SF Environment
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A Department of the City and County of San Francisco

Compare Dry Cleaning Solvents

Although various perc alternatives are available, many pose varying degrees of health and environmental concerns in spite of being marketed as "eco-friendly". Professional wet cleaning has been identified as a truly environmentally friendly, non-smog forming technology that minimizes environmental and health concerns. Professional wet cleaning uses specialized equipment to clean garments with water and soaps.

Another garment cleaning technology thought to minimize environmental hazards is CO_2 dry cleaning. CO_2 dry cleaning uses pressurized liquid carbon dioxide harvested from other industrial processes to clean garments. Due to the lack of commercial availability at this time and limited use by cleaners, there is insufficient information to fully assess CO_2 technology.

Here are the four most commonly used methods used worldwide:

1. **Professional Wet Cleaning**
2. **Hydrocarbon**
3. **GreenEarth®**
4. **Perchloroethylene**

1. Professional Wet Cleaning:

Wet cleaning is a cleaning technology that uses specialized washers and dryers that control revolutions, temperature and moisture content of the clothes. Controlling these factors eliminates problems with damage to garments or shrinkage, concerns which are often associated with cleaning specialized garments in normal home washers. New professional wet cleaning machines allow us to go back to using water and soap.

- Health Effects to workers: Given that the workers are mostly using only soap and water, the health effects do not vary much from the ones of doing laundry at home. In addition the detergents can be odorless, biodegradable and low-toxic. As is the case with other professional garment cleaning technologies, cleaners will need to select spotting chemicals carefully to minimize potential hazards.

- Impacts to consumers: Consumers that use wet cleaning know that the clothes they send to the cleaners do not return home with any chemicals that might be harmful to themselves or their families. All of the clothes that can be washed in a dry cleaning system can be professionally wet cleaned, giving the consumer an option that provides the same quality in an environmentally sound fashion.
- Environmental Effects: There have been several studies that further verify that the environmental impact of wet cleaning is minimal. Multiple studies examining the wastewater leaving a wet cleaning plant have shown that wastewater from wet cleaning facilities is of little to no concern. Furthermore, cleaners that have switched to wet cleaning from traditional dry cleaning have found reductions in their energy bills and in many cases their water bills as well.

2. Hydrocarbon:

The first dry cleaning chemicals were hydrocarbon solvents. However, due to flammability issues, they became less common and gave way to perc. As the use of perc is gradually being phased out, most cleaners are choosing hydrocarbon solvents as a replacement. However, the hydrocarbon solvents have their own health and environmental effects. Hydrocarbon solvents include DF-2000 (ExxonMobil), EcoSolv (Chevron Philipps), Shell Sol (Shell), and Pure Dry (Niran).

- Health Effects to workers : One of the most alarming aspects of the hydrocarbon solvents is the great lack of toxicity data. There are very few studies exploring carcinogenicity, toxicity or effects of long-term exposure. However, existing studies indicate that inhalation exposure can depress the central nervous system. High vapor concentrations, as can happen in small spaces, may cause headaches, dizziness, anesthesia, drowsiness, unconsciousness and other central nervous system effects, including death. Exposure can cause irritation to the eyes, skin and respiratory tract. Furthermore, these chemicals pose significant fire hazards given that they are all combustible liquids and are thus regulated by the fire department.
- Impacts to consumers: The lack of toxicity information about common hydrocarbon solvents makes it very difficult to judge how safe they are. However, hydrocarbon solvents are volatile organic chemicals that contribute to smog formation, which is known to cause and aggravate asthma. As Class IIIA combustible solvents, the flammability of hydrocarbon solvents may present a potential fire hazard for adjacent residents and businesses.
- Environmental Effects: The use of hydrocarbon solvents promotes yet another petroleum based technology, which increases our dependence on limited fossil fuels. Hydrocarbon solvents also emit smog and contribute to global warming.

3. GreenEarth®:

A dry cleaning solvent called GreenEarth® was introduced as an alternative to perc in the last decade. The chemical present in the dry cleaning solvent sold under the Green Earth ® trademark is decamethylyclopentasiloxane or D5. Although this solvent is not widely used in San Francisco currently, it may become more available. D5 has been reviewed extensively by OEHHA (Office of Environmental Health Hazard Assessment, a California state agency) as well as the Canadian government. Below is a summary of their findings on human health and environmental impacts of D5.

- Health Effects to workers : In a 2007 report, OEHHA stated "a statistically significant increase in a malignant tumor (uterine adenocarcinoma) due to D5, a chemical that may be bioconcentrated and is a candidate to replace perchloroethylene in dry cleaning, indicates a potential hazard for workers in the dry cleaning industry and perhaps for the general public." Based on available science, OEHHA concluded that D5 poses a concern for potential carcinogenicity relevant to humans. Potential non-carcinogenic effects of D5 include impacts to the nervous system, fat tissue, the liver (bile formation), and the immune system. Exposure to D5 is known to aggravate liver disorders and cause liver weight changes in rats exposed to it. Should this combustible solvent ignite and start a fire, one of the resulting products is formaldehyde, an acute respiratory and nervous system toxicant and cancer hazard.
- Impacts to consumers: As with perc, the use of GreenEarth® introduces another unnecessary chemical to our household. Furthermore, GreenEarth® is a Class IIIA combustible solvent that is regulated by the fire department, and its flammability may present a potential fire hazard for adjacent residents and businesses.
- Environmental Effects2: D5 persistence in the environment and in animal and human tissues is a concern. D5, which is highly lipophilic, has been measured in aquatic species in a number of environments and has a long half-life in human tissues. Canada recently concluded that D5 is persistent in the environment, consistent with OEHHA's evaluations. Concerns about D5 as an environmental contaminant is based primarily on environmental sampling which has indicated accumulation in wildlife, including fish. More widespread and intensive use of D5 could therefore result in human exposure via the consumption of fish.

4. Perchloroethylene:

Since World War II, perchloroethylene ("perc") became the solvent of choice for use in garment cleaning and is used by many "dry" cleaners in San Francisco. Perc has a

particular odor that is commonly associated with dry cleaner shops or dry cleaned clothes.

- Health Effects to workers : Perc is listed by the state of California as a chemical known to cause cancer (bladder, esophageal, stomach, intestinal and pancreatic cancers) and reproductive toxicity. Reproductive effects such as reduced fertility and spontaneous abortions have been reported from occupational exposure to perc. Long-term exposure can result in neurological effects, such as dizziness and diminished cognitive ability, as well as damage to the liver and kidneys. High levels of exposure in enclosed spaces, even for short periods of time, can cause respiratory failure and even death.
- Impacts to consumers: Perc off-gases from clothes dry cleaned using this chemical. Short-term exposure to perc (such as in a dry cleaning shop) can cause dizziness, rapid heartbeat, fatigue, headaches, confusion, nausea, and skin, eye and respiratory tract irritation. In addition, if the dry cleaning machine using perc is not properly insulated, perc can seep through walls and expose residents and businesses adjacent to the cleaner. Such exposure can cause long-term health effects to residents, similar to those found in workers.
- Environmental Effects: Perc has been shown to contaminate soil, water and air. It is quite volatile and so pollutes indoor and outdoor air. Perc spills are considered severe environmental accidents as perc can seep down into the soil and reach drinking water aquifers.
- While one district in California has implemented a phase-out of Perc over a 15 year period, other jurisdictions have conducted their own careful evaluations and have come to the opposite conclusion.

See the solvent comparison chart:

In English