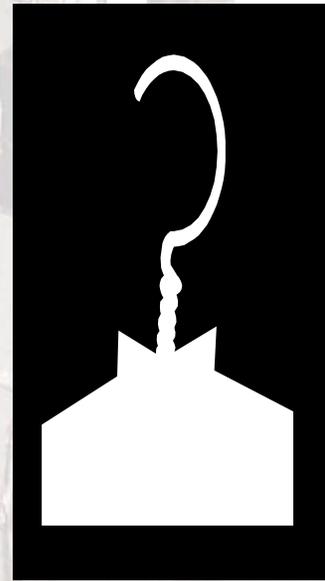


Hung Out To Dry



**How the Use of Perchloroethylene
in Dry Cleaning Endangers You
and Your Family's Health**

COALITION FOR
CLEAN AIR

Leading the Way to Clean, Healthy Air

Hung Out To Dry



How the Use of Perchloroethylene in Dry Cleaning Endangers You and Your Family's Health

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About the Coalition for Clean Air

The Coalition for Clean Air is dedicated to restoring clean, healthful air to California by advocating responsible public health policy; providing technical and educational expertise; and promoting broad-based community involvement.

To obtain more information online about the Coalition for Clean Air's work, visit our site at www.coalitionforcleanair.org.

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Report Highlights

- Perchloroethylene (perc), also known as tetrachloroethylene, is a synthetically produced organic compound used as a cleaning agent by 85 percent of the more than 35,000 professional garment cleaners in the United States.ⁱ
- Perc is a California Proposition 65 chemical known to cause cancer.ⁱⁱ
- Non-cancer health effects from perc exposure include drying or cracking of the skin; irritation of the skin, eyes, nose, mouth, throat and lungs; burns, headache, dizziness, lightheadedness, nausea, vomiting, fainting, coughing, fluid build up in the lungs; damage to the central nervous system, kidneys, liver, and reproductive system.ⁱⁱⁱ
- An estimated 850 tons of perc each year is released into southern California's air (59% of which comes directly from the garment care industry), making perc emissions one of six key toxic air contaminants in Los Angeles region.^{iv}
- According to trade associations, 70 percent of US dry cleaners using perc still operate older "third-generation" machines that the South Coast Air Quality Management District (AQMD) identifies as presenting the greatest cancer risk: 190-in-1,000,000.^v
- Even the newest and latest "fifth generation" perc machines may not be able to meet the maximum individual cancer risk of 25-in-1,000,000 established by the AQMD, and they cannot meet the U.S. Environmental Protection Agency's standard for acceptable cancer risk of 1-in-1,000,000^{vi,vii}.
- It is estimated that many southern California dry cleaners are located closer than 25 meters (82.2 feet) from the nearest residence or business – a proximity likely to increase cancer and non-cancer health risks caused by perc.^{viii}
- Perc is estimated to have contaminated one out of every ten public drinking water wells in California, creating a need for an estimated three billion dollar state cleanup.^{ix}
- Germany, concerned about the toxicity of perc, enacted legislation in 1991 that led to the introduction of less harmful alternatives, such as petroleum-based solvent cleaning, liquid carbon dioxide (CO₂) cleaning and wet cleaning.^x
- Wet cleaning, a process currently in use in California and around the world, has comparable capital and operational costs when compared to perc operations.
- Out of 35,000 delicate garments – most labeled "dry-clean only" – a UCLA study found that 99.9 percent were successfully laundered by wet cleaning.^{xi}

Introduction

Dry cleaning is a part of every day life for most working Americans. Unfortunately, most Americans are unaware that over 85 percent of the more than 35,000 dry cleaners operating in the United States use a dangerous chemical called perchloroethylene (perc), a cleaning solvent also known as tetrachloroethylene, which poses a significant health risk to humans and the environment.^{xii} Perc is identified by international, national and state health and regulatory agencies as a “possible” or “probable” human carcinogen.^{xiii} The continued use of perc in dry cleaning operations can therefore expose employees, consumers, and nearby residents, schools or businesses to a significant level of cancer and non-cancer health risks.

Exposure to perc can occur via drinking water contamination or dermal (skin) absorption, but most commonly occurs through inhalation. A 1996 study published by the Consumers Union estimated that the cancer risk from perc to customers wearing one freshly dry cleaned garment one day per week over a 40-year period could be as high as 150-in-1,000,000.^{1,xiv} The group estimated this risk by using a personal air quality monitor to detect the amount of perc emitted from freshly dry cleaned garments. This risk calculation has been labeled conservative by some experts, because a substantial number of America’s workers are likely to wear more than one freshly cleaned garment over the course of a professional workweek.



