestos diaphragm technology, with an emphasis on explaining the importation, packaging, processing, transportation, handling, use, and disposal of asbestos. Please also describe the human exposure potential in these circumstances and actions taken to limit that exposure potential to asbestos, including required asbestos safety standards, procedures, processes, or equipment.

   RESPONSE: Attachment C details the asbestos diaphragm technology process, including details on the import, packaging, processing, transportation, handling, use and disposal of asbestos in chlor-alkali manufacturing. The attachment includes a single page summary of the chlor-alkali process controls and protections involving asbestos.

3. Your testimony mentioned a few of the downstream consumer products that would be negatively impacted by H.R. 1603 because they are associated with or rely upon chlorine and caustic soda. Please provide the most comprehensive listing that you have of products known to be dependent on chlorine and caustic soda.

RESPONSE: Attachment D includes a summary listing of the products that rely on chlorine (the products of the chlorine "tree"). Because caustic soda is a co-product of chlorine –for every unit of chlorine produced, caustic soda is also produced – the material also includes a description of the products that rely on caustic soda (otherwise known as sodium hydroxide).

4. Chlorine-based disinfectants are widely known and commonly used for sanitation purposes and protect public health – something that was talked about in the hearing.

   a. Please provide all known examples of this use.

      RESPONSE: Attachments B and D address many of the products of chlorine that are used in disinfection and public health protective uses, including chlorine-based disinfectants such as liquid bleach and granular chlorine, as well as pharmaceuticals.

   b. What impact would a significant disruption in domestic chlor-alkali production have on these uses?

      RESPONSE: As noted in my testimony, a ban on asbestos use in chlor-alkali production would jeopardize over one-third of the nation's chlorine supply. As detailed in Attachment B, chlorine-based disinfectants protect public health and support important disaster relief functions. Without a reliable and steady supply of chlorine disinfectants would disrupt the availability of these products, especially in the critical circumstances following a natural disaster. As further detailed in Table II of Attachment A, the annual economic benefits of chlorine chemistry in pharmaceutical uses alone is over $320 billion; while the economic benefit of disinfectant uses is over $5 billion annually. A ban on asbestos use in chlorine production would put those economic benefits at serious risk.

American Chemistry Council

Economic Impacts of an Asbestos Ban on the Chlor-Alkali Industry and U.S. Economy

Chlorine and sodium hydroxide ("chlor-alkali") production provides significant economic benefits in the United States. As building block chemicals, they are critical to many industries and products that are essential to multiple economic sectors, including healthcare, energy, agriculture, technology, and more.

Thirty-six percent of domestic chlor-alkali production relies on chrysotile asbestos diaphragm technology. Thus, a blanket ban on all uses of asbestos would curtail over one-third of production causing serious and immediate economic consequences. Because of the many downstream uses of chlorine and sodium hydroxide, a reduction in its supply would not only impact the direct chlor-alkali manufacturing jobs, but would ripple across the U.S. economy and jeopardize 155,000 jobs, $9.74 billion in wages, and $63.0 billion in output. Table I details these economic impacts.

TABLE I	Employment	Payroll ($ bill)	Output ($ bill)
Direct	18,519	$2.00	$22.4
Indirect (Supply Chain)	67,784	$4.70	$29.1
Payroll-Induced	68,956	$3.04	$11.5
Total	**155,259**	**$9.74**	**$63.0**

Analysis of upstream economic impacts was done with the IMPLAN model, using industry spending patterns and output-to-labor ratios. ***Direct*** *– Jobs, wages, and output generated from chlor-alkali manufacturing;* ***Indirect (Supply Chain)*** *– Jobs, wages, and output created by businesses in the chlor-alkali downstream supply chain;* ***Payroll-Induced*** *– Jobs, wages, and output supported by the household spending of wages and salaries of direct and indirect employees.*

Additionally, due to the physical properties of elemental chlorine it can only be shipped by land, limiting imports to Canada and Mexico. In North America, 93 percent of chlorine is produced in the U.S., with Canada and Mexico producing 3 and 4 percent, respectively. The demand for chlorine could not be met by imports. The U.S. is a net exporter of sodium hydroxide; an asbestos ban would eliminate the trade surplus and encourage more imports of caustic soda and its derivatives.

