1997 Edition

Clearing the Air on Clean Air: Strategies for Perc Drycleaners

Compliance
Risk Reduction
Pollution Prevention

SPONSORED BY:

The Tennessee Department of Environment and Conservation

and

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ABOUT THIS HANDBOOK

This handbook will help your facility comply with the Clean Air Act Amendments (CAAA) requirements. The book is a tool to help perc dry cleaners reap the benefits of reducing waste. The handbook focuses on procedures that result in compliance, risk reduction, and decreased waste generation for your company. In it, you will find information that will help you initiate and maintain regulatory reporting and monitoring information, and identify and assess pollution prevention/waste reduction options. You will also find answers to questions like:

- What does EPA want me to do?
- What records does the law require me to keep on site for inspection?
- What reports do I need to file and when?
- How do I find leaks and monitor air emissions?
- Why should I bother with voluntary pollution prevention/waste reduction measures?
- What waste reduction options are other dry cleaners successfully using?
- How do I implement waste reduction practices?
- Are there loans or grants available for dry cleaners who have to make equipment changes?

Because individual dry cleaner's circumstances and needs vary widely, you should modify the procedures to meet your own unique requirements.

Why Perc?

As you probably know, dry cleaners are one of the users of *perchloroethylene* (perc or PCE). Perc, a solvent, is regulated by the Clean Air Act Amendments (CAAA) of 1990. Perc is a hazardous air pollutant and dry cleaners must control perc emission levels. On December 9, 1991, EPA proposed national emission standards for hazardous air pollutants (called *NESHAP*) to limit perc emissions from both existing and new dry cleaning plants.

According to 1991 EPA data, dry cleaners use 191.8 million pounds of perc annually. This manual is for dry cleaners who use perc and regulators who will enforce the laws for dry cleaners.

There are many ways to lose perc in dry cleaning operations— process vent and fugitive emissions to the atmosphere and losses in wastes like muck and still bottoms.

On May 12, 1994, Clearing the Air on the Clean Air Act, a teleconference on the NESHAPs affecting perc dry cleaners, was broadcast nationwide. This manual was written to accompany that teleconference. If you would like to order a copy of the videotape, visit the UT CIS home page at www.cis.utk.edu. The following organizations sponsored the teleconference.

EPA's Air Pollution Training Branch provides technical training for State and local air pollution control officials throughout the nation. The curriculum includes engineering, ambient and source monitoring, dispersion modeling, and compliance course work. Seminars, workshops, and course work are broadcast via satellite or presented in more traditional short course and self-study formats.

EPA's Federal Small Business Assistance Program (SBAP) was established to provide technical support to the state small business stationery source technical and environmental compliance assistance programs. The Federal SBAP is located within the Office of Air Quality Planning & Standards Control Technology Center (CTC), a leader in providing technical assistance to state and local agencies. The Federal SBAP is run in cooperation with several other EPA assistance centers including, the Pollution Prevention Information Center, the Chemical Emergency Preparedness & Prevention Office (CEPP), and the Emission Measurement Technical Information Center (EMTIC).

EPA's Office of the Small Business Ombudsman provides a convenient way for small business to access EPA, facilitates communication between the small business community and EPA, investigates and resolves disputes with EPA, and works with EPA personnel to increase their understanding of small businesses in development and enforcement of environmental regulations.

Tennessee's Small Business Assistance Program is located within the Tennessee Department of Environment and Conservation's Division of Pollution Prevention and Environmental Awareness. The State Ombudsman guides its role of employer assistance to those regulated under the Clean Air Act Amendments.

The Tennessee Valley Authority is a resource development arm of the Federal government committed to environmental leadership supporting creative solutions to environmental problems. Through public and private partnerships, TVA promotes sustainable economic development by educating corporate America on the value of waste reduction.

The UT Center for Industrial Services is Tennessee's statewide industrial extension program. CIS provides technical and managerial assistance to Tennessee manufacturers to help them prosper. CIS was created in 1963 by the Tennessee General Assembly to "render service to the industries in this state by providing information, data, and materials relating to the needs and problems of industry."

1 CHAPTER ONE COMPLIANCE

Although the amount of perc escaping from *your* dry cleaning operation may not seem like a problem, when you combine it with all the other dry cleaner's emissions, it adds up to a serious threat to clean air. Furthermore, only 62 percent of commercial dry cleaning machines currently have emission control equipment. EPA believes the number of dry cleaners aggressively using preventive maintenance to reduce perc emissions is even lower. Loss of perc in transfer machines occurs in machine venting, clothing transfers, open containers, and equipment leaks. Process emissions occur in (vented) dry-to-dry machines during the introduction of fresh air through the clothes (aeration cycle). During aeration, air streams from transfer machines and (vented) dry-to-dry machines can contain solvent. Non-vented, dry-to-dry machines eliminate process emissions by eliminating the introduction of fresh air through the clothes.

Fig. 1 Emission Factors for Dry Cleaning Machines (Pounds of Perc Per 100 Pounds of Clothes)

	Type of Machine		
Source	**Transfer**	**Dry-to-Dry (vented)**	**Dry-to-Dry (non-vented)**
Machine vent	4.0	3.1	0
Fugitive			
Clothing transfer	2.5	0	0
Equipment Leaks	2.5	2.5	2.5
Losses in Waste	3.2	3.2	3.2
Total	12.2	8.8	5.7

FIG. 1 Source: Federal Register/Vol.57, No. 191, 10-1-92 & Center for Emission Control 09-92.

Dry cleaners can control process vent emissions with refrigerated condensers or carbon adsorbers. Room enclosures control most fugitive emissions, including those during clothing transfer. Leak detection and repair, good housekeeping, and preventive maintenance also control fugitive emissions.

The most significant aspect of the new, industry-supported rule is that dry cleaners can use ONLY refrigerated condensers for primary add-on control. Primary add-on control is the first, and often only, control required by EPA. Secondary control

can be an add-on carbon adsorber used with a refrigerated condenser. EPA requires secondary add-on control for the largest new machines. The condenser must have a dual coil to capture perc vapors from the washer and dryer of a transfer machine. You may have to retrofit some older, single coil refrigerated condensers on transfer machines. EPA has not approved any other add-on devices for primary control.

EPA's ***final*** rule requires all new dry cleaning machines to be dry-to-dry machines. It does not require the replacement of existing transfer machines with new dry-to-dry machines. However, if your tumbler or reclaimer needs replacement, you will have to buy a dry-to-dry system with a refrigerated condenser.

Figure 2 on the next page is a diagram of typical perc atmospheric and waste losses.

Compliance and Risk Reduction for Perc Dry Cleaners

On September 15, 1993, EPA's Air Office published the ***final*** air standard for perc dry cleaners. The rule puts dry cleaners into three separate categories — small area, large area, and major sources. Each category has different requirements.

Outlined below is a method that will satisfy all reporting and record keeping requirements of the new EPA final air standard.

Perc Consumption Record

You need to determine the total volume of perc you purchased for ALL of the machines at your plant. This determination is the basis for a perc consumption record. On the first business day of each month, you are required to calculate the amount of perc consumed (purchased) in the previous month and a rolling total of consumption for the past 12 months.

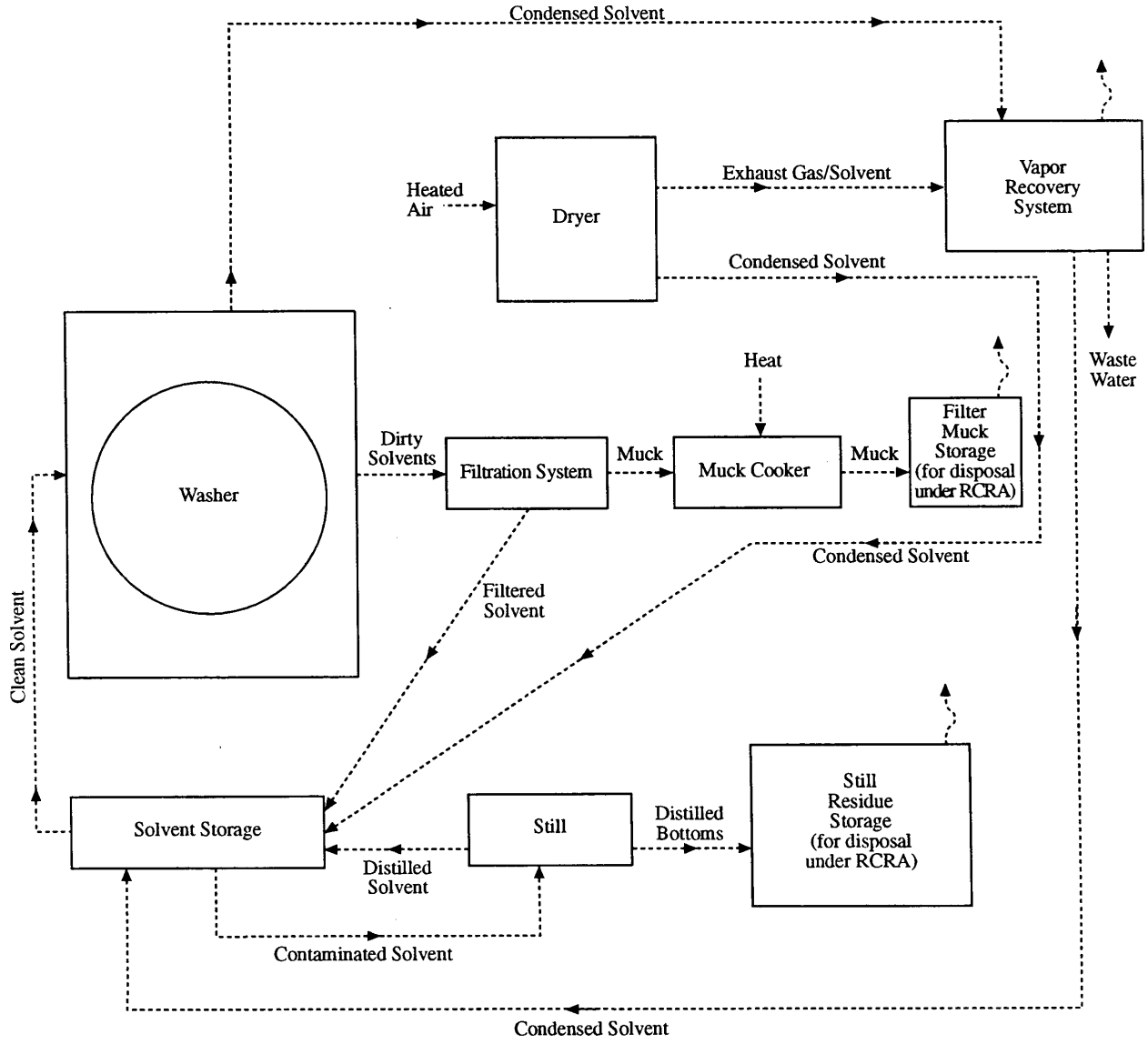
For the purpose of recording perc consumption, the following definitions apply:

Monthly Consumption = the sum of all perc purchases made in the prior month, based on receipts.
Annual Consumption = the sum of all perc purchases made in the prior 12 months, based on receipts.

Effective December 1993, you must keep receipts of perc purchases on-site for a minimum of five years. If you do not have receipts for the previous 12 months, estimate your consumption to calculate the 12-month rolling total. Be sure to make a note in your perc consumption record when you are making estimations.

On the following pages, you will find a sample log book entry and a blank form that you may use. If you own more than one facility, separate records must be kept for each facility.

Fig. 2 Typical Atmospheric and Waste Losses



Enter below how much perc was consumed (purchased) during the 12-month period from December 1992 to November 1993 from the example perc consumption record on the next page. If no receipts or records are available, estimate the quantity.

