

InterClean Equipment, Incorporated

Hydrofluoric Acid + Truck Washing = Death

Fleet Owners Are Clueless To The
Deadliness Of Hydrofluoric Acid

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The chemical used in washing vehicles in the trucking industry is the same chemical that, when combined with uranium, fuels nuclear power plants. This same chemical is used in etching glass, etching silicon wafers in semi-conductor manufacturing, galvanizing iron, and is added to gasoline to produce high-octane fuel. This chemical is hydrofluoric acid.

Where as most of these industries regulate minimal human exposure, some in the trucking industry have made it a practice to use hydrofluoric acid (HF-A) in their soap solutions without the knowledge of its hazards or growing regulations. Although the state and federal environmental precautionary regulations can create extra expenses for a fleet owner, what becomes more costly are the damages to the environment and the hazards to the worker.

For example, an employee in Georgia was washing a vehicle down with hydrofluoric acid and two other acidic ingredients when he became exposed through breathing and contact to the skin. None of the employees were told that contact on two percent of the body can be fatal, nor were they given protective clothing. They were also letting the acid wash down the drain.¹ Needless to say, this company had to deal with the consequences of not following worker safety requirements or adhering to the law.

¹ Chemical National Response Center, Report 487739, June 16, 1999

From purchasing, to storage, to usage, and disposing, hydrofluoric acid is one of the most highly regulated toxic chemicals. Fleet owners may or may not know the dangers involved with washing vehicles with HF-A; however, the following information may simplify the small print associated with written environmental laws, while also offering a grim look at hydrofluoric acids deadly potential.

One reason why facilities choose this deadly toxin in their daily wash routine is its inexpensive cost. Purchasing hydrofluoric acid in a 55-gallon drum is the standard for fleet operations. The cost is five dollars cheaper than other detergents, or between three to five dollars a gallon in an 8% diluted concentration. Soap companies recommend diluting the acid further to 1:30 when applying to a surface.² Using higher concentrations create greater risk, and a 1% solution can have adverse affects over time to those in direct exposure. A frequently used mixing method for soap companies supplying HF-A combines the acid with other acids, thus creating “super acids.” These have the capacity to be 12 times more harmful than hydrofluoric acid by itself.

² DuBois Corporation: A Word About Hydrofluoric Acid

In 1999, while diluting a solution of HF-A for high-pressure washers, business owner Robert Belk saturated his clothes with the corrosive toxic cleaner. He “had burns on both his legs and left arm...(and) suffered severe respiratory problems and heart failure late Thursday and died early Friday.”³

Many chemical soap companies have recommendations on how to use their hydrofluoric acid when cleaning vehicles. Some use two-step automatic drive through systems where acid is applied first to shock the surface and suspend soil, grease, and oils. The second step adds alkaline, allowing the alkaline to balance the acidic levels of HF-A before the acid corrodes the surface.

Others use old fashion elbow grease with a scrub brush. One soap company also specifies using alkaline soap with HF-A when manually applying the acid. Because of its power, it begins to corrode the surface if not controlled or neutralized with alkaline, causing the windows to dissolve and the aluminum to blur. It’s also suggested to clean from the bottom of the surface up, while rinsing along the way, to prevent corrosive streaks.⁴ Finally, this soap company advises not to wash the roof of the trailer in fear of having

³ Associated Press, October 23, 1999, Lexis-Nexis Academic Universe

⁴ //www.milanco.com/training/fleet.htm

nowhere for the acid to corrode but down. The impact hydrofluoric acid has in washing is impressive, but at what price is it necessary?

Another horrifying example of a HF-A soap incident occurred on October 30, 1999, in Grand Rapids, Michigan. One employee had the misfortune of getting the acid on her hands while applying an aluminum cleaner containing HF-A. She washed the acid from her hands, she thought, and then found gloves for protection. The gloves acted as an incubator for the acid. “Kelly didn’t clean off her hands good enough...the acid got into her fingers. By Monday, her fingers had turned totally black...she will certainly lose two fingers down to her knuckles.”⁵ There are many other reported incidents that are too numerous to mention here.

