



Doing laundry is a common household activity. Whether the activity is performed physically using brushes and detergents or through the use of programmable washing machines, the process depends on soap and water. Dry cleaning is different because it cleans clothes without the use of water. Contrary to popular belief dry cleaning is by no means dry; clothes are immersed and cleaned using a liquid solvent. Different dry cleaning technologies use different liquid solvents. These chemicals may impact worker health, consumer health and the health of the environment. Since the health risks due to exposure to these solvents vary from carcinogenic (causes cancer) to mostly harmless, it is important to be aware of the various cleaning options when selecting a garment cleaner to care for your clothes.

Currently, there are four popular garment-cleaning technologies in use to professionally clean garments in San Francisco. Each of these technologies uses a different chemical solvent. The health effects and environmental effects of these processes are summarized below and are listed from most hazardous to most benign.

4 Perchloroethylene: Since World War II, perchloroethylene (“perc”) became the solvent of choice for use in garment cleaning and is used by a majority of “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, stomach, esophageal, intestinal and pancreatic cancers) and reproductive toxicity. Reproductive effects such as infertility 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, eyes 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. Perc does not readily volatilize or separate from water and it is known to severely affect aquatic life.

3 GreenEarth®: In the last 7 years a dry cleaning solvent called GreenEarth® moved into the market as an alternative to perc. The chemical used in the GreenEarth® process is called siloxane or D5. With a strong marketing strategy behind it, this siloxane-based solvent is rapidly becoming more available in small corner store shops. Although it is almost odorless other characteristics of this solvent are of concern.

- Health Effects to workers: Siloxane or D5 tends to migrate to fat cells and so workers that are routinely exposed to it may have it slowly building up in their bodies. Preliminary studies suggest a possible cancer hazard associated with this solvent. Studies done with rats have linked D5 with an increase in uterine

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tumors. Exposure to D5 is also known to aggravate liver disorders as well as cause liver weight changes in rats exposed to it. Furthermore, D5 is combustible and so is subject to regulation by local fire authorities to ensure worker safety. Should the solvent ignite and start a fire one of the resulting products is formaldehyde, which is 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. There is sufficient evidence¹ suggesting the potential toxicity of D5 for several state agencies to be concerned and demand more evidence of its safety. Furthermore, GreenEarth®'s flammability presents a potential hazard for adjacent residents and businesses.
- Environmental Effects: Several state agencies² have declared their concern that D5 may accumulate in the food chain. Furthermore the Canadian Government has labeled D5 as a "very toxic material" and has classified it as "³persistent, ⁴bioaccumulative and inherently toxic to aquatic organisms". (Environment Canada, Existing Substances Division)

2 Hydrocarbon: The first dry cleaning chemicals were hydrocarbon solvents. However, due to flammability issues they became less common and gave way to perc. Concern over perc is leading to increased restrictions and regulations and several hydrocarbon solvents are regaining their popularity. However, the hydrocarbon solvent-based technology has its own health and environmental effects.

- Health Effects to workers: One of the most alarming aspects of the hydrocarbon solvents, like the Exxon manufactured DF-2000™, is the great lack of toxicity data. There are very few studies exploring carcinogenicity, toxicity or effects of long-term exposure. However, 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. Furthermore, these chemicals pose significant fire hazards given that they are all combustible liquids.
- Impacts to consumers: The lack of toxicity information about common hydrocarbon solvents makes it very difficult to judge how safe they are as a substance. However, the use of the technology itself contributes to air pollution given that it generates smog, which is known to cause and aggravate asthma and contributes to the increasingly threatening problem of global warming as well.
- Environmental Effects: From rising gas prices and the news every night we are all aware that oil resources are becoming scarce. The use of hydrocarbon solvents promotes yet another petroleum based technology, which increases our dependence on these limited fossil fuels. And as previously mentioned they emit smog, which contributes to global warming.

1 Wet Cleaning: Wet cleaning is a cleaning technology that uses specialized washers and dryers that control revolutions, temperature and moisture content of the clothes. Normal washers can't control these three factors and that is what causes clothes to fade, get damaged or shrink. These new and professional 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.
- 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. Several studies done of the wastewater leaving a wet cleaning plant have shown

that wastewater from wet cleaning facilities is of little to no concern⁵. Furthermore, cleaners that have switched to wet cleaning have found a reduction in their electricity bills and in many cases their water bill lowers as well.

What is the government doing?

California has moved to phase out perc; the state is requiring all perc dry cleaners within 300 feet of residential buildings, school, medical facilities and other sensitive areas to be phased out by 2010. All perc machines must be phased out by 2023. The state, through the Air Resources Board, has also begun an incentive program to encourage perc-using cleaners to change to carbon dioxide or wet cleaning. This program provides a \$10,000 grant for cleaners willing to change.

What should you do?

- ✓ You have already begun by informing yourself about the dry cleaning technologies available.
- ✓ Ask your dry cleaner what kind of technology he uses and encourage him to choose the greener option.
- ✓ Encourage him/her to adopt practices that create less waste such as accepting and recycling hangers and using reusable suit bags and hangers.
- ✓ If your cleaner uses perc, *be sure to let your clothes air out before putting them in your closet.*
- ✓ But if you wish to nip the problem at the root avoid buying clothes that require dry cleaning given that, regardless of the process, this adds the use of extra energy and resources.

Want to know more? Please contact SFEnvironment at 415-355-3766

¹ Fong, M. et al. State of California, Air Resources Board, California Dry Cleaning Industry Technical Assessment Report. February 2006

² Such as the Office of Environmental Health Hazard Assessment (OEHHA), California Air Resources Board (CARB), and the California Environmental Protection Agency (CalEPA)

³ Bioaccumulative: General term describing a process by which chemical substances are ingested and retained by organisms, either from the environment directly or through consumption of food containing the chemicals. (Environment Canada)

⁴ Persistent: Organic substances that do not break down quickly in the environment and are readily taken in by living organisms through contaminated food or polluted water or air. (Environment Canada)

⁵ Star, A. and Eyring W. Pollution Prevention Products for Illinois Dry Cleaners: Testing and Recommendations of Chemicals for Wetcleaning. A Report of The Center for Neighborhood Technology. May 2002