

**Dry Cleaning & Air Quality Requirements**

Dry cleaners are located throughout Yakima County, typically near residential areas for customer convenience. Solvents used in dry cleaning processes often contain hazardous substances that may be released to the air. To reduce public exposure, dry cleaning activities are monitored for compliance with air quality requirements by the Yakima Regional Clean Air Agency (Yakima Clean Air.)

**Dry Cleaning Solvents**

Most of the air pollution from dry cleaning is from the evaporation of solvents used in the cleaning process. Perc (perchloroethylene) is the most commonly used dry cleaning solvent. Petroleum solvents are also used, such as Stoddard solvent, and less volatile, petroleum hydrocarbon cleaning solvents, such as DF2000. Perc is a hazardous air pollutant and a suspected cancer causing chemical. Petroleum and petroleum-derived hydrocarbon solvents contain volatile organic compounds (VOCs) and are highly flammable.

Dry cleaning machines use these solvents for cleaning garments. Solvent is removed from the cleaned garments during the drying cycle, where heated air is passed through the garments to evaporate the solvent. At the end of the drying cycle, residual solvent contained in the heated drying air, is routed through a refrigerated condenser, where it is reclaimed. The solvent is then collected, filtered and returned to the work tanks.

With the use of refrigerated condensers, the emissions from dry cleaning operations have decreased significantly.



However, emissions can still occur if the refrigerated condenser is not operating properly, when the machine doors are opened to remove clothing, when filters are changed, when clothing is removed prematurely and not fully dried, through leaks or spills from the machine, and when solvent containing materials are left in open containers.

**Air Quality Requirements**

Dry cleaning is subject to federal and state air quality regulations, administered by Yakima Clean Air. Regulations focus on equipment, operations, and practices that affect emissions, such as temperature monitoring of refrigerated condensers, leak checks, repairs, maintenance, and record-keeping activities. Below is a summary of the key requirements for Perc dry cleaning operations.

- Inlet and outlet temperatures for the refrigerated condenser (RC) must be recorded during the cool down phase of the dry cleaning cycle weekly, to monitor the effectiveness of recovering the cleaning solvents from the dryer exhaust.
- The dry cleaning system must be checked weekly for perceptible leaks from hose and pipe connections, fittings, couplings, and valves; door gaskets and seating's; filter gaskets and seating's; pumps; solvent tanks and containers; water separators; muck cookers; stills; exhaust dampers; diverter valves; and cartridge filter housings. Once a month the leak check must be performed with a hydrocarbon detector or Perc gas analyzer.
- Perceptible leaks must be repaired within 24 hours of detection. If repair parts are not available, parts must be ordered within two days of detection and installed within five days of receipt.
- Dry cleaning machines must be properly operated and maintained in accordance with manufacturer's recommended procedures to minimize solvent emissions. Manufacturer's operation and maintenance manuals must be kept on site, and must be available for review at all times.
- Records of temperature monitoring, leak checks, repairs, maintenance, solvent purchases and receipts, and waste disposal must be kept up-to-date and on-site for five years. Records must be available for review at all times.



# COMPLIANCE ASSISTANCE PROGRAM

## Compliance Inspections

During a typical on-site visit, inspectors will review:

### Operations

- Is the equipment properly maintained and operated according to the manufacturer's recommendations?
- Are there any perceptible leaks with the dry cleaning machine, solvent and hazardous waste containers, the surrounding space and tools? Inspectors may use the senses of smell, sight, and touch, or a detector, to find perceptible leaks.
- If leaks are detected, have repairs been made within 24 hours of detection?
- If repair parts were not available, were parts ordered within two days of detection and installed within five days of receipt?
- Are Perc and related wastes are stored in closed containers with no perceptible leaks?
- Do monitored RC inlet and outlet temperatures indicate adequate condensation of solvents and removal from the exhaust vapor stream during the "cool down" cycle? Is the RC outlet temperature

always 45° F (7° C) or less during the "cool down" cycle? Is the difference between the RC inlet and outlet temperatures 20° F (11° C) or more?

### Records

- Have weekly temperatures been recorded to demonstrate proper operation of the RC?
- Is a copy of the manufacturer's operation and maintenance manual on site for review?
- Are waste manifests maintained? Are MSDS for cleaning solvents available on site?
- Are leak check records adequate?
- Have repairs occurred within 24 hours of detection?
- Are Perc receipts kept, including monthly and rolling 12-month totals?

### Other

Your facility may have additional requirements you must comply with conditions of the New Source Review Order of Approval issued by Yakima Clean Air.