The hydrofluoric acid exposure IDLH limit, set by OSHA, is not to exceed 30 ppm. This means HF-A is Immediately Dangerous to Life and Health at this amount or above in a thirty minute period. The danger in breathing it as a gas or getting it in your skin and eyes can have devastating results.

When hydrofluoric acid comes in contact with the skin, it immediately penetrates the skin and moves past the epidermis, leaving no signs of burn marks on the skin surface. The hydrogen

then separates from the fluoride and attaches itself onto the body's enzymes that keep a person's pH balanced and tissues stable. While hydrogen is quickly dissolving the exterior surface of the cells in the body, fluoride is even nastier in its interior cell destruction.

Fluoride bonds with the ever-abundant magnesium and calcium in the body, destroying cell membranes and nerves on its way to the bone. Because the nerves are damaged, numbness can leave the infected oblivious for several hours while the acid is spreading. It infects the blood stream and slowly turns bone to jelly, collapsing the cells from the inside. "People have died after a patch of skin no bigger than the sole of the foot was exposed to the substance."⁶

OSHA is presently preparing requirements for medical surveillance of those working with hydrofluoric acid. Pre-placement medical evaluations focusing on "the function and integrity of the skin, eyes, liver, kidneys and respiratory system" are suggested before a worker is placed on the job. Health interviews and physical examinations are being considered and will be expected periodically during the time of employment. Once the employee is transferred or

⁵ Letter from V. Catalfo, Jr. to members of vehicle washing group

⁶ Discover, April 1996 v17 n4 p88

terminated, another exam will follow to determine any effects of the working conditions.⁷

NIOSH has recommended standards for occupational exposure as well. In these recommendations it is advised to perform an annual urinalysis for those working with HF-A. Also, it's advised to keep all pertinent medical records for twenty years after the employee is terminated.

While the cost of HF-A cleaning solutions are less expensive than safer soap options, the cost of personal protective equipment (PPE) for handling the toxin add up to outweigh the savings. Because HF-A has a boiling point of 67 degrees Fahrenheit, higher concentrations can quickly become a powerful gas or plume cloud in higher concentrations, capable of traveling miles from a spill. To satisfy safety issues, OSHA recommends the use of a respirator and splash-proof goggles with a face shield when handling HF-A in any capacity.

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According to NIOSH and the Centers for Disease Control (CDC), permanent blinding can result from exposure to the eyes or eyelids. Inhaling the acid vapors can cause ulcerative tracheobronchitis, hemorrhagic pulmonary edema, hypocalcemia, hypomagnesemia,

⁷ NIOSH Pocket Guide to Chemical Hazards, www.cdc.gov/niosh/npg/pgintrod.html

⁸ U.S Department of Labor, [//www.osha-slc.gov/SLTC/heal.../hydrogenfluoride/recognition.html](http://www.osha-slc.gov/SLTC/heal.../hydrogenfluoride/recognition.html)

and cardiac arrhythmia. The lowest lethal limit for 5-minute exposure is estimated between 50 to 250ppm. Chemical cartridge respirators, gas masks, or any supplied –air respirator with a full facepiece, helmet, or hood, are approved for handling hydrofluoric acid. It is advised not to touch the respirator or goggles with contaminated-gloved hands.

