Perchloroethylene: Facts and Myths

Perchloroethylene, also known as PERC, has set the standard in cleaning precision parts for more than 50 years. The use of this chemical has been declining recently though, as PERC has been replaced with other solvents or processes. The decision to replace PERC is usually based on misperceptions about the chlorinated solvents' regulatory status, continued availability, and safety in use. Despite PERC's superior performance compared to alternatives, these misconceptions have led to many companies dumping PERC for a different method.

Today, the development of new equipment and processes that minimize emissions and maximize solvent recovery makes PERC more effective than ever. At the same time, it is safer than ever. Despite the belief of many, PERC has not been banned. Of the chlorinated solvents, only 111-trichloroethane (methyl chloroform) has been phased out of production, due to its ozone depletion potential. The other chlorinated solvents remain in use around the world as acceptable substitutes for ozone depleting solvents.

With regards to operators, PERC is only dangerous when used improperly. Chlorinated solvents are among the most studied industrial chemicals, which has resulted in the development of careful guidelines that keep handlers safe. Animal tests and epidemiological studies have indicated that when the solvents are handled, used, and disposed of in accordance with these recommended practices, they do not cause adverse health or environmental effects.

Physical Properties

Perchloroethilene and trichloroethylene are clear, heavy liquids that demonstrate excellent solvency. The chemicals are virtually non-flammable due to the fact they have no flash point. They work well with oils, greases, waxes, tars, lubricants, and coolants generally found in the metal processing industries.

Trichloroethylene (TRI) is recognized for its cleaning power. A heavy substance (1.2 kg. /lt) with a high vapor density (4.53 times that of air) allows relatively easy recovery from degreasing systems. TRI has the ability to maintain a constant pH and protect against sludge formation. These characteristics have made it the standard to which other degreasers are compared. Due to its high solvency, TRI dissolves soil quicker than other degreasers and increases the output of a machine. TRI is often used to degrease zinc, brass, bronze, and steel parts during fabrication and assembly. It is well suited for aluminum as well, because its stabilizer system protects the solvent against decomposition.

PERC has a high boiling point, weight (1.3kg. /lt), and vapor density (5.76 times air). With these statistics, it leads all chlorinated solvents. The high boiling point of PERC gives it an advantage in removing waxes and resins that need to be melted before removal. This higher temperature also allows more vapors to be condensed on the surface of the parts, thereby using a higher volume of solvent for cleaning than other options.

PERC is ideal for light weight and light gauge parts because of its high boiling point. These parts would reach the operating temperature of lower-boiling solvents before the cleaning process was completed. PERC does not have that problem. The high boiling point is essential for obtaining good penetration during cleaning, especially when parts

have fine orifices or spot-welded seams, and particularly if there is moisture trapped in the part.

PERC is also inherently more stable than other solvents. It incorporates a multi-component stabilizer system that provides resistance to decomposition. It can be used to degrease all common metals, but is especially applicable to cleaning those prone to staining or corrosion, such as aluminum, magnesium, zinc, brass, and their alloys.

Life Cycle

Water and detergents are often used as alternatives to PERC. They are thought to have less environmental impact. However, studies have shown that this is not always true. In a 1997 study sponsored by the European Chlorinated Solvents Association, robust data was collected to compare the environmental impact of metal parts cleaning methods. All technologies were found to have potentially significant environmental impact, depending upon how they were used.

PERC is especially prone to creating air pollution. However, by using technically advanced, hermetically sealed machines, this can be effectively controlled.

Aqueous solutions cause water pollution, even after treatment of the cleaning resides. In fact, impact on water of aqueous solutions was between 200 and 2,000 times higher than with PERC degreasing, depending on the site.

Both technologies have disadvantages, and each have their own strengths. The study concludes that Aqueous cleaning is best for producing clean and wet metal parts. In this scenario, even the best PERC method had a greater environmental impact than the aqueous technologies. However, when clean and dry parts were required, hermetically sealed machines operation with PERC, especially when paired with carbon recovery, had a lower environmental impact than aqueous solutions. Therefore, solvent cleaning is preferable when the following production step requires a dry part.

To reap these benefits, PERC must be used with a machine that is properly designed to minimize environmental impact. If used correctly, PERC can be the most efficient, effective, and economical cleaning process for precision products.