Consumers benefit greatly from chlorine and its downstream products. If chlorine did not exist, consumers would either have to find substitutes when possible, or forgo the product altogether when alternatives do not exist, such as with many pharmaceuticals. Table II details the annual economic benefits to U.S. and Canadian consumers from chlorine chemistry. Full reports that elaborate on these economic benefits can be accessed at https://www.elementofsurprise.org/resources/

TABLE II	$ bill.
Pharmaceuticals	$320.0
Crop Protection	$26.0
Silicon/Silicones	$23.0
PVC	$15.0
Water Treatment	$10.0
Titanium/Titanium Dioxide	$7.7
Fluorocarbons	$6.9
Bleaches and Disinfectants	$5.5
Polyurethanes	$4.6
Total	**$418.7**

Source: IHS Markit

American Chemistry Council

Chlorine-Based Disinfectants Protect Public Health and Provide Disaster Relief

Chlorine-based disinfectants are necessary to protect public health. In 1997, *Life* magazine stated "[t]he filtration of drinking water plus the use of chlorine is probably the most significant public health advancement of the millennium." In addition to drinking water disinfection, chlorine-based disinfectants are key to surface disinfection in healthcare facilities, schools/daycares, restaurants, homes, and more to help prevent the spread of diseases. Also, following a natural disaster, chlorine-based disinfectants assist in safely rebuilding homes and communities.

Some recent real-world examples of the importance of chlorine-based disinfectants occurred after Hurricanes Harvey and Maria battered the U.S. and Puerto Rico in 2017. Once the storms passed, many homes were flooded. The moist environment creates a breeding ground for mold and bacteria, which can pose serious health risks to individuals. Airborne mold spores can be inhaled by people and cause lung infections, permanent neurological issues, and allergies. Bacteria can also cause infections. Chlorine-based disinfectants, such as liquid bleach and granular chlorine, are effective at destroying mold and bacteria and controlling any subsequent regrowth. Thus, these disinfectants are one of the first items needed in the recovery process to decontaminate surfaces. As such, they are highly sought after and can be difficult to obtain after a natural disaster.

To aid in the recovery from Hurricane Harvey and Maria, the Chlorine Chemistry Foundation (CCF), working with safe water partners and volunteers on the ground, provided chlorine-based products to communities most impacted by the hurricanes. After Hurricane Harvey, CCF funded a donation of 18,500 gallons of bleach to Houston, TX. Once the bleach was sent to Houston, the U.S. Conference of Mayors enabled its distribution to the areas that needed it most.

After Hurricane Maria, both Florida and Puerto Rico were in need of chlorine-based disinfectants. CCF funded the donation of over 8,700 gallons of bleach and partnered with World Vision to distribute the bleach in Florida. In Puerto Rico, CCF provided funding for 4,000 pounds of granular chlorine. World Vision enabled the transport of the product to Puerto Rico and Water Engineers for the Americas (WEFTA) distributed the product to communities and trained community leaders on how to use the product safely. Approximately 10,000 people were helped by this effort in Puerto Rico.

Hurricanes and other natural disasters cannot be stopped; however, a steady supply of chlorine-based disinfectants, and dedicated partners that enable their distribution and safe use, can help people impacted by natural disasters recover and rebuild. A ban on chrysotile asbestos for use in the chlor-alkali industry would disrupt over one-third of the domestic supply of chlorine, which in turn would jeopardize the important role chlorine-based disinfectants have in protecting public health during both routine and post-disaster times.

Executive Summary

The use of chrysotile asbestos is key to the manufacture of chlorine and caustic soda in the United States. The chlor-alkali industry recognizes the inherent properties of this mineral, and from its entry into a port in the United States to its ultimate disposal, the management of chrysotile asbestos in the chlor-alkali industry is highly regulated and managed in a closely controlled process.

Chrysotile asbestos arrives in the United States in sealed containers, is stored in controlled areas, processed with dedicated equipment, and disposed of in accordance with Federal, State and local requirements. While a variety of regulations generally cover hazard communication, release reporting, waste management, etc. of chrysotile asbestos, the Federal government has issued two specific rules that govern the safety of workers and the protection of the environment. These are the Occupational Safety and Health Administration's (OSHA) Standard for Toxic and Hazardous Substances, Asbestos (29 CFR § 1910.1001) and the Environmental Protection Agency's (EPA) National Emission Standard for Hazardous Air Pollutants (NESHAP), National Emission Standard for Asbestos (40 CFR § 61.140). Additionally, the industry follows the procedures set forth by Chlorine Institute Pamphlet 137, "Guidelines: Asbestos Handling for the Chlor-Alkali Industry."

Worker safety is paramount in the management of chrysotile asbestos and nowhere in the chlor-alkali process does a person come into direct contact with dry material while not wearing appropriate personal protective equipment (PPE). We estimate that about 100 workers industry-wide across the United States process chrysotile asbestos on a day-to-day basis. Specific training, PPE and work practices govern how they conduct their work activities. Even though they wear PPE, the workplace is monitored for chrysotile asbestos and employees are afforded specific medical monitoring and surveillance. These activities, coupled with equipment maintenance and management of the workplace environment, form an overall comprehensive chrysotile asbestos management program that is specifically aimed at eliminating any potential exposure to chrysotile asbestos by personnel and the environment.

The following text provides specific information on the management of chrysotile asbestos by the chlor-alkali industry in the United States.