Parts Per Million	Typical Inhalation Response to Perchloroethylene
50	Odor threshold to un-acclimated persons
100	Faint odor definitely apparent to un-acclimated persons.
200	Moderate to faint odor upon exposure. Faint to moderate eye irritation. Minimal light-headedness. Eye irritation threshold – 100-200 ppm.
400	Strong and unpleasant odor. Definite eye irritation, slight nose irritation. Definite lack of coordination (2 hours) of exposure at this limit.
600	Strong odor, very unpleasant but tolerable. Definite eye and nose irritation. Dizziness, loss of inhibitions (10 minutes.)
1,000	Very strong, intense, and irritating odor. Marked irritation to eyes and respiratory tract. Considerable dizziness, not likely to be tolerated voluntarily (2 minutes.)
1,500	Almost intolerable odor, gagging. Intolerable irritation to eyes and nose. Complete lack of coordination in minutes to unconsciousness within 30 minutes.

**Going Beyond Compliance** - Once a business has reached compliance, the next step is to look at going *beyond* compliance. As technology improves, new solvents and garment cleaning processes are being developed that have less environmental impact than Perc. Benefits may include reduced emissions, paperwork, and regulation requirements, as well as potential savings in hazardous waste disposal costs. Below are several "beyond compliance options" for Perc dry cleaners. Find what works best for your facility.



## COMPLIANCE ASSISTANCE PROGRAM

Type of Solvent or Process	Benefits	Concerns
Hydrocarbon - a solvent (i.e. DF2000, EcoSolve)	Most widely used solvent alternative, not high in toxicity, higher flash point than traditional petroleum solvents, cleans delicates better than Perc, better feel than Perc, can retrofit some Perc machines for this solvent.	Has regulatory requirements, machines generally have nitrogen to prevent fire, longer cycle time, not as aggressive of cleaner as Perc, bacteria growth in solvent must keep water in machine clean, may not be able to retrofit all Perc machines to use this solvent.
Tonsil - a special filter to put in hydrocarbon machine (spin filter contains Tonsil and diatomaceous earth)	Prevents bleeding of garments in machine, can avoid distillation process, don't need to use detergent in machine, absorbs water eliminating bacteria growth problem.	Filter needs proper care or all benefits could be reversed, may have regulatory requirements.
Pure Dry - a solvent variation of hydrocarbon with PFC and HFC	Same benefits as listed with hydrocarbon solvent.	Same listed with hydrocarbon solvent, regulatory and health concerns with the additives.
D5 (decamethylcyclotrisiloxane) - a solvent (i.e. Green Earth)	Higher flash point than hydrocarbons, can run in hydrocarbon machines, good on delicates, good feel, currently no known regulatory requirements.	Longer cycle time than Perc or hydrocarbon, caused cancer in lab animals.
Glycol Ether - a solvent (i.e. Rynex, Solvair)	Very aggressive cleaner, no need to spot clothes prior to cleaning.	Cycle time is long, water separation is difficult, a VOC has some regulatory requirements, toxicity not clear, expensive equipment.
Carbon Dioxide - a solvent (uses carbon dioxide and detergent for cleaning) (i.e. Micell)	Short cycle time, currently no known environmental regulations.	Special stainless steel and pressurized equipment required (~\$120K vs. ~\$40K for a Perc machine).
n-PB (n-propyl bromide) - a solvent	Solvent can be used in Perc machines, very aggressive cleaner	If solvent mixes with water it turns into acid and will harm garments, reproductive toxin, causes nerve damage, may be carcinogen, has some regulatory requirements.
Traditional Wet Cleaning - a process (use water and detergent to clean garments)	No known environmental regulations, aggressive cleaning method.	Need humidity controlled dryer and tensioning equipment.
Icy Water - a process (similar to wet cleaning except garments are washed in cold water and dried with cold air)	Same benefits as listed in wet cleaning, lower agitation, can use traditional finishing equipment, garments easy to finish.	Need a washer with refrigerated condenser.
Green Jet - a process (spray water and detergent rather than immersion)	Finishing much easier than wet cleaning, currently no known regulatory requirements	Non-aggressive cleaning, may be better as supplementary technology.



# COMPLIANCE ASSISTANCE PROGRAM

## Alternatives to Spotting

Another way to reduce emissions, protect employee health and save money is to change from traditional spotting chemicals to a Perc-free or TCE-free spotting agent. The Institute for Research and Technical Assistance performed field tests on spotting agents and found two safer alternatives: Cold Plus, and Nature's Choice. The alternatives generally sold for \$10-\$20 less per gallon than traditional spotting agents. This is not an endorsement.