Example

This facility consumed (purchased) _____ gallons of perc 12/92—11/93 based on: receipts estimate
(circle one)

Fig. 3 Perc Consumption Record Example

MONTH	QUANTITY Purchased (GAL)	12 MONTH TOTAL FROM ___ TO ___	12 MONTH TOTAL (GAL)	NOTES
DEC '92	50*	NA	NA	no receipts
JAN '93	0*	NA	NA	no receipts
FEB '93	20*	NA	NA	no receipts
MARCH '93	20*	NA	NA	no receipts
APRIL '93	0*	NA	NA	no receipts
MAY '93	50	NA	NA	receipts available
JUNE '93	40	NA	NA	
JULY '93	20	NA	NA	
AUG '93	0	NA	NA	
SEPT '93	20	NA	NA	
OCT '93	40	NA	NA	
NOV '93	40	12/92-11/93	300 (1)	
DEC '93	20	01/93-12/93	270 (2)	
JAN '94	40	02/93-01/94	310 (3)	
FEB '94	0	03/93-02/94	290	

* = ESTIMATED

(1) 50 + 0 + 20 + 20 + 0 + 50 + 40 + 20 + 0 + 20 + 40 + 40 = 300
(2) 0 + 20 + 20 + 0 + 50 + 40 + 20 + 0 + 20 + 40 + 40 + 20 = 270
(3) 20 + 20 + 0 + 50 + 40 + 20 + 0 + 20 + 40 + 40 + 20 + 40 = 310

Note: Effective Dec. 93, you must keep all perc purchase receipts. If you do not have receipts for purchases made prior to Dec. 93, you must estimate. However, you should note this on your log as demonstrated above.

Fig. 4 Perc Consumption Record Example

MONTH	QUANTITY PURCHASED (GAL)	12 MONTH TOTAL FROM ___ TO ___	12 MONTH TOTAL (GAL)	NOTES
DEC '92		NA	NA	
JAN '93		NA	NA	
FEB '93		NA	NA	
MARCH '93		NA	NA	
APRIL '93		NA	NA	
MAY '93		NA	NA	
JUNE '93		NA	NA	
JULY '93		NA	NA	
AUG '93		NA	NA	
SEPT '93		NA	NA	
OCT '93		NA	NA	
NOV '93		12/92-11/93		
DEC '93		01/93-12/93		
JAN '94		02/93-01/94		
FEB '94		03/93-02/94		
MARCH '94		04/93-03/94		
APRIL '94		05/93-04/94		
MAY '94		06/93-05/94		
JUNE '94		07/93-06/94		
JULY '94		08/93-07/94		
AUG '94		09/93-08/94		
SEPT '94		10/93-09/94		
OCT '94		11/93-10/94		
NOV '94		12/93-11/94		

* = ESTIMATED

Fig. 5 Perc Consumption Record

MONTH	QUANTITY PURCHASED (GAL)	12 MONTH TOTAL FROM ___ TO ___	12 MONTH TOTAL (GAL)	NOTES
DEC '93		01/93-12/93		
JAN '94		02/93-01/94		
FEB '94		03/93-02/94		
MARCH '94		04/93-03/94		
APRIL '94		05/93-04/94		
MAY '94		06/93-05/94		
JUNE '94		07/93-06/94		
JULY '94		08/93-07/94		
AUG '94		09/93-08/94		
SEPT '94		10/93-09/94		
OCT '94		11/93-10/94		
NOV '94		12/93-11/94		
DEC '94		01/94-12/94		
JAN '95		02/94-01/95		
FEB '95		03/94-02/95		
MARCH '95		04/94-03/95		
APRIL '95		05/94-04/95		
MAY '95		06/94-05/95		
JUNE '95		07/94-06/95		
JULY '95		08/94-07/95		
AUG '95		09/94-08/95		
SEPT '95		10/94-09/95		
OCT '95		11/94-10/95		
NOV '95		12/94-11/95		

Reporting

The "Initial Notification Report" and "Compliance Report for Control Requirements" both require you to determine the number and type(s) of machine(s) that you have at your plant. There are two types of dry cleaning machines: dry-to-dry and transfer. A dry-to-dry system has one machine that does both the washing and drying of fabrics. A transfer system has two machines: a washer and a dryer. Clothing is transferred from the washer to the dryer at transfer machines, and this step is a big source of perc emissions.

Deadlines

• With the new amendments to the reporting requirements (added Dec. 20, 1993), the Initial Notification Report is due June 18, 1994 whether you're an EXISTING or NEW source. All sources must submit an "Initial Notification Report" by June 18, 1994. This date reflects an extension of 180 days beyond the first reporting requirement by EPA to allow you more time to file correctly.

• The Compliance Report for Control Requirements is due June 18, 1994 for NEW sources and Oct. 23, 1996 for EXISTING sources.

• The Compliance Report for Pollution Prevention is due June 18, 1994 for ALL sources.

Consider submitting your forms by registered mail with a return receipt so you can be sure of delivery. You do not need to have your forms notarized; just signed. See Appendices A-C for blank copies of the forms.

Existing and New Sources

Besides reporting perc consumption levels, you must also determine if you are a new or existing facility according to the law. New facilities are those who bought machines on or after December 9, 1991. Existing facilities are those who purchased machines before December 9, 1991.

Existing dry cleaners who have to make equipment purchases as a result of this law will have 36 months to comply. If you are a new area source, you must comply with the regulations upon start-up.

Table 1 Determining Your Source Category

Applicability	Small Area Source	Large Area Source	Major Source
Dry Cleaning Facilities with	Consuming less than:	Consuming equal to or between:	Consuming more than:
(1) Only Dry-to-Dry Machines	140 gallons PCE/year	140 - 2,100 gallons PCE/year	2,100 gallons PCE/year
(2) Only Transfer Machines	200 gallons PCE/year	200 - 1,800 gallons PCE/year	1,800 gallons PCE/year
(3) Both Dry-to-Dry and Transfer Machines	140 gallons PCE/year	140 - 1,800 gallons PCE/year	1,800 gallons PCE/year

Table I shows the different type machines and perc consumption levels for determining each type of source—SMALL, LARGE, AND MAJOR.

Am I an Existing Small Area Source?

Look at your total plant perc consumption records. If you reported your 12-month perc consumption at:

less than 140 gallons of perc
or
less than 200 gallons of perc if you only have transfer machines
and
your machine was installed before December 9, 1991
then you are an

EXISTING SMALL AREA SOURCE.

Effective December 20, 1993, *Existing Small Area Sources* must comply with the following regulations:

1. Keep perc purchase receipts for determining consumption amounts.
2. On the first business day of each month, you must record the amount of perc you bought in the prior month and the total amount of perc bought in the prior 12 months.
3. Keep all perc in closed, non-leaking containers.
4. Drain cartridge filters in their housing or sealed containers for a minimum of 24 hours.
5. Keep machine doors closed except when loading and unloading.
6. Operate and maintain equipment according to the manufacturer's instructions. Keep owner's manuals and design specs on-site.
7. Conduct a bi-weekly leak detection and repair program and keep a written log. You can perform leak detection by sight, smell, or feel of air flow. The leak inspection must include:
   - Hose and pipe connections, fittings, couplings, and valves;
   - Door gasket seating;
   - Filter gaskets and seating;
   - Pumps;
   - Solvent tanks and containers;
   - Water separators;

- Muck cookers;
- Stills;
- Exhaust dampers;
- Diverter valves; and
- Cartridge filter housings.

8. If you find leaks:

- Repair within 24 hours;
- If you need repair parts, order them within 2 days;
- Install parts within five days of receipt; and
- Keep a written log of repair work.

Following the leak inspection log examples, you will find a suggested corrective action form.

9. Keep all records for a minimum of five years.

Diagrams of a dry-to-dry machine (front and rear view) on the next two pages show leak detection areas. The diagrams on the following pages you will find two sample inspection forms—one form for a single machine and a second form for multiple machines. Use the form provided by the responsible regulatory agency in your area. If no forms are provided to you by regulatory agencies, use one of the sample forms in this book or make your own.

Existing facilities that don't exceed the *Small Area Source* perc purchase limits don't need to install any process vent controls unless state or local regulations in your area require it. For example, in Davidson County, TN, the Health Department requires ALL sources to have process vent controls with no exceptions. Check with your state and local regulatory agencies about their special requirements.

If your 12-month total perc consumption exceeds the small area source limits, you must comply with the large area source or major source requirements within 180 days or by September 23, 1996, whichever is later.