Supply Chain

Chrysotile asbestos is shipped to the United States in 40 kilogram bags. Typically, twenty (20) bags are placed on a pallet. The pallet is covered completely in a heavyweight wrap; it is very durable and similar in thickness to a drum liner. At the port of shipment, the pallets are placed in a shipping container. The shipping container is sealed and protected from accidental or purposeful opening with a heavy duty bolt-type car seal. The car seal can only be removed using a substantial cutting tool like a bolt cutter or similar device.

At the port of entry, the shipping container is removed from the ship and placed on the deck. It is not opened and material is not transloaded to a different trailer or conveyance. The shipping container is marked per Department of Transportation requirements and is transported to a chlor-alkali facility where the pallets and bags will be removed. This process ensures that workers and the ambient environment are protected from an accidental release of material.

Shipping Container   "Bolt-Type" Car Seal

Chlor-alkali facilities will not accept a shipment unless a current Safety Data Sheet is available from the supplier, and moreover, will not accept a damaged shipping container.

Material Delivery

Upon delivery to a chlor-alkali facility, the chrysotile asbestos shipping container is inspected before unloading. As with the entire handling experience, strict adherence to process, procedures and housekeeping is followed for container inspection. Once the container has been opened, pallets and bags are inspected. If broken bags or loose chrysotile asbestos is evident, the area is controlled to prevent accidental exposure, the bags are repaired, and the area is barricaded and treated as an area requiring immediate cleanup.

The plastic wrapped pallets are labeled, and as required by OSHA's Hazard Communication and Asbestos Standards contains the following language:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

In the event that a container is damaged, port or warehouse personnel must repair the container and manage their remediation activities in conformance with OSHA's Asbestos rules.

Container Upon Opening   Container Partially Unloaded   Empty Clean Container

Personnel involved in the cleanup wear specific PPE, including respirators and protective clothing and footwear. Once the shipping container has been emptied, it is inspected and cleaned as necessary.

Any loose chrysotile asbestos is cleaned up using a High-Efficiency Particulate Air (HEPA) filter-equipped vacuum cleaner or is wetted with water and cleaned up before unloading proceeds. Broken bags are placed in an appropriately labeled, heavy-duty plastic bag or they are securely repaired. Individuals not involved in the cleanup are prohibited from entering the area until cleanup is completed.

When moving chrysotile asbestos to its storage location, care is taken to ensure that bags are not punctured. The unloading personnel are trained per regulatory requirements prior to any unloading activity. Personnel moving chrysotile asbestos containers wear specific PPE, including respirators and protective clothing.

Storage

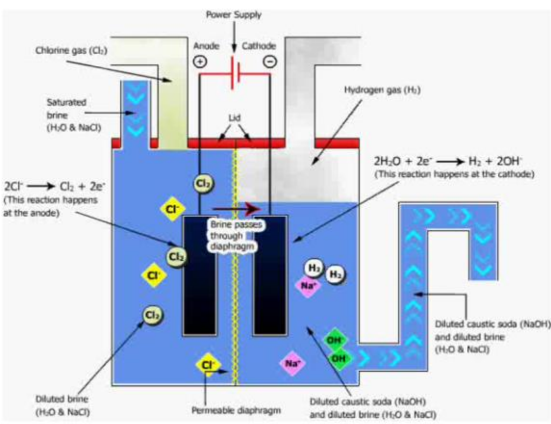
Chrysotile asbestos is stored in an isolated, enclosed area with restricted access (e.g., a locked building). The area is also provided with signage for awareness of entry only by authorized personnel.

Secure Storage Room - Exterior

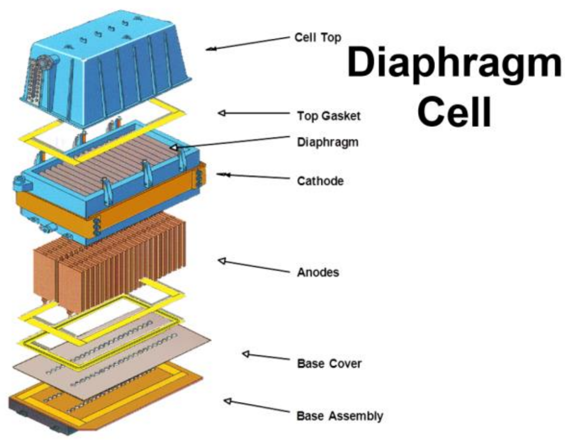
The storage area is secure, properly maintained and inspected on a regular basis. The standard for cleanliness is high - _any_ area or surface that exhibits signs of chrysotile asbestos is cleaned with a HEPA filter-equipped vacuum cleaner or by wetting the fibers and cleaning up the spill. Personnel involved in the cleanup are required to wear specific PPE as stated earlier (respirators, protective clothing, etc.).