## Leak Detectors and Monitoring Equipment - New Federal Requirements

On July 27, 2006, new federal requirements became effective for all dry cleaners that use the chemical perchloroethylene (Perc). Existing dry cleaning machines (installed between December 9, 1991 and December 21, 2005) must be in compliance with the new standards by July 28, 2008. One of the new rules requires dry cleaners to conduct monthly inspections for Perc vapor leaks using a halogenated hydrocarbon detector or Perc gas analyzer, such as a photo ionization detector.

In the following tables is information on types of detectors that may meet EPA requirements. This is not an endorsement and is not an extensive list. Further research is recommended to find the best tool for your facility. Prices are subject to change. Sources: CARB, EPA and Tennessee Small Business Environmental Assistance Program.

Perc Gas Analyzers - Photo Ionization Detector (PID) - Can be used for equipment leak detection ( $\geq 25$ ppm Perc) and carbon adsorber monitoring (300 ppm $\pm$ 75 ppm perc / 100 ppm $\pm$ 25 ppm). Detectors are calibrated to be solvent specific. Price range \$1,500 - \$3,800.				
Manufacturer	Model #	Type	Sensitivity	Distributors
Ion Science	PhoCheck 1000	PID	0.1-4,000 ppm 5% accuracy	Ion Science Americas LLC 1-800-224-5153 <a href="mailto:info@ionscience-americas.com">info@ionscience-americas.com</a> <a href="http://www.ionscience.com">www.ionscience.com</a>
Rae Systems	MiniRAE 2000 2 sensitivity levels	PID	0-99 ppm / 100-2,000 ppm 2% accuracy	Rae Systems 206-310-5906 <a href="mailto:lstading@raesystems.com">lstading@raesystems.com</a> <a href="http://www.raesystems.com">www.raesystems.com</a>
	ToxiRAE Plus 2 sensitivity levels	PID	0-99 ppm / 100-2,000 ppm 2% accuracy	Inspector Tools 1-800-895-4916 <a href="http://www.inspectortools.com">www.inspectortools.com</a> Cole-Parmer 1-800-323-4340 <a href="http://www.coleparmer.com">www.coleparmer.com</a>
International Sensor Technology	IQ350-TLV- FALCON	PID	Low level (0-100 ppm) Medium level (0-500 ppm)	International Sensor Technology 1-800-478-4271 <a href="http://www.intlsensor.com">www.intlsensor.com</a>
PID Analyzers / HNU	DL-102	PID	less than 1 ppm to 3.0 ppm	PID Analyzers, LLC 1-800-PID-6826 <a href="http://www.hnu.com">www.hnu.com</a>



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**Halogenated Hydrocarbon Detectors** - Must detect 25 ppm or more Tetrachloroethylene (Perchloroethylene or Perchloroethene). Price range \$125 - \$580.

Manufacturer	Model #	Type	Sensitivity	Distributors
Snap-On Inc.	ACT 730 Leak Detector	Halogen selective	<0.25 oz/yr	Snap-on Equipment 1-800-225-5786 <a href="mailto:Clay.Cook@snapon.com">Clay.Cook@snapon.com</a> <a href="http://buy1.snapon.com">http://buy1.snapon.com</a>
Inficon Inc.	Tek-Mate	Heated Diode Halogen selective	<0.4 oz/yr	Nu-Way Products Co. Phillip Farmer 1-800-462-2089 <a href="http://www.inficonrefrigerantleakdetectors.com">www.inficonrefrigerantleakdetectors.com</a>
Aeroequal Semiconductor	Aeroqual 200 Leak Detector (perchloroethylene)	Solvent specific	0-200 ppm	Kanomax USA, INC 1-800-247-8887 <a href="http://kanomax-usa.com/Aeroqual-Series-200.html">http://kanomax-usa.com/Aeroqual-Series-200.html</a>
TIF	TIFXP-1A Six Tricolor LEDs for Visual Leak Indication, Se	Halogen selective	<0.1 oz/yr	Grainger Industrial Supplies <a href="http://www.grainger.com">www.grainger.com</a>
	TIFRX-1A Six Single Color LEDs for Visual Leak Indication, Two Sensitivity Levels	Halogen selective	<0.25 oz/yr	TIF 1-800-327-5060 <a href="http://www.tif.com">www.tif.com</a> Network Tool Warehouse Tel: 1-800-939-8665
	TIFXL-1A One Sensitivity Level	Non-selective	<0.4 oz/yr	<a href="http://www.ntxtools.com">www.ntxtools.com</a> Cleaner Supply 1-800-388-5410 <a href="http://www.cleanersupply.com">www.cleanersupply.com</a>