Fig. 7 Dry-to-Dry Main Assembly

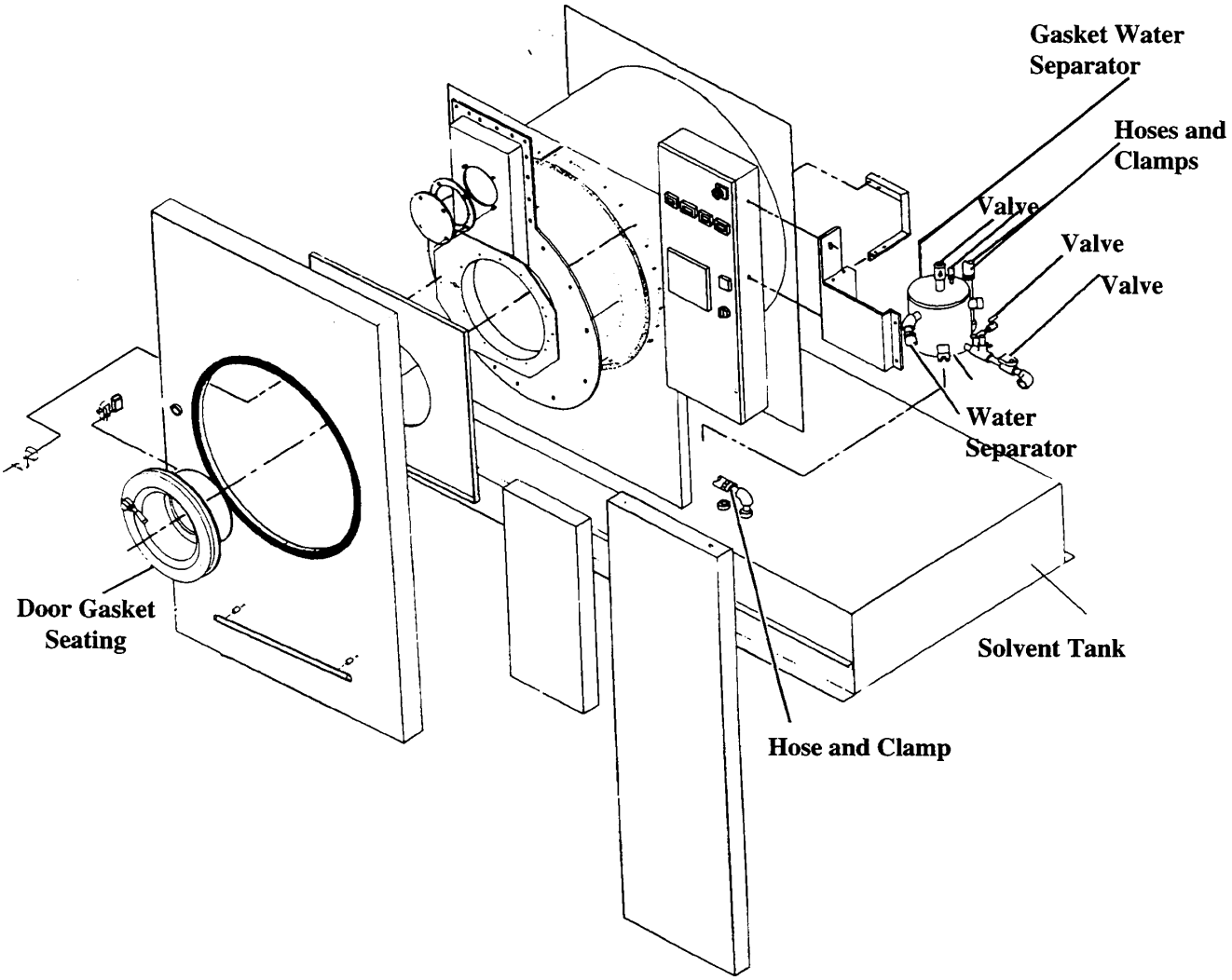


Fig. 8 Dry-to-Dry Main Assembly Back

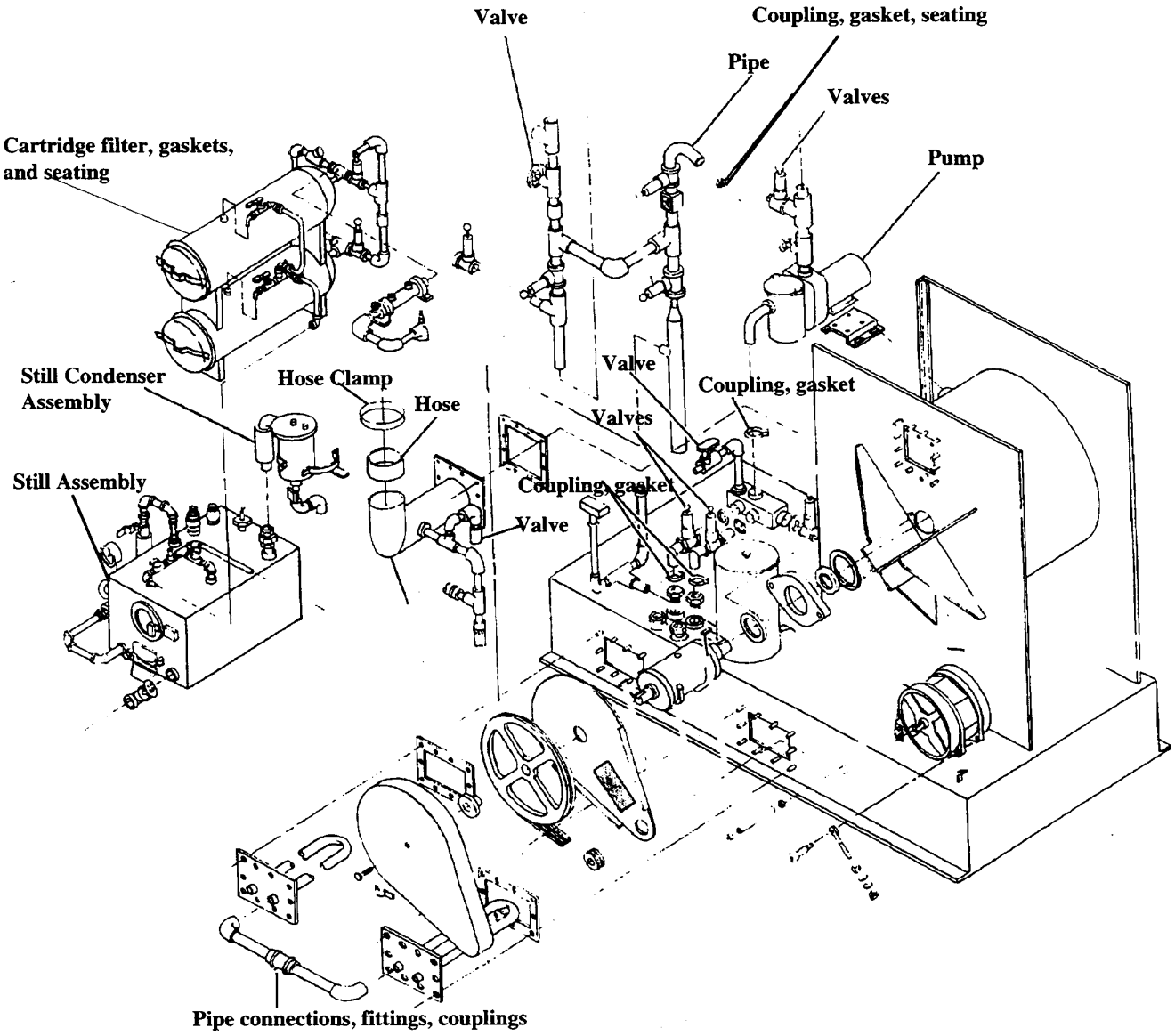


Fig. 9 Leak Detection Inspection Log

DATE _____ MACHINE NO. _____

INSPECTOR _____

Inspection done by SIGHT,SMELL,FEEL/MONITORING INSTRUMENT
circle one

Inspect the following items for leaks.

		SIGNS OF LEAKING?	
1.	Hose and pipe connections, fittings, couplings, valves	YES	NO
2.	Door gasket and seating	YES	NO
3.	Pump	YES	NO
4.	Solvent tank and containers	YES	NO
5.	Water separator	YES	NO
6.	Muck cooker	YES	NO
7.	Still	YES	NO
8.	Exhaust damper	YES	NO
9.	Diverter valve	YES	NO
10.	Filter gasket and seating	YES	NO
11.	Cartridge filter housings	YES	NO

If YES was answered to any of the above, attach a completed corrective action report.

Fig. 10 Multiple Machine Leak Detection Inspection Log

DATE _____ INSPECTOR _____

Inspection done by SIGHT,SMELL,FEEL/MONITORING INSTRUMENT
circle one

Inspect the following items for leaks. Circle YES or NO.

	SIGNS OF LEAKING?		
	Machine No. _____	Machine No. _____	Machine No. _____
Hose & pipe connections, fittings, couplings, valves	YES / NO	YES / NO	YES / NO
Door gaskets & seatings	YES / NO	YES / NO	YES / NO
Pumps	YES / NO	YES / NO	YES / NO
Solvent tanks & containers	YES / NO	YES / NO	YES / NO
Water separators	YES / NO	YES / NO	YES / NO
Muck cookers	YES / NO	YES / NO	YES / NO
Stills	YES / NO	YES / NO	YES / NO
Exhaust dampers	YES / NO	YES / NO	YES / NO
Diverter valves	YES / NO	YES / NO	YES / NO
Filter gaskets & seatings	YES / NO	YES / NO	YES / NO
Cartridge filter housings	YES / NO	YES / NO	YES / NO

If YES was answered to any of the above, attach a completed corrective action report.

Fig. 11 Corrective Action Form

DATE OF INITIAL INSPECTION _____

MACHINE NO. _____

INSPECTOR _____

DESCRIBE PROBLEM:

ARE PARTS NEEDED YES NO

DATE ORDERED _____

DATE RECEIVED _____

DATE INSTALLED _____

DATE PROBLEM CORRECTED _____

EXPLAIN:

Am I a New Small Area Source?

Look at your total plant perc consumption records. If you reported your 12-month perc usage at:

less than 140 gallons of perc
and
your dry-to-dry machine was installed on or after Dec. 9, 1991
then you are a

NEW SMALL AREA SOURCE.

Beginning now, *New Small Area Sources* must comply with all of the requirements for an existing small area source (see items 1-9 in this book) and the following *additional* regulations by September 22, 1993 or immediately upon start-up, whichever is later.

10. Install a dry-to-dry machine with a refrigerated condenser. This only applies for NEW installations. (You do not have to replace *existing* transfer machines that are still operational.)

11. The refrigerated condenser on a dry-to-dry machine must not release air-perc vapor to the atmosphere while the drum is rotating. To ensure this, the air-perc vapor should be recirculating back through the machine without venting to the atmosphere (closed loop). This ensures that the vapor stream will pass through the refrigerated condenser several times.

12. If a refrigerated condenser pulls air through the door when the door is opened after the cycle, then it must have a diverter valve.

13. Once a week, measure and record the temperature of the exhaust on the outlet side of a refrigerated condenser and log the results. The temperature must be equal to or less than 45^0 F. If the temperature is greater than 45^0 F, make repairs or adjustments within 24 hours and keep records of those repairs. (use corrective action form on page 21).

14. If refrigerated condenser monitoring results do not meet the specified temperature values and repairs need to be ordered or service performed:

    • Order needed repair parts or service within two days.

    • Install parts within five days of receipt.

    • Keep a written log of repair work.

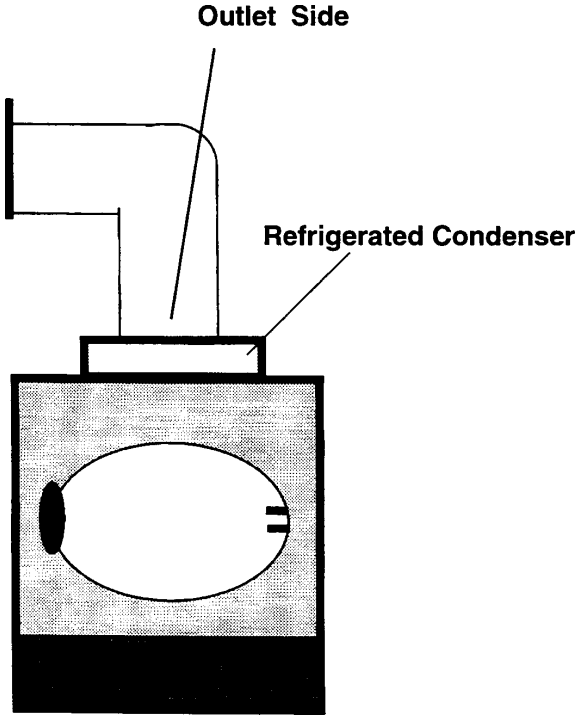
A sample of corrective action report form is shown in ***figure 11***.

On the following pages, a diagram shows the refrigerated condenser monitoring areas followed by an example blank form for recording the results for the refrigerated condenser's weekly monitoring and corrective actions (if applicable).

If your 12-month total perc consumption exceeds the *New Small Area Source Limits*, you must comply with the *New Large Area Source* requirements within 180 days or September 23, 1996, whichever is later.

After September 23, 1996, if you wish to increase operations and the increase would put you in the *Major Source* category, you must comply with the requirements for *Major Sources* upon start-up.

Fig. 12 Weekly Monitoring
Refridgerated Condenser Temperature
Dry-to-Dry, Dryer, Reclaimer



Measure the temperature of the vapor on the outlet side of the refridgerated condenser. Temperature must be less than or equal to 45°F (7.2°C).

Note:
The temperature sensor must have an accuracy of ± 2°F (± 1.1°C). Use the sensor according to the manufacturer's instructions.

Fig. 13 Refridgerated Condenser Weekly Temperature Log

FOR A DRY-TO-DRY MACHINE, A DRYER, OR A RECLAIMER, MEASURE THE TEMPERATURE ON OUTLET SIDE OF REFRIGERATED CONDENSER.

DATE	INSPECTORS INITIALS	MACHINE NO.	TEMPERATURE	IS TEMP. >45° F?
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO

IF THE TEMPERATURE WAS GREATER THAN 45° F (7.2° C), ATTACH A COMPLETED CORRECTIVE ACTION REPORT.

Am I an Existing Large Area Source?

Look at your total plant perc consumption records. If you reported your 12-month perc consumption at:

between 140 – 2,100 gallons of perc/year
if you only have dry-to-dry machines
or
between 200 – 1,800 gallons of perc/year
if you only have transfer machines
or
between 140 – 1,800 gallons of perc/year
if you have both dry-to-dry and transfer machines
and
your machine was installed before December 9, 1991
then you are an

EXISTING LARGE AREA SOURCE.