The risk does not stop, however, with the consumer. A 1992 study conducted by the US Environmental Protection Agency (US EPA) found that perc-dry cleaned clothes could also elevate levels of perc throughout a home and especially the room where the garments are stored.^{xv} According to the South Coast Air Quality Management District (AQMD), even living near a perc dry cleaning facility can cause an individual cancer risk as high as 190-in-1,000,000.^{xvi} Unfortunately, AQMD’s risk numbers may underestimate localized risk from perc exposure where dry cleaners are located closer than 25 meters (82.2 feet) from the nearest residence, school or business. According to the AQMD, many dry cleaners in the South Coast region (Los Angeles, Orange and parts of San Bernardino and Riverside Counties) are located 25 meters or less from the nearest residence, school or business. In more densely populated cities, like San Francisco or New York, where

¹ 150 in 1,000,000 cancer risk means that 150 cancer cases are expected from 1 million people exposed to a freshly perc cleaned garment once per week over a 40-year period.

residences are cited above a dry cleaning facility, those residents may have an even greater risk of perc exposure.²

Our nation's groundwater and soil are also significantly at risk of perc contamination. According to one report, perc is found in more than 50 percent of the Superfund sites in the country and 70 percent of all perc used ends up in the environment.^{xvii} The California State Department of Toxic Substances Control identified perc as a solvent that has contaminated one out of every ten public drinking water wells in California, creating a need for a state cleanup effort estimated at up to 3 billion dollars.^{xviii} The New York State Department of Environmental Conservation found one out of every five of the state's 2,221 dry cleaners had perc site contamination, and identified 235 sites that threaten drinking water supplies.³ Florida estimates that there are approximately 2,800 perc-contaminated sites that will require clean-up, costing billions of dollars in remediation.^{xix} Some landlords, who have experienced first-hand or heard of the high remediation costs of soil or groundwater contamination caused by perc, will no longer renew or accept lease applications from dry cleaners.^{xx} It has become abundantly clear that remediation or "end-of-pipe" strategies that treat contamination after it has already occurred have failed and that agencies need "pollution prevention" style strategies aimed at preventing perc contamination.

Today, perc exposure is an unnecessary risk to our communities and the environment. Successful non-toxic alternatives are both in use and just as effective as perc at cleaning delicate garments. By phasing out the use of perc, and phasing in proven non-toxic alternatives like wet-cleaning or liquid carbon dioxide, federal and state governments would be adopting a pollution prevention strategy that could eliminate this national public health threat. This report hopes to educate current and future consumers, decision makers and other interested parties about the substantial health risks associated with the continued use of perc in the American garment care industry, to provide a brief discussion of the alternatives to perc, and to provide policy recommendations that will help us eliminate this unnecessary risk.



West Los Angeles dry cleaner located adjacent to a preschool.

² According to Dr. Judith S. Schreiber, Senior Public Health Specialist, Office of the Attorney General, Bureau of Environmental Protection, Albany, New York, collocated apartment measurements were increased in all situations ranging from 100-55,000 microgram per cubic meter.

³ The South Coast Air Basin is estimated to have roughly 2,086 dry cleaning facilities with 2,181 operating perc dry cleaning machines (see AQMD Draft Staff Report, p. 2-3).

Brief History of Perc Use in Dry Cleaning Operations

Perc was first introduced to the United States in 1934 as a dry cleaning solvent alternative to the once-popular petroleum.^{xxi} The superior cleaning ability of perc, combined with petroleum shortages caused by World War II and municipal fire codes prohibiting the use of petroleum solvents in dry cleaning operations, resulted in a surge in the use of perc. Because perc was not considered a fire hazard, professional cleaners were able to move into residential and commercial areas of cities. By the early 1960s, perc became the most widely used dry cleaning solvent in the United States. It was not until the late 1970s that increasing evidence demonstrated perc use by professional dry cleaners to be harmful to human health and the environment. With the identification of perc as a possible or probable human carcinogen, petroleum-based solvents have begun a resurgence and other alternatives have been invented as countries like Germany begin to encourage the use of less harmful alternatives to perc.

Perc Use is an Environmental Justice Issue

Nationwide, most shops in the garment care industry are small businesses, and the majority of owners and employees in large metropolitan areas are Korean-American.^{xxii} For example, Korean-Americans in the Los Angeles-area own an estimated 50 percent of garment care shops.^{xxiii} Latinos – amongst other minorities – represent a significant percentage of the workforce in southern California’s garment care industry. The fact that American minorities currently own a majority of America’s existing garment-care shops makes the problem of perc exposure an issue of environmental justice. Most shop owners are highly dependent upon the machine and chemical manufacturers and distributors to supply them with safety and health information. Unfortunately, these are the very people who have a financial interest in the continued sale of perc as a cleaning solvent. Due to this financial interest, many minority shops are misinformed about the dangers of perc and are made resistant to adopting safer alternatives that can eliminate the present cancer and non-cancer risks in their field.