Chrysotile Asbestos Processing

The diaphragm cell chlor-alkali process involves separation of the sodium and chlorine molecules of salt via electricity to produce sodium hydroxide (caustic soda), hydrogen, and chlorine. Specifically, brine (an aqueous solution of salt) is passed through an electric current and sodium hydroxide, hydrogen and chlorine are formed. Key to the diaphragm cell process is the electrolytic cell. It is in this cell that the electrolytic reaction occurs. The cell contains two compartments separated by a permeable diaphragm, which is made mostly of chrysotile asbestos. The diaphragm prevents the reaction of the caustic soda with the chlorine and allows for the separation of both materials for further processing. The use of chrysotile asbestos in the chlor-alkali industry is solely related to its use as a diaphragm in an electrolytic cell and has been safely done for many decades.



Electrolytic Cell Diagram



Electrolytic Cell Construction

The preparation of diaphragms is key to the electrolytic cell process, and how this is accomplished is tightly controlled. The process involves the following steps:

- <u>Raw Material Management</u> - Chrysotile asbestos is only removed from the secure storage area when it is needed for the diaphragm preparation process. The required bags of asbestos are moved to a designated area with limited access. The bags selected to be opened are placed in a glove box or hood prior to being opened.

Storage in Secure Area

Glove Box

The use of respiratory protection is required to protect the employee in the event of an unforeseen circumstance since the chrysotile asbestos is in a dry state when handled. During these activities, the employees are also required to wear protective clothing.

Empty bags are deposited in a closed and labeled waste container through a port in the glove box. When only partial contents of a bag are required, the partially filled bag is stored within the glove box. If partially filled bags must be moved outside the glove box, they are resealed and HEPA filter equipment-vacuumed before they are moved. Waste containers are likewise sealed and vacuumed prior to removal.

Chrysotile asbestos from the glove box is transferred to a mixing tank via a closed system that is maintained under vacuum. The chrysotile asbestos to be used to create a diaphragm is mixed with a liquid solution of weak caustic soda and salt. The slurry is created in the mixing tank and this process is typically referred to as creating a chrysotile asbestos slurry. At this time, chrysotile asbestos is no longer in the dry form and accordingly is no longer likely to become airborne. Halar® or Teflon™ fibers (e.g., modifier) are added to the chrysotile asbestos slurry in appreciable quantities. This material then co-deposits in the diaphragm and, upon heating in an oven, the Halar® or Teflon™ fibers sinter and fuse to the chrysotile asbestos rendering the diaphragm non-friable. The slurry is then transferred to a depositing tank for diaphragm preparation. Any visible wet chrysotile asbestos in and around the mixing or depositing tanks is removed before it is allowed to dry.

- <u>Diaphragm Preparation</u> - The creation of a diaphragm requires that the chrysotile asbestos slurry be applied to a specifically designed metallic screen or perforated plate. Vacuum is applied so as to allow for uniform application of the slurry across the screen. Once this is complete the slurry-containing mesh is drained and free water removed (chrysotile asbestos is still wet). After this, the screen is placed in an oven to fuse the chrysotile asbestos deposit. During this process, the chrysotile asbestos and modifier slurry hardens and becomes fused on the screen to form a diaphragm. After it has cooled, it is ready for installation in the electrolytic cell.

Close Up - Final Electrolytic Cell Diaphragm

The fused diaphragm is hard and the chrysotile asbestos contained in it remains in a non-friable state. The amount of chrysotile asbestos used for each diaphragm is in the range of 50-250 lbs. depending on the cell size. A typical chlor-alkali production plant will use about 5-25 tons per year of chrysotile asbestos depending on cell size and technology.

Diaphragm Installation - Once the diaphragms have been created, the deposited screens are inspected, physically joined with another part of the electrolytic cell and sealed. The cell can then be placed in service.

Single Electrolytic Cell

Electrolytic Cell "Circuit"

The process described above occurs in a designated area in the facility and access is restricted. PPE is worn throughout this process by anyone who works in the designated area.

Personnel are required to decontaminate their PPE and equipment to prevent exposure to skin and hair and inhibit the transfer of chrysotile asbestos fibers from designated areas to other areas of the facility. Facilities have procedures in place to prevent contamination of footwear upon building entry and exit. Additional procedures have been established for entry and work in designated areas that contain wet chrysotile asbestos to prevent contamination of skin, clothing, and footwear. These work procedures include decontamination of work clothes and footwear, use of disposable coverings, and controlling access of personnel and visitors wearing personal footwear. Outer clothing and footwear is decontaminated or discarded whenever the employee exits a designated area. Individuals working in such areas are not allowed to keep contaminated work clothing and personal clothing in the same storage area.