By December 20, 1993, *Existing Large Area Source* must have complied with requirements for an *Existing Small Area Source* (items 1-9). However, the *Existing Large Area Sources* must conduct a WEEKLY (not biweekly) leak detection and repair program with a written log AND comply with these additional requirements:

15. If using a refrigerated condenser on a dry-to-dry machine, reclaimer, or dryer:

    Once a week, measure and record the temperature of the exhaust on the outlet side of a refrigerated condenser and log the results. The temperature must be equal to or less than 45^0F. If the temperature is greater than 45^0F, make repairs or adjustments and record your corrective actions.

    In the previous section, a diagram shows the refrigerated condenser monitoring techniques followed by an example blank form for recording the results of the refrigerated condenser's weekly monitoring and corrective actions (if applicable).

16. If using a refrigerated condenser on a washer:

    Once a week, measure and record the temperature of the washer exhaust on the inlet and outlet side of the refrigerated condensers and log the difference. The temperature difference must be 20^0F or greater. If the temperature difference is less than 20^0F, make repairs or adjustments and record your actions.

Important: Dry cleaners with transfer systems must use separate condenser coils for controlling the perc air streams from the dryer/reclaimer and washer.

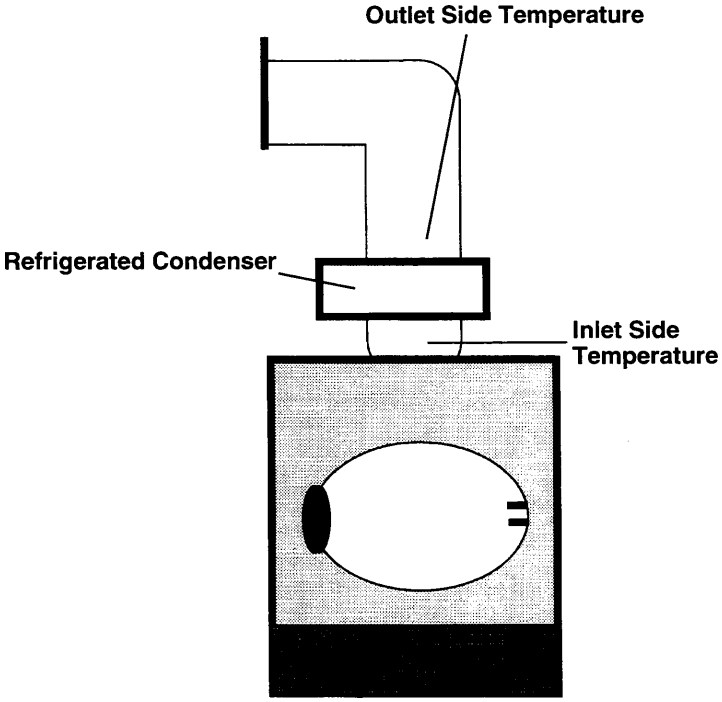
On the next page, a diagram shows the washer monitoring areas followed by an example blank form for recording the results of the refrigerated condenser's weekly monitoring and corrective actions (if applicable).

17. If using a carbon adsorber:

    Once a week, measure and record the concentration of perc in the carbon adsorber exhaust using a colorimetric detector tube. The measurement must be taken while the machine is venting to the carbon adsorber at the end of the last dry cleaning cycle prior to desorption.

    The concentration must be 100 ppm or less. If the concentration is greater than 100 ppm, repairs or adjustments must be made with actions documented.

Fig. 14 Weekly Monitoring Refridgerated Condenser Temperature



Washer:
Measure the temperature of the vapor entering and exiting the refridgerated condenser and calculate the difference. Temperature difference between the inlet and the outlet must equal 20°F (11.1°C).

Note:
The temperature sensor must have a range from 32°F (0°C) to 120°F (48.9°C). The sensor must have an accuracy of ± 2°F (±1.1°C). Use the sensor according to the manufacturer's instructions.

18. If refrigerated condenser monitoring results do not meet the specified temperature values and repairs need to be ordered or service performed:
    - Order needed repair parts or service within two days.
    - Install parts within five days of receipt.
    - Keep a written log of repair work.

See the sample corrective action report form in figure 11.

By September 23, 1996, LARGE AREA SOURCES must comply with the following equipment requirements:

19. If you do not already have a refrigerated condenser or a carbon adsorber that was installed before September 22, 1993, you must install a refrigerated condenser.

20. The refrigerated condenser on a dry-to-dry machine must not release air-perc vapor to the atmosphere while the drum is rotating. To ensure this, the air-perc vapor should be recirculating back through the machine without venting to the atmosphere (closed loop). This ensures that the vapor stream will pass through the refrigerated condenser several times.

21. If a refrigerated condenser pulls air through the door when the door is opened after the cycle, then it must have a diverter valve.

22. A refrigerated condenser on a washer must not vent the air-perc vapor remaining in the washer to the atmosphere until the washer door is opened. Route the air-perc vapor back to (or contain them within) the machine without venting to the atmosphere (closed-loop). This ensures that the vapor stream will pass through the refrigerated condenser several times.

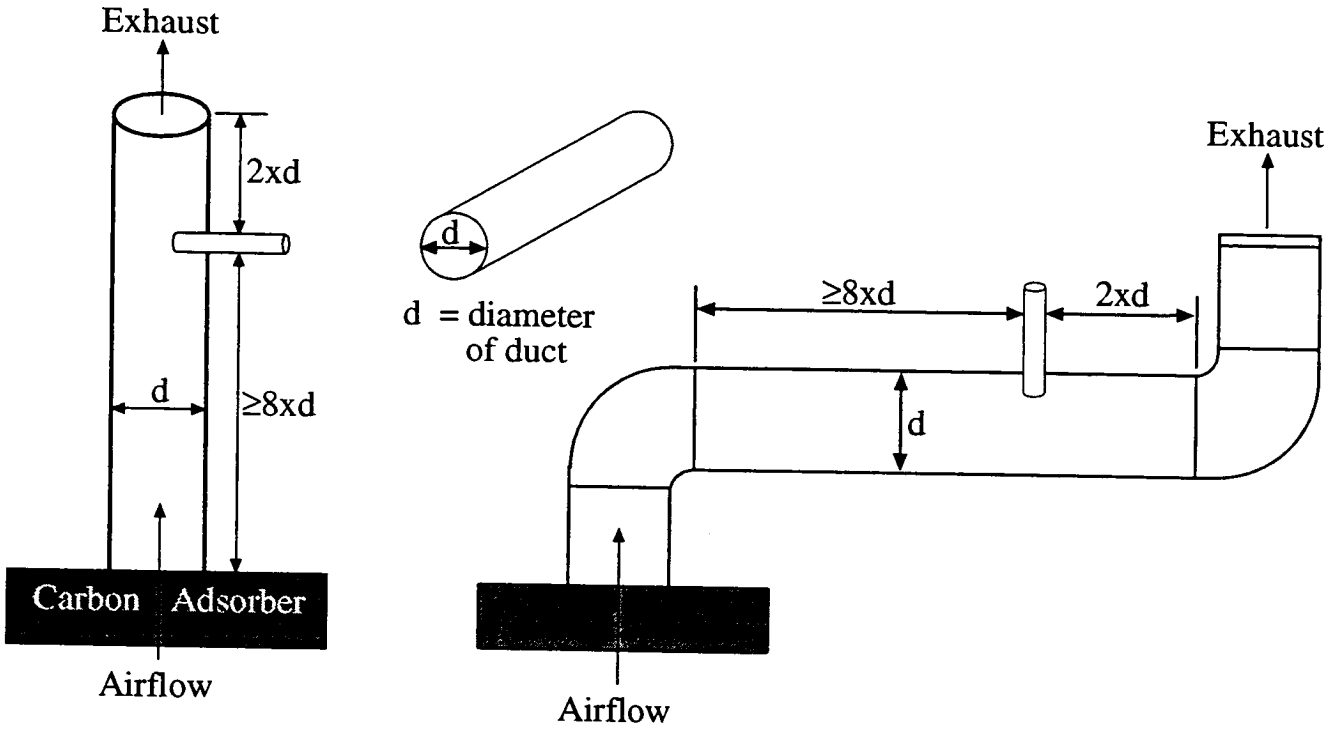
23. All dryers, washers, reclaimers and dry-to-dry machines must have their own refrigerated condenser coils. It may be possible to retrofit a refrigerated condenser that has only one coil for a dryer to contain two coils, one for the dryer and another for a washer.

24. Do not bypass carbon adsorbers at any time.

If your 12-month total perc consumption exceeds the *Large Area Source* limits, you must comply with the *Major Source* requirements within 180 days or by September 23, 1996, whichever is later.

Any replacement or reconstruction of a transfer dry cleaning machine is prohibited. You must install a dry-to-dry machine with a refrigerated condenser. After September 23, 1996, if you wish to increase operations or add a new dry cleaning machine and the increase would place you in the *Major Source* category, you must comply with the requirements for *Major Sources* upon start-up.

Fig. 15 Weekly Monitoring Perc Concentration Carbon Adsorber



Using a colorimetric detector tube, measure the concentration of perc in the adsorber exhaust duct according to the diagram above. The measurement must be taken while the machine is venting to the adsorber at the end of the last dry cleaning cycle prior to stripping the adsorber.

THE CONCENTRATION OF PERC MUST BE ≤ 100PPM.
Note: The detector tube must have an accuracy of ± 25 ppm.

The sampling port must be:
• at least 8 diameters downstream of any bend, contraction or expansion
• downstream from no other outlet
• 2 diameters upstream from any bend, contraction, expansion, inlet or outlet.