Sources of Perc Exposure

Routes of Exposure to Humans

Over 85 percent of America's dry cleaners currently use perc as a cleaning solvent^{xxiv} and their customers come from a small geographic area around the dry cleaner's location (typically a 1.5 to 2 mile radius).^{xxv} An estimated 850 tons of perc each year is released into southern California's air (59% of which comes directly from the garment care industry), making perc emissions one of six key toxic air contaminants in the Los Angeles region.^{xxvi} Inhalation is the primary route of human exposure to perc. Perc is readily absorbed into the blood stream from the lung following inhalation. Oral exposure to perc may occur from ingestion of contaminated drinking water or food, or from ingestion of breast milk from perc-exposed mothers. Perc is readily absorbed into the blood stream from the gastrointestinal tract following ingestion. Dermal absorption is possible from activities that require contact with perc, as might occur in occupational settings. Using perc in drycleaning, therefore, can pose a significant risk to our communities because it has multiple exposure pathways. Multiple studies have shown perc to be present in the breath, blood, fatty tissue, and breast milk of the general populations of the U.S. and Canada.^{xxvii}

Groundwater and Hazardous Waste Contamination

Perc contaminates our nation's water and creates hazardous waste. Consequently, perc is a significant threat to the safety of our nation's groundwater and soil. According to 2001 report released by Greenpeace, perc is found in more than 50 percent of the Superfund sites in the country and 70 percent of all perc used ends up in the environment.^{xxviii} Perc contamination across the nation has led to the creation of the State Coalition for Remediation of Dry Cleaners⁴, an organization that has four main objectives:

- Provide a forum for the exchange of information and the discussion of both technical and implementation issues related to state drycleaner programs;
- Share information and lessons learned with states that do not have dry cleaner-specific programs;
- Serve as a resource for dry cleaner remediation issues; and

⁴ The State Coalition for Remediation of Dry Cleaners is made up of nine states that have specific drycleaner remediation programs: Florida, Illinois, Kansas, Minnesota, North Carolina, Oregon, South Carolina, Tennessee, and Wisconsin. Associate member, states that are likely to have programs in the near future, are Louisiana, Missouri, and New Mexico. In addition, a number of other states, including California, New Jersey, New York, and Vermont have expressed interest in participating in Coalition activities.

- Encourage the use of innovative technologies in drycleaner remediation.⁵

Although efforts like the State Coalition for Remediation of Dry Cleaners provides valuable information to help states grapple with perc-contaminated sites, the problem persists and is growing, exposing millions of Americans to unsafe levels in drinking water. Sadly, perchloroethylene is highly stable in groundwater and can be expected to persist there for months to years in groundwater supplies.^{xxxix} Human exposure to perc-contaminated drinking water can have serious developmental health effects on children as studies have found that mothers exposed to perc then exhibited levels of perc in breast milk that could exceed safe drinking water limits set by US EPA.^{xxx}

Perc is currently found in Southern California's groundwater and wastewater at levels in excess of the current drinking water standards (set at 5 parts per billion).^{xxxix} However, southern California is not the state's only region that is suffering from perc-contaminated water. The State of California and the City of Modesto are suing the manufacturers, distributors, equipment manufacturers and retailers for perc contamination (see *City of Modesto, et al. v. The Dow Chemical Company, et al.*) In another case, private plaintiffs are suing the City of Santa Rosa, the County of Sonoma and the State of California for providing permits to dry cleaners who have allegedly contaminated local drinking water wells through the City's sewer systems (see *Carla M. Clark, et al. v. the City of Santa Rosa, et al.*). Recent state audits found that dry cleaners in the Los Angeles area, the San Francisco Bay Area, and the Sacramento Metropolitan Area were 90 percent^{xxxix}, 79 percent^{xxxix}, and 87 percent^{xxxix} out of compliance, respectively, which begs the question: how safe are our water supplies with the continued use of perc?

Table 1. California Drinking Water Wells Contaminated as of 1996

PCE has been detected in 968 wells or 10.2% of the 9500 wells tested in California as of 3/96.

