



## Electrical Cleaning The Clock is Running

The primary producer of 1,1,1-trichloroethane in the United States just announced they would not ship trichlor solvent after November 1, 1995. For those end users who have not found a satisfactory alternative to trichlor for their electrical cleaning, time is running out.

American Polywater® manufactures a number of high purity, electrical-cleaning solvents that can be used for everything from high-voltage splicing to cleaning motor windings. This Technical Talk will discuss the important factors in solvent selection for electrical cleaning.

### Background

The Montreal Protocol confirmed that some long-lived chlorinated solvents interfere with the production of ozone in the upper atmosphere. This is a significant environmental concern, since ozone serves as a screen against excess ultraviolet sunlight.

The Protocol established a list of solvents, called "ozone-depleters", including the common electrical and contact cleaning solvents; 1,1,1-trichloroethane and trichlorotrifluoroethane (CFC113). These solvents were to be phased out of production by the year 2004. The Clean Air Act of 1992 accelerated this ban to Jan 1, 1996. Note that this law applies to solvent producers, and eliminates the ozone-depleting solvents by stopping their production.

However, parts of the Clean Air Act also apply to end users of ozone-depleting solvents. The intent of this part, called the SNAP regulations, is to prevent the replacement of ozone-depleting solvents with "something worse". End-users are required to replace ozone-depleting solvents with a material that is "SNAP Approved" for their particular end use.

### Unique Problems in Electrical Cleaning

Trichlor and CFC113 are extensively used in electrical equipment maintenance and high voltage cable splice preparation. These ozone-depleting solvents are powerful and fast evaporating degreasers, but they are not flammable (no flash point). They have been available under a variety of trade names. Aerosol cans, gallon pails, and saturated wipes are all popular packages.

Unfortunately, the electrical usage of these ozone-depleting solvents is very small compared to their primary uses, trichlor as a metal degreaser and CFC113 as a circuit board cleaner. Many of the alternatives targeted to these uses (water-based cleaners, detergent cleaners, etc.) are not suitable for electrical use.

Although popular, chlorinated solvents do have some end-use drawbacks. For one, these solvents are hazardous wastes, and spent cans, rags, etc., are subject to hazardous waste disposal and reporting rules.

In 1988, American Polywater® did a landmark study on specific solvent needs for electrical cleaning. Solvency power, evaporation rate, residue, dielectric character, combustion properties, and safety were all studied. This research backed up American Polywater's® development of a line of electrical cleaners.

### Flashpoint vs Evaporation Rate

The research established the relationship between a solvent's combustibility and evaporation rate.

Many trichlor alternatives with *fast evaporation rates* (alcohol, ether, hexane, etc.) are extremely flammable (flash points below 70°F). Besides the obvious fire concern, such flammable solvents are hazardous wastes (ignitable). To safely use such flammable solvents in the field, end users should be properly trained and equipped.

Cleaners with flash points over 140°F are not hazardous wastes, and minimize combustibility problems. However, such cleaners evaporate much slower than trichlor. American Polywater's® Type HP Cleaner is a leading electrical cleaner of this type.

Because Type HP does not evaporate quickly during use, less solvent is needed for many jobs. The amount in the air and exposure to vapors is minimized.

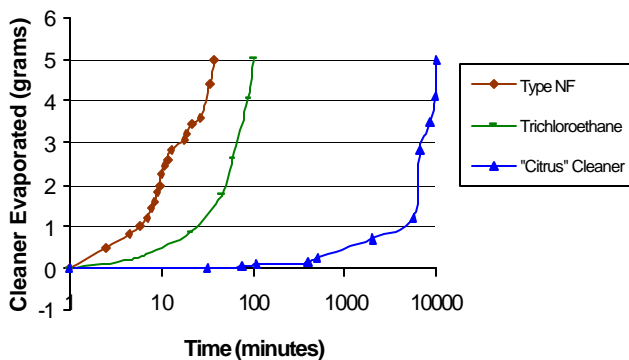
With sensitive semi-conducting rubbers and plastics, the contact time with a slow-drying solvent should be minimized. Excess solvent should be dried from the surface, rather than waiting for it to evaporate. Type HP Electrical Cleaner comes in kits with attached drying towels to make this easy and obvious. Thousands of high voltage splices and terminations have been successfully completed using Type HP Electrical Cleaner. Type HP is also available in aerosol and bulk for maintenance cleaning.

### New Fast Dry, Non-flammable Cleaner!!!

American Polywater recently developed Type NF, a new, fast evaporating, non-flammable electrical cleaner specifically for use in high voltage splicing and terminating. This cleaner is *not* based on perchloroethylene (tetrachloroethylene), with its carcinogen listing and low TLV's for vapor exposure (35 ppm). Type NF is a chemical break-through.

### Evaporation rate

The evaporation rate for the new Type NF is compared to trichloroethane and a "citrus" type cleaner in the graph below.



The time shows how fast it took for 5 grams to evaporate, and is plotted on a log scale. The NF evaporates slightly faster than trichlor and almost a thousand times faster than the "citrus" cleaner.

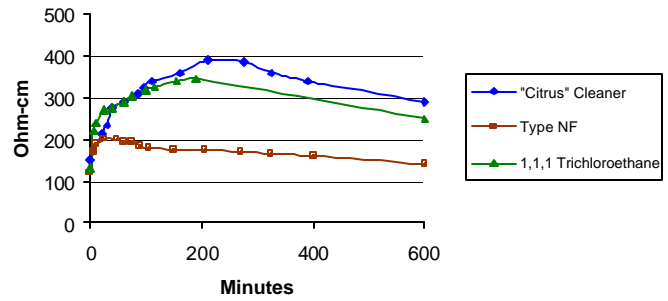
### Flashpoint

NF dries quickly with no residue, yet has no flash point, as the comparison below shows:

NF	No Flash
Trichlor	No Flash
"Citrus"	145° F Flash

### Effect on Semi-con Rubber

The graph below shows the effect of the three cleaner types on the volume resistivity of a semi-conducting EPR rubber.



This data was developed by wiping the semi-con rubber surface with a cleaner soaked rag for 2 minutes (to excess), then measuring volume resistivity over time. Note that Type NF has a minimal effect that is reversed by evaporation in a few minutes. The "citrus" cleaner affects the semi-con over time, peaking at 5 hours, presumably from continued solvent migration through the rubber's thickness. Neither the "citrus" cleaner nor trichlor have returned to the initial volume resistivity of 50 ohm-cm after 10 hours.

The Type NF solvent, with its fast evaporation and targeted solvency, provides much more flexibility for cleaner use with these solvent sensitive rubber materials.

### Summary

A majority of electrical cleaning and maintenance has successfully converted to slower drying, no-residue electrical cleaners like Type HP. This cleaner offers economy, safety, effectiveness, SNAP Approval, and minimal regulatory hassle.

When a non-flammable, fast dry, SNAP approved, non-carcinogen cleaner is needed, American Polywater's® Type NF is now available.

If you have not yet converted your electrical cleaning away from an ozone depleting solvent, 1996 is not very far away!!! **Call American Polywater® toll free at 800-328-9384 for samples or additional information on our electrical cleaner line.**

### Editor's PS

Since this was written, American Polywater has released a second fast evaporating, no-flash solvent called **Type TR**. Contact American Polywater for additional information

Comments, questions, or editorial requests, please contact:

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