Example

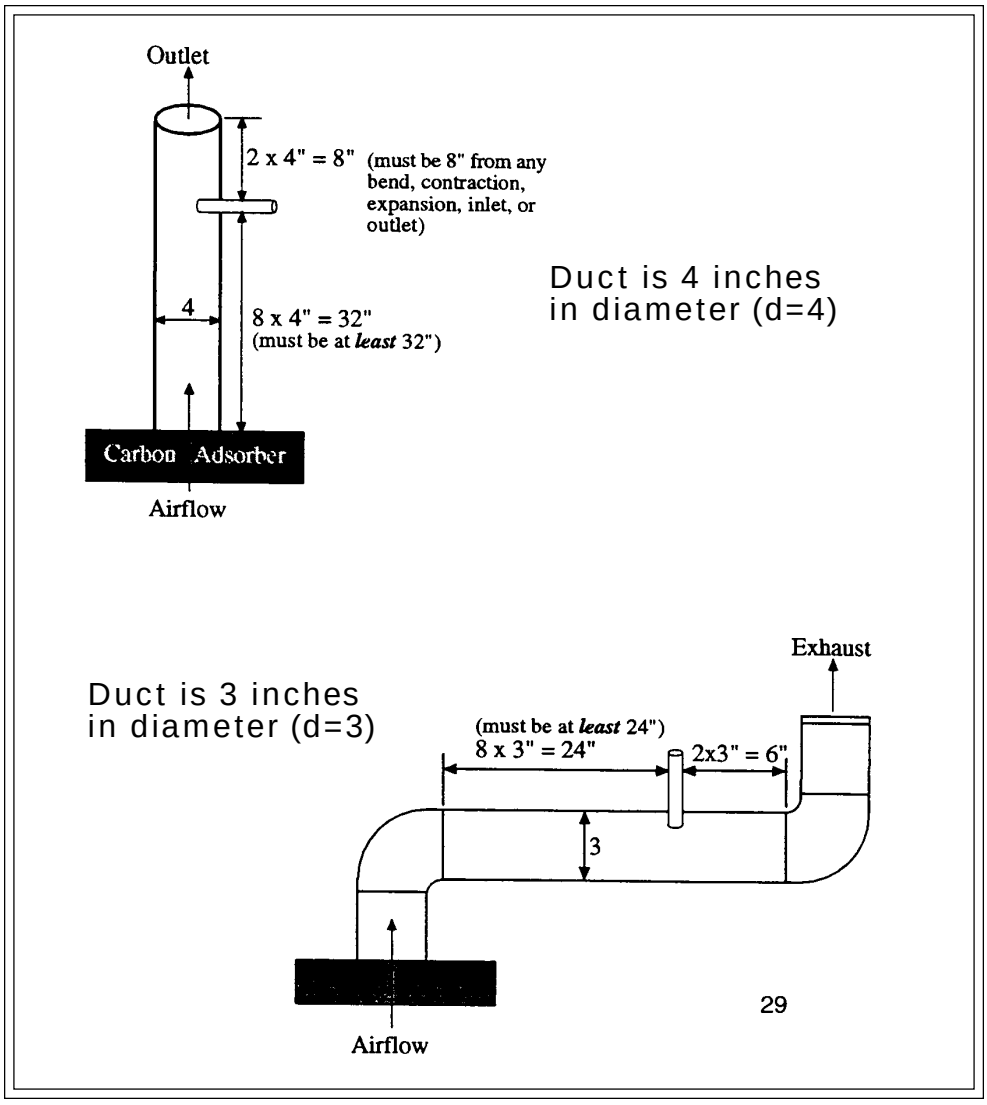

Outlet
2 x 4" = 8"
(must be 8" from any bend, contraction, expansion, inlet, or outlet)
Duct is 4 inches in diameter (d=4)
4
8 x 4" = 32"
(must be at least 32")
Carbon Adsorber
Airflow
Duct is 3 inches in diameter (d=3)
Exhaust
(must be at least 24")
8 x 3" = 24"
2x3" = 6"
3
Airflow
29

Fig. 16 Carbon Adsorber
Weekly Perc Concentration Log

MEASURE THE CONCENTRATION OF THE PERC IN THE EXHAUST DUCT AFTER THE CARBON ADSORBER.

DATE	INSPECTORS INITIALS	MACHINE NO.	CONCENTRATION (PPM)	IS CONCENTRATION >100 PPM
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO

IF CONCENTRATION IS GREATER THAN 100 PPM, ATTACH A COMPLETED CORRECTIVE ACTION REPORT.

Am I a New Large Area Source?

Look at your total plant perc consumption records. If you reported your 12-month perc consumption at:

between 140 – 2,100 gallons of perc/year
if you only have dry-to-dry machines
or
between 140 – 2,100 gallons of perc/year
if you have both dry-to-dry and transfer machines
and
your machine was installed on or after December 9, 1991
then you are a

NEW LARGE AREA SOURCE.

By December 20, 1993, *New Large Area Sources* must have complied with all the requirements for new small area sources (items 1-14).

If your 12-month total perc consumption exceeds the *New Large Area Source* limits, you must comply with the *New Major Source* requirements within 180 days or by September 23, 1996, whichever is later.

Any replacement or reconstruction of a transfer dry cleaning machine is prohibited. You must install a dry-to-dry machine with a refrigerated condenser. After September 23, 1996, if you wish to increase operations or add a new dry cleaning machine and the increase would place you in the *Major Source* category, you must comply with the requirements for *Major Sources* upon start-up.

Am I an Existing Major Source?

Look at your total plant perc consumption records. If you reported your 12-month perc consumption at:

greater than 2,100 gallons of perc/year
if you only have dry-to-dry machines
or
greater than 1,800 gallons of perc/year
if you have both dry-to-dry and transfer machines
and
your machine was installed prior to December 9, 1991
then you are an

EXISTING MAJOR SOURCE.

By December 20, 1993, *Existing Major Sources* must have complied with ALL requirements for the existing large area sources (items 1-9 and 15-17). There are additional requirements:

By September 23, 1996, *Major Sources* must comply with the following equipment requirements:

25. Contain transfer machines within a room enclosure. The room enclosure must be:

- Impermeable to perc;
- Designed to maintain a negative pressure when the machine is operating so air inside the enclosure does not vent out any openings; and
- Vented to a carbon adsorber to capture emissions from the enclosure.

26. Submit a room enclosure description to the State by October 1996. Check with your regulatory agency to see if they have a form you should use.

Any replacement or reconstruction of a transfer dry cleaning machine is prohibited. You must install a vented, dry-to-dry machine with a refrigerated condenser.

Am I a New Major Source?

Look at your total plant perc consumption records. If you reported your 12-month perc consumption at:

greater than 2,100 gallons of perc/year
if you only have dry-to-dry machines
or
greater than 1,800 gallons of perc/year
if you have both dry-to-dry and transfer machines
and
your machine was installed on or after December 9, 1991
then you are an

NEW MAJOR SOURCE.

By December 20, 1993, *New Major Sources* must comply with requirements for existing new small and large area sources (items 1-24 in this book). There are additional requirements:

27. The air-perc vapor from inside the drum must pass through the carbon adsorber immediately before or as the door of the machine is opened.

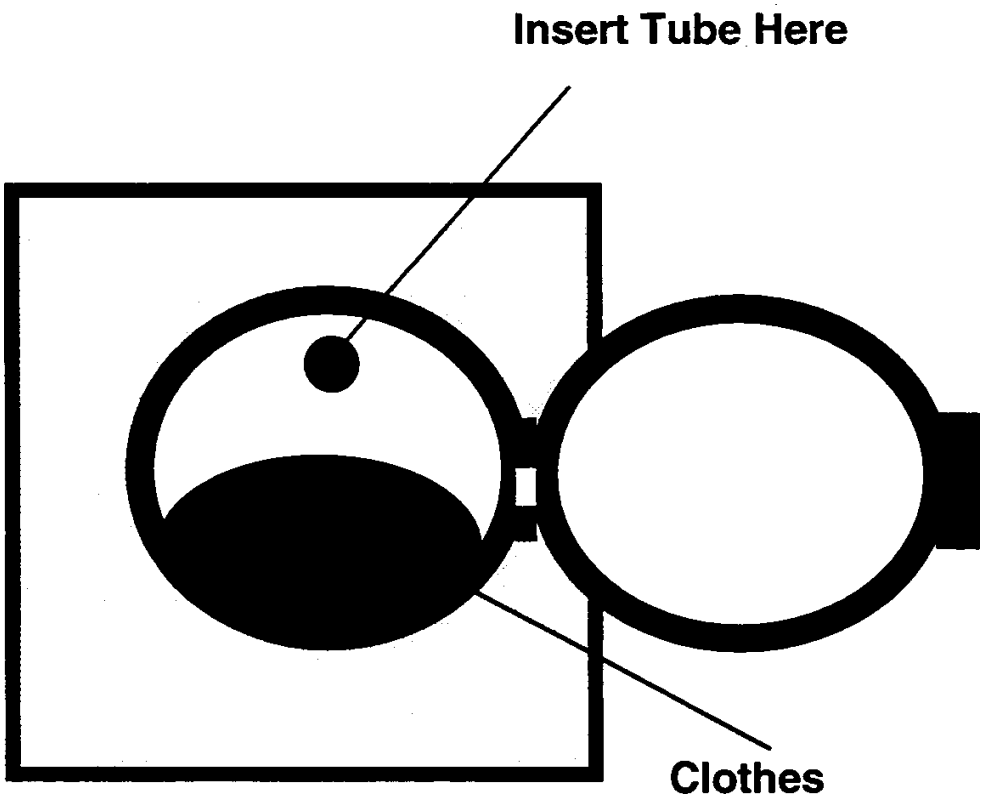
28. If the carbon adsorber is the vented type, see the instructions for monitoring on pages 26 and 27.

29. If the carbon adsorber is the no-vent type, once a week, measure and record the concentration of perc in the dry cleaning drum at the end of the dry cleaning cycle using a colorimetric detector tube. Take the measurement in the open space above the clothes at the rear of the drum immediately upon opening the door.

    The concentration must be 300 ppm or less. If the concentration is greater than 300 ppm, make repairs or adjustments and report your actions.

A diagram showing correct carbon adsorber monitoring areas is on the following page. A blank form for recording the results and corrective actions (if applicable) follows as well.

Fig. 17 Weekly Monitoring Perc Concentration Supplemental Carbon Adsorber



Using a colorimetric detector tube, measure the concentration of perc left in the drum at the end of the dry cleaning cycle immediately after opening the door. Insert the detector tube into the open space above the clothes at the rear of the drum.

THE CONCENTRATION OF PERC MUST BE EQUAL TO OR LESS THAN 300 PPM.
Note: The detector tube must have an accuracy of equal to or greater than 75 ppm.

Fig. 18 Supplemental Carbon Adsorber Weekly Perc Concentration Log

Measure the concentration of the perc in the rear of the machine drum, above the clothes, at the end of the cycle immediately after opening the door.

DATE	INSPECTORS INITIALS	MACHINE NO.	CONCENTRATION (PPM)	IS CONCENTRATION >300 PPM
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO

IF CONCENTRATION IS GREATER THAN 300 PPM, ATTACH A COMPLETED CORRECTIVE ACTION REPORT.

2 CHAPTER TWO

POLLUTION PREVENTION & WASTE REDUCTION: AN INTRODUCTION

Our environmental protection efforts in this country emphasize the control and cleanup of pollution caused by hazardous materials when they become hazardous wastes. Today, pollution prevention at the source is emphasized as is reuse and recycling. In order to run your shop as economically and efficiently as possible, all types of wastes including hazardous wastes, solid wastes, air emissions, and water discharges should be targeted for reduction. It has become apparent that there are shortfalls in the command and control, end-of-pipe regulations.

EPA and the states' pollution prevention and waste reduction policies and laws are based and promoted on human health and environmental concerns. Pollution prevention and waste reduction have positive impacts on businesses and industry such as economic returns from reduced costs in raw materials, waste treatment and/or disposal. Elimination of wastes reduces liabilities. Companies that reduce their wastes also improve their public image in the community.

Pollution prevention (P2) or source reduction involves reducing the amount of waste exiting a process such as dry cleaning. Source reduction includes:

- Process or procedure modifications;
- Equipment or technology modifications;
- Substitution of raw materials or improvements in feedstock purity;
- Reformulation or redesign of products;
- Improvements in housekeeping, maintenance, training, or inventory control; and
- Recycling within a process such as the close-looped distillation of perc.

A dry-to-dry machine is a modification (required when transfer machine needs replacement) which reduces the amount of perc used in the cleaning process. Retrofitting a vented system to a no-vent system is an equipment modification which reduces air emissions and perc consumption.

Recycling is the use, reuse, or reclamation of a waste either on-site or off-site after it is generated by a particular process. Recycling can be an effective substitute for a commercial product or as an ingredient or feedstock in an industrial process. Recycling also refers to the reclamation of useful constituent fractions within a waste material or removal of contaminants from a waste to allow it to be reused.

Capturing perc emissions with carbon adsorption and refrigerated condensers and returning it to the process is an example of reuse. Perc recovered from draining cartridge filters is an example of recycling.

Once the sources of pollution within dry cleaning plants are identified, solutions are easily found that help you reduce or eliminate the generation of these wastes through source reduction, reuse and recycling. There will still be end-of-the-pipe requirements but it is this group's hope that by using a joint industry - government effort, the cost of complying with any future regulations will be significantly reduced or in some cases eliminated altogether.

Inputs into a dry cleaning operation determines what will come out of it. Identifying pollutants and problems isn't easy. Its complexity varies from location to location depending on the size of the facility, the volume of perc consumed, the garment usage profile of the customers, and the specifics of local, state, and federal requirements.