1. Central Valley – 287 contaminated public wells
2. South Lake Tahoe – 10
3. San Bernardino County – 92
4. Riverside County – 40
5. Los Angeles/Orange County – 445
6. Central Coast – 53
7. Santa Clara Valley – 15
8. East Bay Region – 5
9. Sonoma County – 5

The discharge standard at some local wastewater treatment plants is expected to be lowered even further during the 2002 calendar year and may go as low as 0.8 parts per billion. Wastewater treatment plants, which lack the ability to phase out perc dry cleaning operations but are liable for bringing the public clean water, may be lowering their standards to force the elimination of future permits for dry cleaner sites.

⁵ To help disseminate information regarding the remediation of drycleaner sites, the Coalition has established a World Wide Web site that is available through US EPA's Clean-Up Information (Clu-In) site at <http://www.clu-in.org/programs/dryclean>.

Impacts of Perc Use on Human Health and the Environment

International, national and state health organizations have identified both non-cancer and cancer health risks associated with perc exposure.

Non-Cancer Health Risks

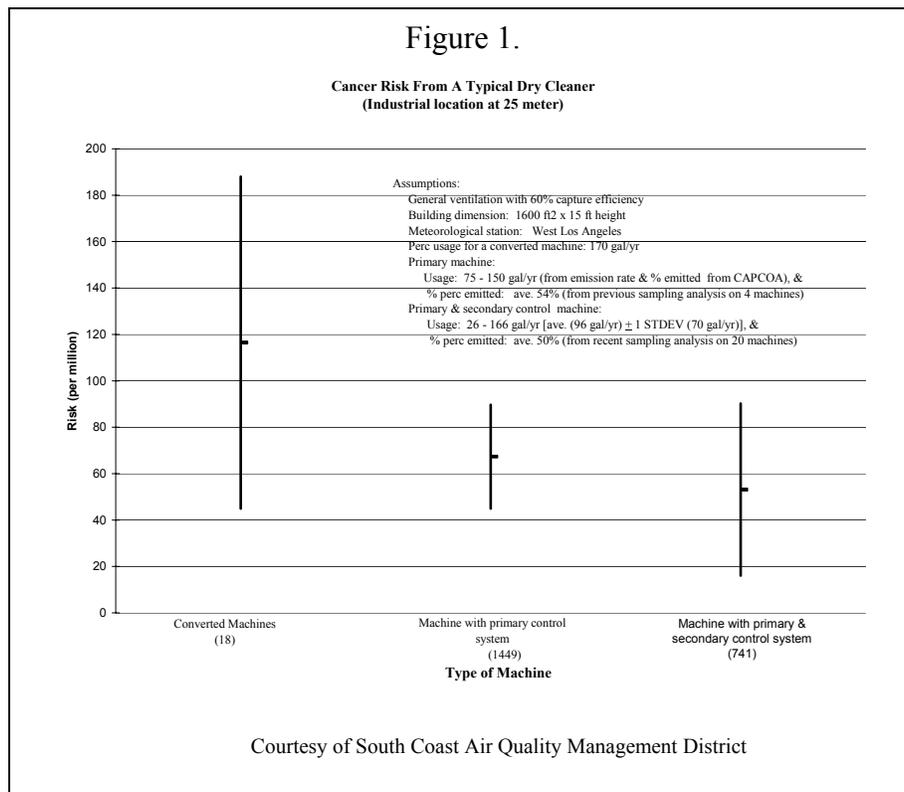
Acute, or short-term, exposure to perc can cause a series of human health-related problems, especially to those who come in direct daily contact with the chemical. Some of the most common symptoms include irritation of the skin, eyes, nose, mouth, throat and lungs; burns, headache, dizziness, lightheadedness, nausea, vomiting, fainting, coughing, and impaired judgment and perception.^{xxxv} High levels of exposure to perc can cause central nervous system intoxication, dizziness, and loss of coordination. Several health studies have found that dry cleaning workers directly exposed to perc regularly suffer from such central nervous system ailments as headaches, nausea, vertigo, fatigue, irritability, and dizziness.^{xxxvi}

Chronic, or long-term, exposure can cause neurotoxicity, reproductive toxicity, developmental toxicity, damage to the liver and kidneys, and respiratory disease. A New York study showed deficits in vision in adults at a day-care center co-located in the same building where perc measured 2,000 microgram per cubic meter. The study's abstract states that, "Several occupational studies have indicated chronic, airborne perc exposure adversely affects neurobehavioral functions in workers, particularly visual color discrimination and tasks dependent on rapid visual-information processing."^{xxxvii} A 1995 study by Altman and colleagues extended these findings by indicating that residents living near dry-cleaning facilities also exhibited altered neurobehavioral functions.^{xxxviii} Long-term perc exposure is also associated with reproductive disorders and infertility in both men and women^{xxxix}, neurological defects^{xl}, and impaired liver and kidney functioning^{xli}.