The gloves, full-body coverings, and boots worn should be made of the acid resistant neoprene or polyethylene material. In solutions of 30% or more, HF-A has a “breakthrough time” of one to four hours for neoprene and polyethylene. The chemical-resistant clothing must be inspected before every use for pin-sized holes and laundered after every use. Personnel cleaning the clothing should be forewarned of the hazards in handling the contaminated garments and advised on measures to limit their health risks. Before an employee begins working with hydrofluoric acid, NOISH requires them to be informed of the “hazards, symptoms of exposure, emergency procedures, and precautions to ensure safe use and to minimize exposure.”⁹ This information shall be posted in the work area and kept on file, readily accessible to the worker.” A periodic education program shall also be instituted so all workers have current knowledge of the dangers with regard to new found data on

⁹ U.S Department of Labor, //www.osha-slc.gov/SLTC/heal.../hydrogenfluoride/recognition.html

hydrofluoric acid. All containers must be labeled for concentrations less than 40% with the following:

DANGER!

HYDROFLUORIC ACID

HAZARDOUS LIQUID

CAUSES SEVERE BURNS WHICH MAY NOT BE

IMMEDIATELY PAINFUL OR VISIBLE

AVOID CONTACT WITH EYES, SKIN, CLOTHING

In case of contact, immediately flush skin or eyes with water continuously, remove contaminated clothing and continue flushing until medical attention is obtained.

Using polyethylene vessels is one of the only ways for properly storing hydrofluoric acid. It eats through metal drums, concrete, and glass containers and is resistant to materials like platinum and polypropylene. Users must be compliant with all federal, state and local regulations pertaining to the concentration used. All require storage of HF-A in a cool, dry, ventilated area, out of direct exposure of the sun. The storage area needs to have a colored curb or barrier high enough to contain spills, along with a high flow wash area for those who come in contact with the acid. The floor of the storage area is recommended to be acid-resistant and nonporous. Drums should not be stored for more than 90 days and should be inspected for leaks periodically.

“Vehicle washing has become a major environmental compliance issue for most companies that operate a fleet of vehicles.”¹⁰ In 1998, the EPA began preparations to establish NSPS (New Source Performance Standards) for transportation equipment and vehicle cleaning. Furthermore, pretreatment standards are being developed for new and existing sources that discharge POTWs (Publicly Owned Treatments Works). Vehicle washing is also outlined in the Stormwater Pollution Prevention Plan for the Trucking Industry developed by the (ATA) American Truckers Association.¹¹

RCRA advises on recycling, treatment and disposal methods that can minimize hydrofluoric acid waste after fleet washing. One suggestion is reusing the wastewater solutions and applying it as the initial rinse in cleaning. Also, using alkaline residuals to neutralize the acid waste and treat the water solution in a wastewater treatment unit regulated by the Clean Water Act.

In preventing pollution, RCRA suggests installing a closed washing and rinsing system to recycle wastewater, while reducing water usage. This also allows for frequent washing to prevent residue accumulations that create hazardous wash water.

¹⁰ EPA Sector Notebook Project: Ground Transportation Industry, VI.C.2. September 1997

¹¹ RCRA In Focus: Motor Freight and Railroad Transportation, EPA530-K-00-003, September 2000

If a wash facility drains to the local sewer or oil-separator systems, the drainage generated needs authorization through the Clean Water Act before disposal. The local government pretreatment standards determine the kinds of wastes and amounts allowed traveling into the sewer systems. Wash facilities continue to become increasingly regulated in the fight for the environment and the demand for occupational safety.¹²

“Why would anyone want to work with a liquid that burns the skin, cannot be used without a mask, permanently stains paint, etches glass and destroys spray bottles?” asks Irene Bernardo, owner of a vehicle detailing outfit.¹³ HF-A is incompatible with metals, concrete, glass, and more importantly, the environment. To say HF-A cleans, is misunderstanding its corrosive principles. Hydrofluoric acid may be cheaper to purchase, but there is so much complexity to its growing regulatory laws. This and the risks to humans, who work with it, can bring more headaches to a fleet owner wanting only to clean the fleet with a method that seems cost effective.

¹² RCRA In Focus: Motor Freight and Railroad Transportation, EPA530-K-00-003, September 2000

¹³ A deadly rinse: The dangers of hydrofluoric acid, John Strachan, www.carwash.com