Organizations need to recognize the possible benefits to be gained from waste reduction efforts even if it is considered a long-term ideal rather than an immediate goal. Waste reduction makes sense in today's competitive marketplace. Clearly, the need to minimize the volume and toxicity of all solid and hazardous waste is apparent.

State Initiatives

In response to a growing concern that solid and hazardous waste problems needed far more attention than they previously had received, many states passed legislation that established state solid and hazardous waste reduction policies with P2/waste reduction programs. Most of these "facility planning laws" mandate waste reduction planning with voluntary implementation.

These requirements are intended to increase the awareness of generators and facility owners and operators of the importance of reducing solid and hazardous wastes. A quality management planning approach can serve as the basis for more process specific assessment of pollution prevention opportunities. Each generator must determine whether any particular pollution prevention or waste minimization approach that might apply to a process is economically practicable.

Most companies will embrace the concept but do not implement best management procedures. Therefore, a mix of incentives and waste management controls should be in place to encourage participation. Until the true costs of waste management are calculated and understood, unnecessary hazardous waste will be produced and additional costs will be incurred.

The goal of reducing the generation of waste will require a commitment to waste prevention and reduction in businesses and industry through education, planning, and technical assistance programs. Check with your states' Ombudsman, Small Business Assistance Programs, and Pollution Prevention/Waste Reduction Programs for assistance and training opportunities that will help you stay in compliance. In many cases, their services are free and can be nonregulatory.

This manual presents several opportunities for reducing solid and hazardous waste generation for dry cleaners. They should all be carefully evaluated. Opportunities to reduce the volume of non-hazardous solid wastes through better supplier partnerships may exist. Some options for reducing solid wastes are also presented. Dry cleaners' (corporate) management must make a strong commitment to a continuing waste reduction program and improved supplier partnerships if their plants are to achieve waste reduction.

Establishing a Continuing Waste Reduction Program

Opportunities for waste reduction are present in every operation, unless ALL waste streams are eliminated or have been reduced to the lowest levels technically and economically achievable. Pollution prevention/waste reduction strategies have focused largely on process and procedure modifications and product reformation.

Some businesses have improved the marketability of their products through the implementation of an internal waste reduction program. Some dry cleaners advertise hanger and poly recycling and report this has improved their public image and possibly their competitive status with other businesses. Good housekeeping has also been mentioned as something that helped to increase business revenue and prevent waste.

The way to take advantage of waste reduction opportunities is to establish a program to identify and capitalize on them. The essential elements of an effective company-wide program are:

- Top *Management Commitment* and Support
- Explicitly *Defined Program* and Objectives
- Accurate *Accounting of Waste Streams* and their True Costs
- A Pervasive *Waste Reduction Ethic*
- *Information and Technology* Sources
- Periodic *Program Evaluation and Reassessment* of Waste Reduction Opportunities

None of the elements is measurably more important than another and a program will rarely be more than partially effective unless all those listed are present.

The program must have a set of GOALS which should be:

- *Acceptable* to those who will work to achieve them.
- *Flexible* to adapt to changing requirements.
- *Measurable* over time.
- *Suitable* to the overall corporate goals.
- *Understandable*.
- *Achievable* with a practical level of effort.

The final element of a successful waste reduction program is continuing evaluation and updating. To plan future pollution prevention and waste reduction efforts, businesses must establish a means of documenting and evaluating current and past efforts.

Involvement by All Employees

Waste reduction must be accepted as the responsibility of all workers and managers involved in the dry cleaning process rather than just the few who are responsible for pollution control and compliance at the plant.

Employee Training and Motivation

An employee training program ensures that every person storing or handling hazardous material is aware of the potential of a hazardous material becoming hazardous waste. Many have initiated such training and awareness programs to keep employees informed of waste reduction advances and goals; and, some have established reward programs for employees who provide suggestions leading to successful waste reduction.

Good Housekeeping

Good housekeeping measures can greatly decrease the amount of wastes generated. Large amounts of solid and/or hazardous waste may be generated through spills and leaks, improper storage practices, inefficient production start-up or shut-down, scheduling problems, lack of emergency procedures and preventive maintenance, or poorly calibrated devices for pollution control processes. New manuals of standard procedures and routine training and retraining can eliminate this problem. These procedures may significantly reduce waste at the source.

Maintenance

Reducing wastes through good operating practices is achieved by using maintenance and preventative maintenance to reduce incidents of equipment breakdowns,

inefficiency, or process fluid and chemical leakage. Liquid and laundry chemical leaks can be eliminated by conducting a regular maintenance program. More effort should be focused on the wastes generated by these activities. Separate and handle the solvents, oils and greases generated during these procedures properly.

Corrective maintenance, such as resetting control valves or adjusting process temperatures, increases efficiency and prevent raw material and energy loss through waste streams. Preventive maintenance helps reduce down-time and wastes produced during the procedure.

Waste Reduction Assessment

The initial step to accomplishing pollution prevention is to conduct a waste reduction assessment. This assessment is a systematic, planned procedure with the objective of identifying ways to reduce or eliminate waste. The required leak detection inspections and monitoring activities and the waste reduction assessment can be accomplished together.

The assessment consists of a careful review of a plant's operations and wastes and the selection of specific areas to assess for opportunities. After focusing on a specific waste or area, a number of options with the potential to minimize waste are developed and screened. For each opportunity, further discussion and brainstorming with employees should produce a list of options to be considered for implementation. The objective is to stimulate alternative reduction methods rather than to select from prepared options.

Finally, the technical and economic feasibility of the selected options are evaluated. Those which represent the highest return on the time, effort, and funds invested should be implemented first.

Waste Reduction Practices

Nationwide there are many commercial dry cleaning establishments and industrial laundries that use perc to remove difficult soils from textiles. Some of the wastes generated from the perc dry cleaning process and packaging are vapor emissions, still bottoms, muck residues (cooked), spent filter cartridges, wastewater, and solid wastes (i.e. drums, pallets, cardboard, hangers, poly, etc.).

Remember, waste reduction is successful only when top management is committed to the program and goals and employees are trained and involved to achieve the goals.

Vapor Emissions

Existing Conditions

Process emissions occur during washing, aeration, still and other equipment operation and door openings. These emissions account for as much as 74 percent

of total perc losses. Fugitive emissions occur from the evaporation during clothes transfer, equipment leaks, losses during solvent transfer, and evaporation from spent filters and distillation wastes.

The most common methods of reducing solvent emissions involve carbon adsorption beds and refrigerated condensers. When coupled with transfer and dry-to-dry technologies, these reduction methods significantly reduce process and fugitive emissions.

Regulatory Requirements

As discussed earlier in this handbook, the new Clean Air Act Amendments (CAAA) regulate process emissions. State and local air authorities may have more stringent requirements. Discussion of additional recommendations that provide additional benefits for dry cleaners follows.

Recommendations

Carbon Adsorbers

- Install floor vents which draw fugitive vapors from around the dry cleaning and auxiliary equipment into the adsorber.
- Do not open the door (if the machine can be opened) before the end of the drying cycle. Air streams may be vented to a carbon bed when the machine door is open.
- Determine and maintain the maximum or ideal ratio of clothes cleaned per activated carbon used.
- Carbon beds should maintain the ideal solvent to carbon ratio to ensure that the stripping is done at proper intervals according to equipment manufacturing instructions.
- Determine and maintain the ideal rated air flow capacity through the carbon bed.
- Determine and maintain ideal steam pressure passed through the bed to "strip" solvents from the carbon bed.

Refrigerated Condensers

- Maintain the proper condensing coil in- and out-temperatures.

Equipment Leaks

- Purchase a halogenated hydrocarbon detector to monitor vapor losses. Up to 25% of solvent emissions can be attributed to equipment leaks. EPA's requirements for leak detection are minimal. EPA states that, "Any perchloroethylene vapor or liquid leaks that are obvious from:

(1) The odor of perchloroethylene;

(2) Visual observation, such as pools or droplets of liquid; or

(3) The detection of gas flow by passing the fingers over the surface of equipment."

A detector makes routine inspections quicker and more accurate. Training and involvement of several employees ensures that someone is always available to monitor for leaks.

Remember: If fugitive equipment leaks are detected, begin the process of repair within 24 hours. Parts should be ordered within 2 days and installed within 5 days of receipt of parts. Completed maintenance measures and corrective actions taken to repair identified leaks should be documented.

- To reduce transfer solvent vapor losses, convert to a dry-to-dry machine.

Best Management Practices & Preventive Maintenance

Good operational control for waste reduction is defined as a procedure or policy in an organization that reduces the generation of multi-media wastes. Better standard procedures usually relate to production (organizational structure, housekeeping improvements, initiatives, operations planning and control) rather than raw materials and design factors. Initial policy deployment by management provides information on better maintenance practices (BMPs) and monitoring.

- Replace the seals regularly on the dryer deodorizer and aeration valves.
- Check the air relief valves for proper enclosure.
- Open the button and lint traps just long enough to clean and only when necessary. Inspect the door gaskets on the button trap. Inspect lint and button traps more often since they are normally opened daily. Dry lint on the button trap gasket can cause a perc leak — clean gaskets thoroughly prior to seating.
- Inspect the gaskets around the cleaning machine door.
- Repair any holes in the air and exhaust ducts.
- Clean the lint screens as often as necessary to avoid clogging the fans and condensers.

Better Standard Operating Procedures

A business's first step in a waste reduction program can be to change procedures. Improving operating procedures reduces accidental and material losses while

maintaining or increasing productivity. Improved procedures can range from a change in management approach to a change in waste handling procedures. Proper procedures to reduce waste are part of the overall operating plan for a business.

- Avoid underloading or overloading of machines.
- Place saturated lint from lint baskets in sealed waste containers.
- Inspect waste storage containers for leaks.

Still Bottoms

Existing Conditions

The principal method for purifying and recovering solvent in dry cleaning operations is on-site distillation. In addition to nonvolatile residues (i.e., detergent, sizing, waxes, oils and greases), still bottoms contain as much as 50 percent solvent.

Regulatory Requirements

Still bottoms are a RCRA hazardous waste and are subject to disposal regulations issued by EPA and the states. After manifesting, a licensed treatment, storage, and disposal facility (TSDF) should manage perc wastes, including still bottoms.

Recommendations

The addition of steam enhances distillation by mixing with still residues to form a perc/water azeotrope that boils at a lower temperature than pure perc. The distillation rate increases and perc separates more completely from nonvolatile contaminants. However, there is an increase in wastewater.

- To recover more solvent or reduce solvent residue, redistill the residue by adding water after boil-down.
- Regularly remove the residues in distillation units. Excessive buildup of contaminants in the still can reduce the efficiency of the distillation process.
- Minimize solvent emissions from distillation units by ducting vents directly to carbon beds and refrigerated condensers if it's economically feasible.

Muck

Existing Conditions

Dirty solvent when filtered yields reusable solvent and muck. The muck from filters may contain considerable quantities of solvent. Muck cookers achieve significant solvent reduction through condensing and reclaiming emissions.

Regulatory Requirements

Filter muck is a RCRA hazardous waste and must be disposed of in accordance with regulations issued by EPA and the states. Muck wastes should be manifested and managed by a licensed treatment, storage, and disposal facility (TSDF).

Recommendations

Adhere to concentration limits for the waste material after cooking to ensure good operation of the muck cooker in minimizing perc content before disposal.

- Determine the feasibility of ducting unrecovered emissions from cookers to carbon beds or refrigerated condensers for reclamation of additional solvent if it's economically feasible.

Cartridge Filters

Background

Cartridge filters with carbon-cores are the most common type of filter used in dry cleaning. There are other types of filters used. They include powder, disc, and polishing units. However, only cartridge filters with carbon cores are discussed.