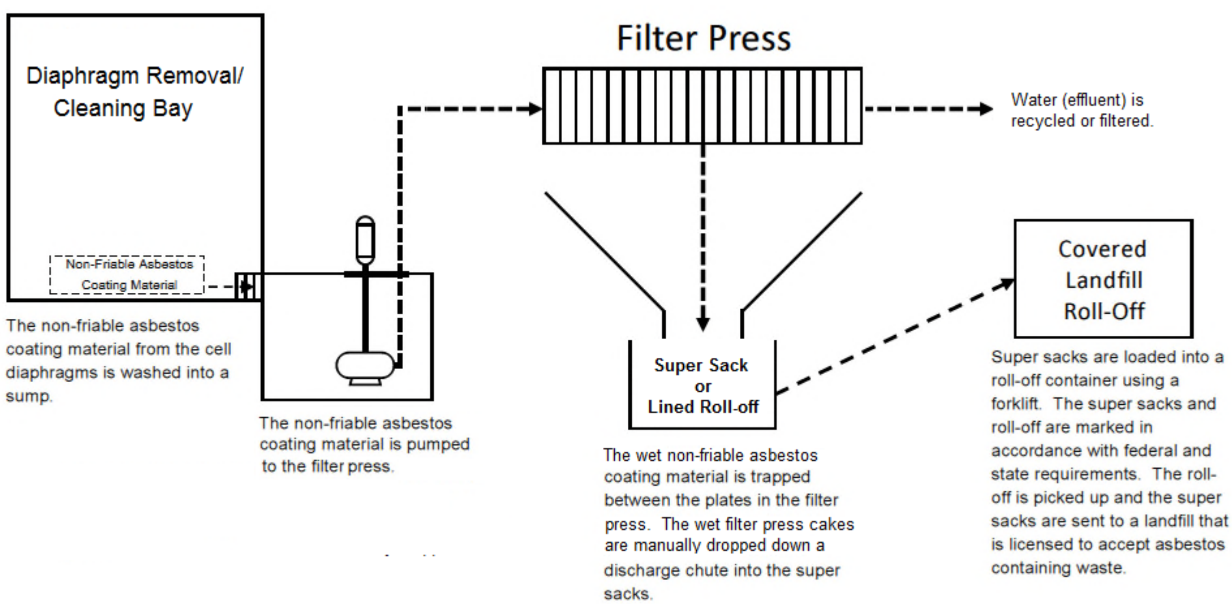
Care is taken to ensure that all surfaces are maintained free of chrysotile asbestos-containing material, debris and accompanying dust. The movement of chrysotile asbestos by mechanical (brush, broom) and pneumatic (compressed air) means is prohibited. Personnel are trained to recognize that dry chrysotile asbestos must not be disturbed and that HEPA filter-equipped vacuums must be used to collect or clean up dry chrysotile asbestos. Wet management methods are allowed if HEPA filer-equipped vacuum or local HEPA exhaust ventilation is not available.

Management of Diaphragms

Diaphragms may last a year or more before they become inefficient and need to be removed from service. While most of the electrolytic cell parts, including the screen on which the diaphragm is situated, are reusable, the chrysotile asbestos diaphragm itself is not.

In order to reuse the parts of the cell it must be disassembled and the chrysotile asbestos diaphragm must be removed. The diaphragm, which is still hard and fused to the screen, is removed with a hydroblasting apparatus. The cleaning bay is an enclosed area and constructed to minimize potential emissions and allow for effective cleanup. Fluid from the hydroblasting operation is contained.

After each use of the cleaning bay, the work surfaces are flushed and cleaned with water. A filtration system is used to remove chrysotile asbestos from the hydroblasting water prior to discharging the water to the facility's wastewater collection and treatment system. The filtered waste material is stored in properly sealed containment areas prior to disposal.



Management of Chrysotile Asbestos Wastes

Chrysotile asbestos wastes (chrysotile asbestos separated from the hydroblasting water, containers and bags, chrysotile asbestos contaminated clothing, etc.) are placed in a labeled, plastic lined impervious container. An approved landfill is used for disposal of chrysotile asbestos wastes in compliance with Federal NESHAP (40 CFR § 61.154) and applicable State regulations for chrysotile asbestos disposal.

Chlor-Alkali Process Controls and Protections

The safety and health of workers is the top priority. In order to safely handle and work with chrysotile asbestos, engineering controls, PPE, training and medical surveillance are used to meet strict OSHA and EPA requirements.

- Engineering Controls - According to OSHA, engineering controls implement physical change to the workplace, which eliminates/reduces the hazard of the job/task. When the use of a substance cannot be eliminated or substituted, the use of engineering controls is considered to be the most effective means of controlling workplace hazards. For this reason, the chlor-alkali industry has adopted three significant systems of engineering controls: wet methods, ventilation, and glove boxes (or a similar enclosed system).

  Activities that have the potential to generate friable/dry chrysotile asbestos (e.g. diaphragm preparation and cell renewal) are performed using wet methods. When chrysotile asbestos is no longer in the dry form (i.e. wetted), it is no longer likely to become airborne.