Cancer Health Risks

Probably the greatest health risk associated with the use of perc is cancer. The National Institute for Occupational Safety and Health (NIOSH) recently performed a study that observed the health effects of 1,708 individuals who worked at dry cleaners in San Francisco and Oakland, California; Chicago, Illinois; Detroit, Michigan; and New York, New York. The study found that dry cleaning workers experienced cancers of the tongue, bladder, esophagus, intestine, lung and cervix.^{xlii} NIOSH recommends that perc be treated as a "potential" human carcinogen and exposure be kept to the "lowest feasible limit."^{xliii}

NIOSH is not alone in its public health recommendation. The International Agency for Research on Cancer (IARC), part of the World Health Organization, has classified perc as a Group 2A carcinogen (i.e., a probable human carcinogen).^{xliv} Perc was listed as a hazardous air pollutant through the adoption of the Clean Air Act Amendments of 1990 (section 7412 of Title 42 of the United States Code), and the US Environmental Protection Agency (US EPA) has identified perc on a continuum between “possible” and “probable” human carcinogen. The California Air Resources Board (ARB) classified perc in October 1991 as a toxic air contaminant pursuant to section 39655 of the California Health and Safety Code, and California’s Office of Environmental Health Hazard Assessment (OEHHA) lists perc as a “possible” human carcinogen.



Unfortunately, exposure to perc goes beyond employees and consumers of dry cleaners. Because the success of a dry cleaning business is largely dependent upon its convenience to the customer, many dry cleaning operations are in close proximity to residential neighborhoods and local businesses. For example, the South Coast Air Quality Management District (AQMD) estimates that many of southern California dry cleaners are located less than 25 meters (82.2 feet) from the nearest residence, school or business. Such close proximity can mean greater risk of exposure to perc. As mentioned, the health risks can be greater in more densely populated cities, like San Francisco or New York, or in a future Los Angeles, as city planning officials increase density to make room

for an ever-growing population.⁶ Finally, the growing number of professional dry cleaners in the region also may contribute to increased perc exposure. In the Los Angeles Basin alone, from 1995 to 1999, the number of dry cleaning shops grew by 23 percent, whereas the total population grew by only 5.4 percent.^{xlv}



Street level dry cleaner located inside a residential building.

Based on OEHHA’s cancer unit risk factor for perc, the AQMD – in its September 2002 Draft Staff Report on “Control of Perchloroethylene Emissions from Dry Cleaning Systems” – has estimated that the likely cancer risk posed by perc exposure to humans working at nearby industrial locations can range as high as 90-in-1,000,000. The cancer risk at residential locations, the AQMD estimates, can be as high as 140 to 190-in-1,000,000.^{7,xlvi} The residential cancer risk is presumed greater than the industrial risk on the basis that workers’ perc exposure will be limited to 40 years of labor whereas, residents will be exposed their entire lives (or 70 years) living nearby. Unfortunately, the AQMD’s risk estimates, as shocking as they might appear, may actually underestimate the real cancer risk posed by nearby dry cleaning operations because: (1) the September AQMD

Draft Staff report admits that “many dry cleaners are located closer than 25 meters to the nearest residence, school or business”^{xlvii} which if accounted for would result in a higher cancer risk; and (2) recent state audits found that dry cleaners in the Los Angeles Area, the San Francisco Bay Area, and the Sacramento Metropolitan Area were 90 percent^{xlviii}, 79 percent^{xlix}, and 87 percent^l out of compliance, respectively. Thus, basing cancer risk estimates on average emissions should be viewed as conservative.

⁶ According to Dr. Judith S. Schreiber, Senior Public Health Specialist, Office of the Attorney General, Bureaus of Environmental Protection, Albany, New York, collocated apartment measurements were increased in all situations ranging from 100-55,000 microgram per cubic meter.

⁷ The human cancer risk from perc exposure has been estimated to be as high as 190-in-1,000,000 or 190 expected cancer cases per 1,000,000 people exposed over the course of an average lifetime (70 years) at the same level of exposure.

The Non-Toxic Alternatives to Perc

The issues facing the garment care industry began to change dramatically during the 1970s and 1980s as a wide array of scientific studies began to evaluate perc for its potential health and environmental risks. In turn, air emissions, trace levels of groundwater and wastewater discharges, and occupational exposures caused by perc usage became issues for regulatory concern and intervention. German legislation introduced in 1991 helped focus attention on numerous alternatives to perc dry cleaning, two of which are known to be non-toxic and non-VOC emitting: wet cleaning.