Regulatory Requirements

Spent cartridge filters are a RCRA hazardous waste and subject to the regulations issued by EPA and the states. Manifest spent filters and allow a licensed treatment, storage, and disposal facility (TSDF) to manage them.

Recommendations

Drain cartridges for a minimum of 24 hours in a closed container. Undrained cartridges may contain as much as one gallon (13 pounds) of solvent.

- Consider draining filter cartridges over a weekend.
- Consider drying filters in housings vented to carbon adsorbers. The amount of perc recovered is sometimes too low to make this option economically worthwhile. The owner/operator should determine the economic feasibility of this option.
- To recover more solvent or reduce solvent residue, use a cartridge stripper to remove solvent from the cartridge and determine the optimum stripping time for your process. Presently, one quarter of commercial dry cleaners use steam to strip spent cartridges.
- Determine and maintain the ideal amount of clothes cleaned for each standard cartridge before stripping.
- Determine the ideal steam pressure for stripping cartridges.
- Consider using hot air and venting to a carbon bed or refrigerated condenser when stripping cartridges to reduce wastewater generation. Kleen-Rite, Inc. (St. Louis, MO) has pioneered this technology.

Wastewater

Existing Conditions

Perc is not very soluble in water. Nevertheless, process wastewater will contain about 150 ppm (0.015 percent) solvent. Dry cleaning establishments that launder industrial rags (shop towels), garments, and other textiles have significant levels of perc in the wastewater. In addition, the recovery of perc from vapors routed to water separators from condensers, carbon adsorbers, cartridge strippers, stills, and muck cookers can yield water-contaminated solvent.

Routing solvents to a water separator will allow recovery of the heavier solvent. The solvent is ultimately returned to the tank. Drained water from the top of the separator may be passed through one or more carbon filters to reduce perc levels before discharge to the sewer.

Regulatory Requirements

Publicly-owned treatment works (POTWs) will vary in the allowable amounts of perc to be accepted. However, sewer pipes that leak perc wastewater may include your plant in future liabilities. Consider using a technology that removes all perc from wastewater before discharge. Placing free phase perc in an evaporator is prohibited.

Recommendations

- Consider buying separator water evaporators that are exempt from RCRA permitting. These units have filters designed to yield perc-free water that eventually evaporates from the unit.

Drums

Existing Conditions

Drums are used to contain virgin materials and store hazardous wastes.

Regulatory Requirements

Improper management of drums can lead to costly fines and unnecessary spills and leaks. Under the Resource Conservation and Recovery Act (RCRA), generators must weekly inspect hazardous waste storage areas for spills and leaks.

Recommendations

- Request that your supplier provide solvents in returnable drums. If the supplier delivers in bulk using a hose, ensure that leak and spill procedures are followed during delivery to reduce emissions and safety risks.
- Use spigots and pumps when dispensing new materials and funnels when

transferring wastes to storage containers to reduce the possibility of spills and evaporative losses. Transferring by hand and using open buckets will increase solvent loss.

- Label all containers of raw materials properly.
- Store solvent and solvent waste drums under cover to prevent rusting and ensure that you comply with all storm water run-off regulations.
- Do not store drums in extreme heat or cold where shelf-life will be diminished or product will be unusable.
- Store solvent and wastes in tightly sealed containers that are impervious to the solvent and chemical reactions.
- Provide secondary containment in areas where solvents and solvent wastes are stored.

A waste reduction program and plan will also incorporate the following practices:

Resource Conservation Programs

Instituting a comprehensive conservation program can save money and valuable resources. For example:

- Using the latest technology or new equipment may require less energy, water and chemicals to operate properly and may reduce cycle times. Converting to a dry-to-dry machine reduces energy and perc consumption.
- Monitoring your water, gas and electric meters routinely is necessary. Identify peaks and valleys for usage during the day and week and what measures might reduce usage. Determine if there are activities that consume water, gas and electricity that could be curtailed during non-production hours.

Utility and water consumption are tracked at most plants. In-process recycling on-site should be considered for heat energy at dry cleaners. The following questions should be asked:

- Is there a heat reclamation system in use and where is it located?
- Where is the reclaimed heat used?
- Can the efficiency of the existing system be improved?

Purchasing, Raw Materials & Inventory Control

Instituting a comprehensive chemical review and purchasing program can save money and valuable resources and reduce toxics and waste. Standard procedures for inventory controls should be implemented or improved to ensure review of all

chemical usage in the dry cleaning plant. Material and waste tracking systems including good inventory controls should be in-place at the plant.

Perc and chemical usage at the dry cleaning facilities should be documented including material safety data sheets (MSDSs) and amounts of chemicals used over periods of time. Dry cleaners should use just-in-time inventory controls with chemicals and adopt first-in, first-out practices to prevent expiration of products which creates waste.

Safety meetings should focus on proper handling and storage of all process chemicals to avoid health hazards and the generation of waste from spills and cleanup. Consider replacing your current raw materials with less toxic ones. Toxics use reduction in all process and treatment chemicals should be reviewed periodically with your suppliers and vendors.

Management, environmental/safety staff, and suppliers must continue asking why are these chemicals used and how can their hazards and toxicity be reduced. Take into consideration the cost of treatment and disposal when deciding what raw materials are purchased and used in dry cleaning.

Non-Hazardous Solid Wastes

The non-hazardous wastes which are generated at dry cleaning plants consist mostly of miscellaneous shipping and packaging materials such as cardboard, plastic jugs and bags, pallets, and fiber and steel drums. At one plant, the dumpsters were estimated to be “80% cardboard and paper” along with dry lint. If a dry cleaner is not currently recycling these solid wastes, options available should be reviewed and implemented where feasible.

Waste Separation

When solid and hazardous waste is generated, proper handling and separation are necessary to maximize the reclamation potential of the waste material. Simple plans designating specific areas for separation of potentially valuable resources from unmarketable wastes will enable a company to achieve lower quantities of solid and hazardous wastes for disposal, lower disposal costs, and increased waste recycling

- Do not allow nonhazardous materials to become contaminated with hazardous materials. Keep hazardous and nonhazardous wastes separate to increase their potential for reuse, recycling or treatment.

Reduce Number of Empty Boxes, Bags, Jugs, Drums & Pallets

The quantity of small containers is great enough that alternate packaging in larger containers would cause a large reduction in the amount of solid waste being landfilled and empty containers to be handled. Determine the number of drums

generated and track their handling and storage procedures and costs. Negotiate with your supplier to use returnable drums or bulk delivery of materials.

The concept of bulk or semi-bulk packaging bears exploration, even if some changes in the procedures used to distribute to the point of use or to dispense for use are necessary. Returnable "tote bins" may be impractical because of current equipment and accessibility, but if the current package is a standard steel drum, the number of empty containers generated could be reduced significantly, potentially 90%. The number of incoming disposable pallets would also be considerably reduced.

For reusing and recycling 55 gallon drums, businesses usually return empty drums to the chemical supplier or deal with a cooperage company who reconditions and sells them. If your supplier will not accept empty drums, determine if a drum reclamation company will recondition your drums for resale. Drum reconditioners recycle steel drums which contain residues of organic materials by burning them out before straightening and repainting. Investigate drum recycling sites to ensure that your drums are managed responsibly and lawfully according to all local, state, and federal regulations.

If drum disposal is necessary, consider sending empty containers to scrap metal vendors. Visit your local scrap metal vendors to note how scrap is handled. Tour the company to monitor how the containers are managed. Ask questions on how your scrap should be stored and transported and how it is received and processed.

When asked about pallets most dry cleaners replied, "Sometimes they are taken by someone except the damaged ones which go to the dumpster." More focus should be placed on this waste by contacting suppliers about pallet reuse or elimination altogether.

Paper and Paper Products Recycling

Recycling paper products can reduce disposal costs. In almost every landfill, paper products represent the largest volume of waste present. As landfill space becomes more valuable, recycling paper products has great potential to extend the life of landfills. Recycling paper has not always been encouraged by paper mills, largely because they lacked capacity to handle the recycled material. This is no longer the case. Most will now buy corrugated board and some 35 grades of paper. Use high grade, office paper on both-sides and then separate and recycle.

Reuse of cardboard boxes can be accomplished by purchasing contracts which encourage the reuse of raw material shipping containers. Reuse of corrugated packaging has been accomplished by many suppliers to all types of industry. Some may require liners to enhance reuse but this option should be pursued with your suppliers.

Some facilities that generate large amounts of cardboard have found it economically feasible to bale and sell their cardboard. Businesses with small amounts of cardboard usually give it away to a business or charity willing to pick it up. We suggest you contact your current or local recycler about the feasibility of upgrading the present recycling program or initiating one.

Information Exchange

Many avail themselves of the services of waste information and waste materials exchanges. The waste information exchange is, in effect, a clearinghouse for information. When a generator is faced with the problem of disposing of a particular waste, consideration of such factors as the cost of raw materials and waste management may prompt the solicitation of the services of a waste information exchange and, in turn, a waste material exchange for the actual removal and disposition of the waste. Participation in a waste exchange program as part of waste minimization provides an automated information system that can be accessed for the purpose of obtaining or exchanging successful waste minimization practices used throughout the country.

Summary

Current pollution controls do little more than move waste around from one medium to another (i.e., air, land, and water). Therefore a comprehensive, management approach to waste is essential. Pollution prevention/waste reduction at the source is an economically sensible approach whereby dry cleaners can lower waste management and regulatory compliance costs, liabilities, and risks. Waste reduction efforts cannot eliminate all wastes, but it can help to lower costs to operators as regulations continue to increase.

3 CHAPTER THREE

EPA DESIGN FOR ENVIRONMENT DRY CLEANING PROJECT

The U.S. Environmental Protection Agency, through its Design for the Environment (DfE) Program, has formed a unique partnership with the dry cleaning industry, solvent producers, suppliers, universities, and environmental, labor, and consumer groups. The overall mission of the Dry Cleaning Project is to evaluate ways to reduce or better control the use of dry cleaning solvents in professional garment cleaning. In doing so, the trade-offs of different technologies and control options, including risks, performance, costs, and energy impacts, are being studied.

In less than two years, a significant amount of progress has been made as a result of the Dry Cleaning Project. The Partnership is working on a number of issues related to clothes cleaning, including investigation of alternative technologies, environmental certification programs for dry cleaners, and performance testing and research. A short-term study of one alternative technology, multiprocess wet cleaning, has been completed. A longer-term study of three alternative processes will be launched in the fall of 1994.

The Partnership is organized into four workgroups: Core, Technical, Implementation, and Outreach. Membership in the workgroups is open to any person or organization. The co-chairs from each workgroup also sit on the Core Group.

The Core Workgroup meets once a month to review the progress of the various workgroups. Announcements of upcoming meetings of the Core Workgroup are made in industry trade papers, and invitations are sent out to interested individuals.

The Technical Workgroup is working with EPA to complete a Cleaner Technologies Substitutes Assessment (CTSA). Through the CTSA, EPA is systematically evaluating a number of alternative clothes cleaning technologies, substitute solvents, and methods to control and limit exposures to dry cleaning solvents. To date, the CTSA work has focused on dry solvents and certain wet cleaning processes. Microwave drying is also being studied. Ultrasonics, supercritical carbon dioxide, and additional wet cleaning processes are among the other technologies that the Workgroup is considering for study. The Workgroup is also investigating the development of a test protocol that would serve as a benchmark for evaluating the performance of existing and emerging cleaning technologies.

The Implementation Workgroup is developing strategies to shift the behavior of dry cleaners and consumers toward pollution prevention options developed through the Dry Cleaning Project. As part of this effort, the Workgroup is

working to set up sites for demonstrating alternative clothes cleaning technologies. It is also investigating the development of an environmental certification program. The Outreach Workgroup is creating products to communicate information generated through the Dry Cleaning Project to both the dry cleaning industry and the general public. Brochures, fact sheets, and case studies are under development.