  Exhaust ventilation or dust collection is used to maintain exposures at or below permissible levels. A typical dry room and the glove box are both under vacuum and routed to a baghouse containing a HEPA filter. The filters in the baghouse meet or exceed OSHA requirements. When vented after the filter, visible emissions monitoring inspections are performed as required by EPA's Asbestos NESHAP.

  A glove box is a sealed compartment similar to those which are used in laboratories and allows personnel to use secure gloves and open the bags without actually touching or being in direct contact with the material. The glove box operates under a vacuum to ensure all fibers are contained and vented to a high efficiency filter.

- Personal Protective Equipment (PPE) - The engineering controls used by the chlor-alkali industry are sufficient to control chrysotile asbestos emissions. However, employees handling chrysotile asbestos are required to wear PPE as an additional precaution to ensure no exposure. PPE includes respiratory protection, disposable gloves and suits, and appropriate footwear (e.g. rubber boots). Each facility requires the use of protective clothing and decontamination procedures to prevent skin and hair contamination and to prevent the transfer of asbestos fibers from designated areas to other areas of the facility. Based on the results of PPE Hazard Assessments, each plant determines required PPE by task based on OSHA requirements and corporate procedures.

- Employee Training - Workers who may be exposed to chrysotile asbestos receive training on appropriate procedures for moving and handling chrysotile asbestos, required PPE, decontamination procedures, and other applicable topics. Training is given initially prior to or at the time of initial assignment to work in designated areas and periodically thereafter, but at least once every three years.

- Medical Surveillance - The OSHA Asbestos Standard requires that the employer establish a medical surveillance program for those employees who are or may be exposed to airborne concentrations of fibers of asbestos at or above the time weighted average (TWA) and/or excursion limit. Therefore, all employees who have the potential to work in a designated area are offered medical examinations at the time of placement into the designated area, annually and upon termination of employment.

The medical examination will include height, weight, blood pressure, heart rate, and a physician's written opinion. A health history is completed with each exam with a special emphasis on respiratory, cardiac, and digestive systems as required by OSHA (29 CFR § 1910.1001). A respiratory disease questionnaire is also completed for each exam. Laboratory testing, including a chest roentgenogram (x-ray) and pulmonary function test (PFT), also known as spirometry or lung function test, is required as part of the medical exam.

There are no known instances of chrysotile asbestos-related disease for chlor-alkali industry employees in the United States based on work in designated areas.

- Personnel Monitoring - Personnel monitoring (eight-hour TWA shift monitoring and specific task monitoring) is conducted to provide quantitative exposure data, verify functionality of engineering controls, determine medical surveillance, define designated areas, and demonstrate compliance with all Federal and State laws and regulations. The monitoring frequency is based on past results, job observations, and planned inspections, and meets all OSHA requirements.

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Chrysotile Asbestos Diaphragm Construction


Shipping Container

1 The port of entry receives asbestos in sealed shipping containers. The material is packaged in dust-proof woven plastic bags on wooden pallets that have been shrink-wrapped in plastic. The container is marked per DOT requirements and is shipped to the plant unopened.

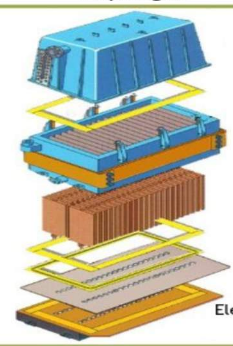
2 Asbestos is unloaded and stored in an isolated, enclosed area with restricted access limited only to trained personnel per OSHA regulations.

3 Raw asbestos is transported in the dust proof woven plastic bags to a glove box as needed for diaphragm preparation. Personnel monitoring is conducted for full shifts and specific tasks based on job observations or planned inspections.


Glove Box

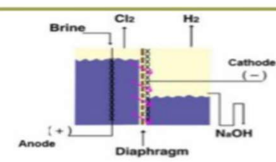
4 Asbestos is mixed with caustic soda and salt to create a "slurry." Halar or Teflon modifiers are added to the slurry to allow for handling/storage in a dry non-friable form.

5 The asbestos slurry is deposited onto a screen and is heated in an oven to sinter the Halar or Teflon fibers to the asbestos, forming a non-friable asbestos diaphragm.


Electrolytic Cell Assembly

6 The diaphragm is inspected and physically joined with other parts of the electrolytic cell and sealed. It is then ready to be placed in service.

7 Asbestos is mostly inert and separates the sodium hydroxide (caustic soda), hydrogen, and chlorine. Asbestos is confined within the production process.



Electrolytic Cell Process

8 Diaphragms need to be replaced periodically, while other parts may be reused. An operator uses wet methods (e.g. high pressure water) to remove the non-friable asbestos coating from the screen. The water and solids are sent to the filter press where excess water is removed.


Filter Press

9 The filtered solids are transferred into bulk bags or lined dumpsters that are tightly sealed and marked per federal and state regulations. The solids are then disposed in landfills licensed to accept asbestos containing waste.