Wet Cleaning

In 1991, a German company introduced machine wet cleaning – a system using computer-controlled washers and dryers with non-toxic, biodegradable detergents specifically formulated for the process – as an alternative to perc dry cleaning for garments labeled “dry clean only.” Interested in both Germany’s success and the identification of alternatives to perc solvents, the United States Environmental Protection Agency (US EPA) undertook an evaluation for a multi-process wet cleaning approach that was based on a quasi-laboratory type, non-commercial setting in 1992. A series of subsequent case studies in the United States and Canada have since found professional wet cleaning to be a viable alternative to dry cleaning in terms of cost, environmental impact, and performance.^{li}



Computerized washer used in the wet cleaning process.

Today, the professional wet cleaning industry in the US has grown considerably. In mid-1997, several hundred advanced, computer-controlled wet cleaning systems were sold in the United States and there are reports that as many as 3,000 cleaners nationally offer safe water-based wet cleaning in their shops today.^{liii}

Because there are currently six manufacturers providing a variety of sizes and models of wet cleaning machines, cleaners also have several wet cleaning systems to choose from.^{liiii} Wet cleaning systems, which also require tensioning presses, cost substantially less than traditional perc machines running at an estimated \$30,000 per system. Some cleaners have reported slightly higher labor costs for spotting techniques and finishing of garments required in the wet cleaning process, but other wet cleaners have minimized this increase in labor costs with additional employee training. Wet cleaning may also achieve

significant energy savings based on a recent evaluation of an Orange County, California-based cleaner. According to the AQMD, the San Clemente Natural Cleaning Center experienced a 45 percent reduction in electricity use and a four percent reduction in natural gas use. AQMD estimated the total energy savings to be about \$71 per month or \$852 per year.^{liv} Solvents used in the wet cleaning process are much less than perc, hydrocarbon or siloxane solvents. Finally, because professional wet cleaning uses water and non-toxic, biodegradable detergents, they are approved for sewer system disposal without permit, do not require a permit to operate from the local air district, nor are they subject to air pollution and air toxic rules that currently govern the use of perc.^{lv}

Unlike cleaners using perc and hydrocarbon solvents, and possibly siloxane solvents, wet cleaners realize a true cost savings by eliminating their need for toxic disposal. Further, wet cleaning shops create acceptable workplace conditions that meet state and local health standards by eliminating the toxic exposure of perc to employees, customers, neighboring residences, schools and local businesses.

Wet cleaning, like perc dry cleaning, is extremely effective in cleaning delicate garments. In a case study of more than 35,000 delicate garments – most of them labeled “dry-clean only” – several Los Angeles-based professional wet cleaners successfully laundered 99.9 percent of the garments received. The reject rates experienced by the Los Angeles businesses are identical to that of the US EPA’s demonstration site in Chicago.^{lvi} Unlike dry cleaning, wet cleaning does not melt buttons or ornamentation on garments. Overall, studies of the economic viability of professional wet cleaning have actually shown the cost of professional wet cleaning to be comparable to that of dry cleaning.^{lvii} Dedicated professional wet cleaning is currently available to customers in southern California in at least 10 locations (see *Appendix A*).

Liquid Carbon Dioxide

A liquid carbon dioxide (CO₂) garment cleaning machine, developed by Los Alamos under a US EPA contract in 1994, is a closed loop system, with a cleaning chamber, storage unit, filtration, distillation, and lint trap. This alternative technology turns gaseous CO₂ into a liquid under applied pressure, which gives it solvent properties. Liquid CO₂ machines have been installed in 14 states: California, Florida, Georgia, Illinois, Massachusetts, Michigan, Minnesota, Nebraska, New Jersey, North Carolina, Pennsylvania, Rhode Island, South Carolina, and Texas. The cost of a liquid CO₂ system is between \$80,000 and \$90,000, which is almost double the cost of a conventional perc machine but comparable with or less than the high end hydrocarbon and siloxane systems marketed today. Like wet cleaning, liquid CO₂ machines would not be subjected to municipal or air quality regulations if the detergents and additives used in the operations contain less than 50 grams per liter of VOC. Unlike wet cleaning, however, until non-VOC detergents emerge for the liquid CO₂ cleaning process, regulatory oversight will be required. Nevertheless, the CO₂ process can provide a professional cleaner with true cost savings by eliminating toxic exposure to employees, customers, and nearby receptors, reducing environmental compliance costs and legal liability. Liquid CO₂ systems have been determined not to be harmful to the environment, nor do they contribute to global

warming as the CO₂ used in garment cleaning comes from captured emissions from other industrial or agricultural processes.^{lviii} Three companies currently manufacture liquid CO₂ garment cleaning machines in the US.