Bulk Bag


Lined Roll-off Dumpster

Chlor-Alkali Process Controls and Protections

The safety and health of our workers is our top priority.

Engineering controls, PPE, training and medical surveillance are used to meet or exceed strict EPA and OSHA requirements.

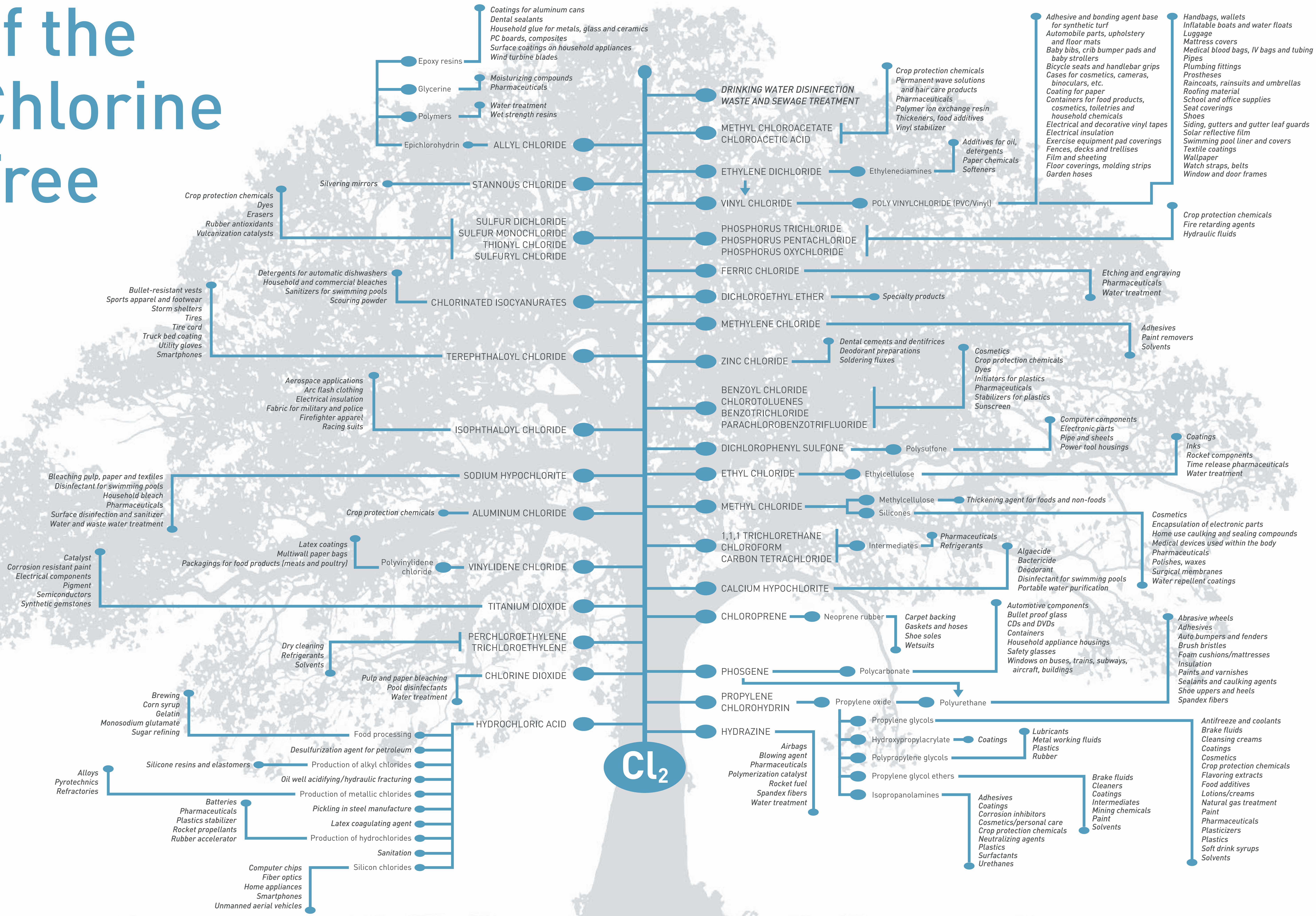
Engineering Controls	PPE	Training	Medical Surveillance
• Wet Methods • Ventilation • Glove Box • Modifiers	• Respiratory Protection • Disposable Gloves and Suits • Rubber Boots	• Employee Training	• Medical Exams
Activities that have the potential to generate friable/dry asbestos are performed using wet methods, in a ventilated area, with HEPA filters, or inside a glove box. Halar or Teflon modifiers are added to the asbestos to allow handling/ storage in a dry non-friable form.	Employees wear protective clothing to prevent potential contact with asbestos. Cleanup procedures are in place to reduce potential spread of asbestos-containing material (including footwear and work areas).	OSHA requires training to prevent exposure to asbestos. Employees working in designated areas receive asbestos training at the time of assignment and at least every three years thereafter. Employees are trained to properly handle and dispose of asbestos-containing materials, including PPE.	Medical surveillance, as per OSHA regulations, is offered to employees as required. Employees receive a medical examination at the time of assignment to a designated area, annually and upon termination of employment.

Personnel monitoring is conducted to provide quantitative exposure data, verify functionality of engineering controls, determine medical surveillance, define Regulated Areas, and to demonstrate compliance.

American Chemistry Council

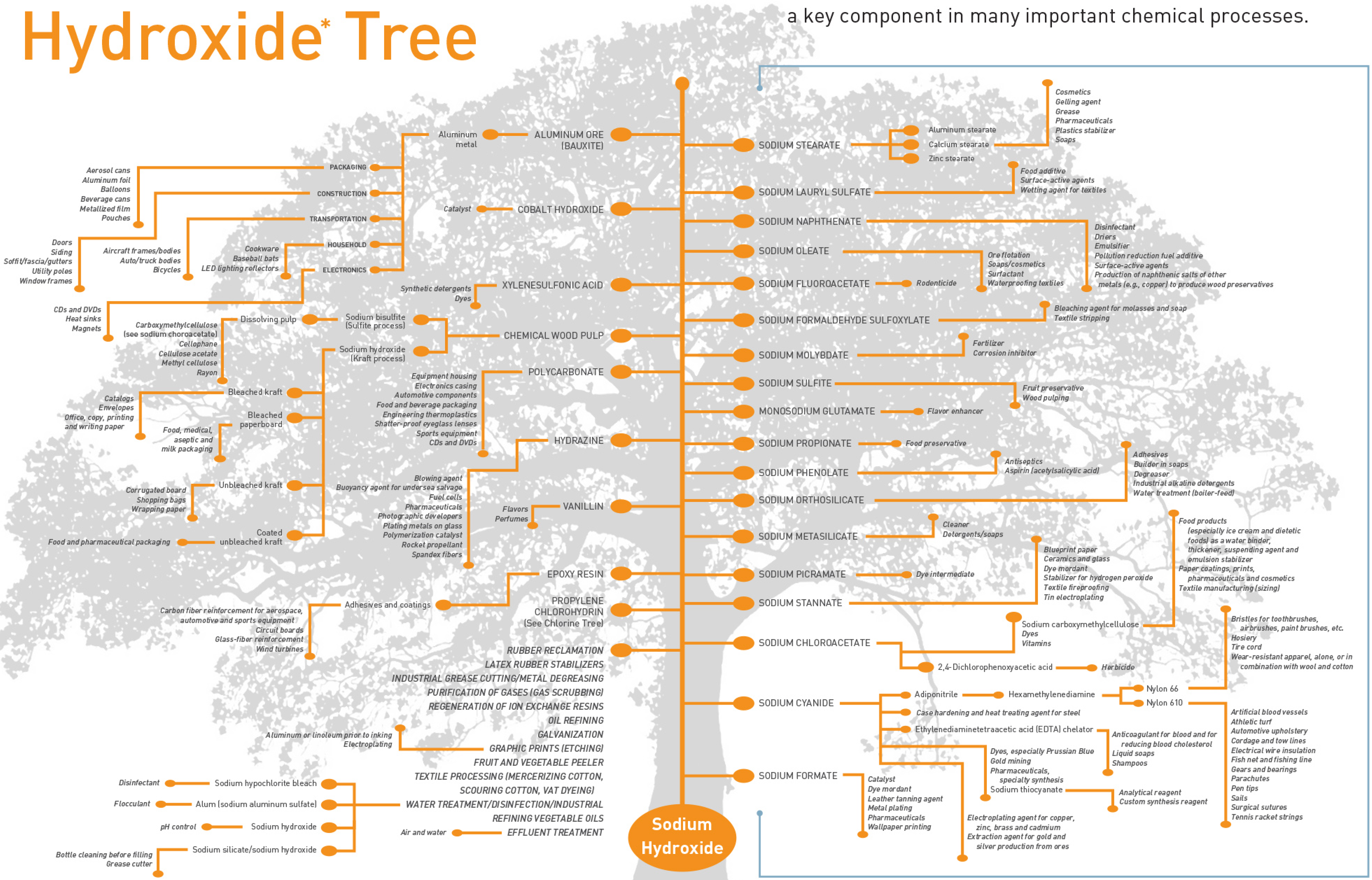
Products of the Chlorine Tree

Chlorine is one of the most abundant, naturally occurring chemical elements. It plays a significant role in the manufacture of thousands of products we depend on every day.



Products of the Sodium Hydroxide* Tree

A co-product of chlorine production, sodium hydroxide is used to help produce a wide range of useful products. It is a key component in many important chemical processes.



*The term *sodium hydroxide* is synonymous with *caustic soda* and *alkali*.