Alternatives that Require More Thought

Siloxanes

Siloxanes, such as GreenEarth™, are silicon-based solvents developed in the late 1990s. Cleaners like them because they make clothes feel soft, and colors can be mixed without fear of damage, unlike perc and wet cleaning. Siloxane solvents are believed to have no smell and contain no smog-forming volatile organic compounds (VOCs). Like hydrocarbon solvents, siloxane cleaning machines are typically more expensive than perc machines with an estimated cost ranging from \$40,000-\$100,000, depending on size. Despite concerns from both inside and outside the garment care industry, the distributing company and the manufacturer, General Electric, claims that siloxane solvents pose little environmental risk even if accidentally discharged. Industry-funded preliminary toxicity testing on GreenEarth™ indicates minimal toxicity with most categories reporting no significant toxic responses. Such results are promising in that siloxane solvents may reduce toxic levels in and around shops and clothes using perc. The two-year bioassay test (combined chronic toxicity and oncogenicity), however, is still in progress with results expected at the end of 2002. Nevertheless, General Electric has identified a maximum exposure limit of 10 parts per million (ppm) time-weighted average for GreenEarth™, which is considered a very stringent standard. In comparison, the Occupational Safety and Health Administration's maximum exposure limit for perc is set at a much less stringent 100 ppm time-weighted average.^{lix} Further, siloxane solvents, while not chlorinated themselves, are currently manufactured using large amounts of chlorine.^{lx} Given manufacturing processes, it is possible that dioxin and other organochlorine compounds could be released as emissions during production or from waste incineration.^{lxi} Finally, GreenEarth™ is classified as a class IIIA solvent that may require firewall modifications due to combustibility issues from local fire authorities.

Hydrocarbon Solvent Cleaning

The similarities of the hydrocarbon solvent cleaning process and equipment to the perc cleaning process and equipment make this alternative appealing to most dry cleaners. The cost of a closed-loop solvent machine, however, ranges from \$40,000 to \$100,000 depending on the size of the machine. Perc machines comparatively cost \$30,000 to \$50,000, again depending on machine size.^{lxii} Although hydrocarbon solvent cleaning is

an improvement to today's perc dry cleaning machines, this alternative is not environmentally benign because some hydrocarbon solvents may be toxic or contain VOCs, or both. Hydrocarbon solvent properties include flammability, solvent power, volatility, odor, and toxicity. Toxicity varies by compound but any petroleum-based solvent has some toxicity by nature.^{lxiii} For example, N-propyl bromide (marketed under the name Comexsol) is in the testing/early marketing phase of development through New York Machinery Tech, Inc. Although this solvent has not undergone a complete toxicity testing, initial indications are that it may be a reproductive toxin.

Beyond toxicity concerns, hydrocarbon solvents also emit smog-forming volatile organic compounds (VOCs). The use of hydrocarbon solvents will therefore be subject to VOC rules for areas that are struggling to attain federal and state clean air standards.⁸ The fact that the garment care industry is already an extremely difficult industry to regulate based on the sheer numbers of shops and that recent audits have shown the majority of shops in the Los Angeles-Area, the state of Massachusetts, the state of New York, the Sacramento Metropolitan Area, and the San Francisco Bay Area are out of compliance with existing occupational health standards, regulators may think twice about promoting alternatives that require further regulation.^{lxiv}

What You Can Do to Protect Yourself and Your Neighborhood

If you have a professional wet cleaner or other non-toxic cleaning facility in your vicinity, we recommend using them for all your garments marked, "dry clean-only." However, because non-toxic alternatives are gradually becoming available to American consumers, many communities do not currently enjoy access to non-toxic professional garment cleaners. You can still minimize your risk and make a difference in your community by performing some or all of the suggestions listed below:

- Dry clean clothes only when they need to be cleaned, as cancer and non-cancer health risks can be reduced if dry cleaned clothes are cleaned less often;
- Air out freshly dry cleaned clothes for 4-5 days before putting them in your closet or wearing them. Be aware that airing out dry cleaned garments reduces, but does not eliminate, the health risks caused by perc emissions;^{lxv}
- Talk to your dry cleaner and encourage them to use non-toxic alternatives, like wet cleaning or liquid CO₂ cleaning. You can download a guide to help you talk with

⁸ Hydrocarbon solvents in the South Coast AQMD will be subject to Rules 201, 1102, Regs III & XIII, and will require a South Coast AQMD permit to operate.

your dry cleaner at the Coalition for Clean Air's website:
www.coalitionforcleanair.org;

- Call or write your national, state and local representative and ask them what plans do they have to reduce perc exposure in your community;
- Express your opinion by calling and talking about the issue on your favorite radio or television talk show, or by writing a letter to your local newspaper;
- Volunteer at a local non-profit organization that works to reduce toxics in your community.

Policy Recommendations

- US EPA, state and local regulatory agencies must acknowledge the limitations of “end-of-pipe” strategies and the inability to reduce perc’s exposure to “acceptable” cancer risk levels.
- US EPA, state and local regulatory agencies should adopt a pollution prevention strategy that requires a phase-out of perc garment cleaning machines with non-toxic, non-petroleum based alternatives no later than 2014. Studies show that the lifetime use of a perc dry cleaning machine is approximately 10 years.^{lxvi} This would make a 10-year phase out of all perc machines in the country feasible and appropriate given the risks to human health and the environment. An additional benefit of an earlier phase-out of perc is a reduction of future remediation costs for the environmental impacts of continued perc use.
- US Congress, state legislatures, and local agencies should provide financial or tax incentives and low interest loans to professional cleaners that make an early transition away from perc garment cleaning machines to known non-toxic and non-VOC alternatives such as wet cleaning. Due to its known non-toxicity, Liquid CO₂ systems should also be considered. Financial or tax incentives should not be offered to hydrocarbon solvents that contribute to our nation’s dependence on foreign petroleum and release smog-forming VOCs, air toxics, or hazardous waste into our environment. Siloxane solvents should be fully tested for toxicity and dioxin contributions before tax incentives are considered for this alternative.
- US Congress, state legislatures, and local agencies should levy financial disincentives on cleaners that continue to operate perc dry cleaning facilities to help fund more progressive cleaners who are adopting existing non-toxic, non-VOC alternatives.

- The Federal Trade Commission should act on its 1998 proposal to change its care label rule to create a new mandatory professionally wet clean care instruction for garments as the current “dry clean only” label tends to mislead consumers into falsely believing that dry cleaning is the best and only way to clean delicate garments.^{lxvii}
- Local governments should adopt ordinances that prohibit the initial siting or permit renewal of professional cleaners using perc as a cleaning solvent in residential or commercial office buildings.
- US Congress and state legislatures should fund local education efforts that inform consumers of the health risks associated with perc usage in the dry cleaning industry, the non-toxic alternatives that consumers should look for, and the steps that consumers can take to reduce their risks where non-toxic alternatives are not available.
- Trade associations of the garment care industry should embrace federal and state education efforts on the dangers of perc use and help assist garment care shops in the transition away from its use.

Appendix A: Dedicated Wet Cleaners in Southern California

Anawood Cleaners *

1223 S. Euclid Street, Anaheim, CA 92802
(714) 535-4192

Cypress Natural Cleaners

9947 Walker Street, Cypress, CA 90630
(714) 827-3210

Del Mar Cleaners (Formally Celebrity Cleaners) *

701 Washington Blvd., Venice, CA 90291
(310) 827-0131

Eli's Airport Cleaners *

16500 Sherman Way, Suite A-6, Van Nuys, CA 91406
(818) 787-2213

Natures Best Cleaners

8782 19th Street, Alta Loma, CA 91701
(909) 989-4777

Natures Best Cleaners

72-655 Highway 111, Suite B1, Palm Desert 92260
(760) 836-3829

Rio Vista Cleaners *

2811 1/2 E. Lincoln Ave., Anaheim, CA 92826
(714) 630-4440

San Clemente Natural Cleaning Center *

913 S. El Camino Real, San Clemente, CA 92672
(949) 492-2579

Sparkle Cleaners

8931 Adams Blvd, Huntington Beach, CA 92646
(714) 963-9208

* means this facility is a part of the Professional Wet Cleaning Commercialization Project and operates as a demonstration facility.

Report End Notes

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Join the Coalition for Clean Air's Wet Cleaning Campaign!

The Coalition for Clean Air's *Wet Cleaning Campaign* has been a focus of the organization's Public Health and Toxics Program since 1995 when the organization became a member of the Pollution Prevention Education and Research Center's Advisory Board. The goal of the Coalition's Public Health and Toxics Program is to eliminate both air pollution and air toxics that are impacting the health of all Californians. The garment care industry's current use of perc as a cleaning solvent presents a significant and unnecessary risk that threatens the health of Americans. You can help our drive to bring cleaner, non-toxic alternatives to the garment care industry by contacting Lori Low at (310) 441-1544 or visit the web at www.coalitionforcleanair.org to learn how.



Leading the Way to Clean, Healthy Air

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