Much of the work of the Partnership to date has focused on the examination of an alternative wet cleaning technology called multiprocess wet cleaning. In 1992, the Partnership conducted a short-term study on multiprocess wet cleaning. As part of the study, an economic feasibility study and performance tests were conducted. This results of this preliminary study indicated that multiprocess wet cleaning is economically competitive with dry cleaning, and acceptable to consumers. As a result of the 1992 study, the Partnership is conducting additional research into alternative cleaning technologies. A long-term study of multiprocess wet cleaning, machine wet cleaning, and microwave drying is underway. The study includes a demonstration project, research, and training.

The demonstration project has three primary goals; 1) evaluate the commercial viability of the alternative cleaning processes compared to traditional dry cleaning; 2) test the performance of the processes in "real-world" conditions and over an extended period of time; and 3) set up a demonstration shop to actively promote an industry-wide shift to cleaning techniques that do not rely on toxic solvents.

One demonstration shop will be set up in Chicago in September of 1994 and will operate for 18 months. Additional shops will be established shortly thereafter in Los Angeles and Indianapolis. The Chicago facility will feature alternative cleaning services only, while the other two shops will offer both dry and wet cleaning services. They will resemble actual, commercial dry cleaning operations as closely as possible in size, number of employees, and number of pounds of clothing cleaned daily. An experienced manager will be selected for each shop, and cleaning professionals with experience in the alternative technologies being evaluated will assist in the design of the shops and in the training of workers.

The demonstration shops will provide the dry cleaning industry with an opportunity to observe the alternative cleaning processes under field conditions. Cleaning professionals will be able to walk around the operating shop, watch the processes from start to finish, and interact with managers and employees. In addition, financial records—from daily operating expenses to capital expenditures—will be kept so that the financial viability of the processes can be evaluated. Surveys will be conducted to measure customer satisfaction with the processes, the effectiveness of various marketing techniques, performance of the cleaning processes on the full range of fabrics, types of apparel, and degrees of soiling typically seen in traditional dry cleaning operations. This research will be critical to understanding the long- and short-term effects of these processes on garments.

Once the shops are operating, a comprehensive outreach program will be implemented to reach out to dry cleaners across the nation. The program will make use of a variety of outreach vehicles, including "hand-on" tours of the demonstration shops, speaking engagements at industry meetings, and videos or slides of the shops.

A training program also will be delivered at the shops. The training will instruct dry cleaning professionals in the alternative cleaning techniques and skills. It also will cover such areas as equipment, facility layout, safety and health considerations, business skills, and customer satisfaction and quality control.

REFERENCES/BIBLIOGRAPHY

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3. H. William Blakeslee and Theodore M. Grabowski, A Practical Guide to Plant Environmental Audits, Van Nostrand Reinhold Company, New York, NY, 1985.
4. Carl H. Fromm and Michael S. Callahan, "Waste Reduction Audit Procedure — A Methodology for Identification, Assessment and Screening of Waste Minimization Options" Proceedings of the National Conference on Hazardous Wastes and Hazardous Materials, Hazardous Materials Control Research Institute, Silver Springs, MD, 1986.
5. The University of Tennessee Center for Industrial Services, Writing a Waste Reduction Plan, Nashville, Tennessee, 1994.
6. Center for Emissions Control, Drycleaning: An Assessment of Emission Control Options, Washington, D.C., 1992.
7. Designs for the Environment. www.epa.gov/opptintr/dfe
8. EPA Sector Notebook. es.inel.gov/comply/sector/index.html

GLOSSARY

Biweekly - any 14-day period of time

Carbon adsorber - a bed of activated carbon into which an air-perchloroethylene gas-vapor stream is routed and which adsorbs the perchloroethylene on the carbon. Carbon adsorption (sniffer) systems can handle high air flows with low solvent concentrations and reduce solvent vapors in exhaust to 95%. Carbon beds can range in size from 100 to 1000 pounds of activated carbon.

Colorimetric detector tube - a glass tube (sealed prior to use), containing material impregnated with a chemical that is sensitive to perchloroethylene and is designed to measure the concentration of perchloroethylene in air.

Diverter valve - a flow control device that prevents room air from passing through a refrigerated condenser when the door of the dry cleaning machine is open.

Dry cleaning machine - dry-to-dry machine and its ancillary equipment or a transfer machine system and its ancillary equipment.

Exhaust damper - a flow control device that prevents air-perchloroethylene gas-vapor stream from exiting the dry cleaning machine into a carbon adsorber before room air is drawn into the dry cleaning machine.

Existing means commenced construction or reconstruction before December 9, 1991.

Heating coil - a device used to heat the air stream circulated from the dry cleaning machine drum, after perchloroethylene has been condensed from the air stream and before the stream reenters the dry cleaning machine drum.

Muck cooker - a device for heating perchloroethylene-laden waste material to volatilize and recover perchloroethylene.

New means commenced construction or reconstruction on or before December 9, 1991.

Perceptible leaks - any perchloroethylene vapor or liquid leaks that are obvious from: 1) the odor of perchloroethylene; 2) visual observation, such as pools or droplets of liquid; or 3) the detection of gas flow by passing the fingers over the surface of equipment.

Perchloroethylene consumption is the total volume of perchloroethylene purchased based upon purchase receipts or other reliable measures.

Reclaimer is a machine used to remove perchloroethylene from articles by tumbling them in a heated air stream (see dryer).

Reconstruction means the replacement of a washer, dryer, or reclaimer; or replacement of any components of a dry cleaning system to such an extent that the fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable new source.

Refrigerated condenser is a vapor recovery system into which an air-perchloroethylene, gas-vapor stream is routed and the perchloroethylene is condensed by cooling the gas-vapor stream. Refrigerated condensers recover solvent emissions by chilling the air stream below the solvent's dew point, causing the solvent and water vapor to condense.

Refrigerated condensers can be placed either in the air-stream near the end of the drying cycle or at the final exhaust point of the process. In transfer machines equipped with refrigerated condensers, the air stream received from the washer when the door is opened is typically vented to the atmosphere after one pass through condenser. Thirty percent of the solvent is recovered. Vapors from the drying unit are continually routed back to the dryer after passing through the condenser until the drying cycle ends. Eighty-five percent of the remaining solvent is recovered. Unrecovered vapors are vented to the atmosphere when the dryer is opened.

In vented, dry-to-dry machines equipped with refrigerated condensers, emissions occur when the door is opened. No-vent machines do not vent to the atmosphere and have the highest efficiency in recovering emissions.

Refrigerated condenser coil is the coil containing the chilled liquid used to cool and condense the perchloroethylene.

Room enclosure is a stationary structure that encloses a transfer machine system, and is vented to a carbon adsorber or an equivalent control device during operation on the transfer machine system.

Still is a device used to volatilize and recover perchloroethylene from contaminated perchloroethylene.

Temperature sensor is a multiple-machine dry cleaning operation in which washing and drying are performed in different machines. Examples include, but are not limited to: 1) a washer and dryer(s); 2) a washer and reclaimer(s); or 3) a dry-to-dry machine and reclaimer(s).

Washer is a machine used to clean articles by immersing them in perchloroethylene. This includes a dry-to-dry machine when used with a reclaimer.

Waste Minimization. EPA presented, in their 1986 report to Congress, a working definition for the term "waste minimization" focusing on primarily two types of activities: (1) source reduction; and (2) recycling (as defined in the "Definition of Solid Waste Final Rulemaking," January 1985). Waste minimization is the reduction, to the extent feasible, of **hazardous waste** that is generated or subsequently treated, stored, or disposed. It includes any source reduction or recycling activity undertaken by a generator that results in either (1) the reduction of total volume or quantity of hazardous waste, or (2) the reduction of toxicity of hazardous waste, or both, so long as the reduction is consistent with the goal of minimizing present and future threats to human health and the environment.

Water separator is any device used to recover perchloroethylene from a water-perchloroethylene mixture.

Year or **Yearly** means any consecutive 12-month period of time.

APPENDIX A

INITIAL NOTIFICATION REPORT

INITIAL NOTIFICATION REPORT

1. **Print or type the following for each separately located dry cleaning plant (facility). The owner of more than one plant must fill out a separate form for each plant.**

Owner/operator_____

Company Name_____

Mailing Address_____

City_____ **State**_____ **Zip**_____

Plant Address (If Different Than Mailing Address)

Street Address_____

City_____ **State**_____

Phone Number _____

2. Check the box below if:

☐ your dry cleaner is a pick-up store.

☐ your dry cleaning plant has only coin-operated dry cleaning machines that are operated by the customers.

If you checked either box above, you can STOP HERE and return the form to the address given in the accompanying letter.

3. Write in the total volume of perchloroethylene (perc) purchased for **ALL** of the machines at the dry cleaning plant over the past 12 months:

_____gallons

NOTE: If perchloroethylene purchase records have not been kept at the plant, the volume may be estimated for this initial report.

Method of determining gallons (circle one):

actual estimated

4. Next to each machine type listed below, write the number of machines of that type located at your plant:

___ Dry-to-Dry ___ Transfer

5. Provide the following information for **EACH MACHINE** at your plant. If you have more than 4 machines at your plant, make additional copies of this page.

	Machine 1	Machine 2	Machine 3	Machine 4
Machine Type (Circle One)	Dry-to-Dry or Transfer	Dry-to-Dry or Transfer	Dry-to-Dry or Transfer	Dry-to-Dry or Transfer
Date Machine Was Installed				
Control Device (Use WORKSHEET on Pages 5 & 6 to Determine Required Control)				
Date Control Device was Installed or Is Planned to Be Installed				

6. The following pollution prevention practices must be performed at your plant starting on 12/20/93. These practices are listed on an attached sheet that can be posted next to your machine:

   - Conduct a weekly leak detection and repair program to inspect all dry cleaning equipment for leaks that are obvious from sight, smell, or touch. NOTE: This program is required every other week if you wrote NO CONTROL REQUIRED in the shaded box in Question 5.
   - Repair leaks within 24 hours after they are found, or order repair parts within 2 working days after detecting a leak that needs repair parts. Install the repair parts by 5 working days after they are received.
   - Keep a log of the weekly (or biweekly) results of the leak detection and repair program.
   - Follow good housekeeping practices, which include keeping all perc and wastes containing perc in covered containers with no leaks, draining cartridge filters in closed containers, and keeping machine doors shut when clothing is not being transferred.
   - Operate and maintain all dry cleaning equipment according to manufacturers' instructions.

7. The following records must be kept at your plant:

   - A log of the results of the leak detection and repair program.
   - A log of the amount of perc purchased for the past 12 months, calculated each month.
   - The operation and maintenance manuals for all dry cleaning equipment at the plant.

8. If a room enclosure is installed on a transfer machine as stated in Question 4, the following information about the room enclosure must be attached to this report.

   - Description of the materials that the room enclosure is constructed of to show that it is impermeable to perchloroethylene, and
   - Explanation of how the room enclosure is operated to maintain a negative pressure at all times while the transfer machine is operating.
   - Explanation of how the room enclosure exhausts into a carbon adsorber

9. Print or type the name and title of the Responsible Official for the dry cleaning plant:

_____

Name Title

A Responsible Official can be:

- The president, vice president, secretary, or treasurer of the company that owns the dry cleaning plant,
- An owner of the dry cleaning plant,
- The manager of the dry cleaning plant, or
- A government official if the dry cleaning plant is owned by the Federal, State, City, or County government.
- A ranking military officer if the dry cleaning plant is located at a military base.

The Responsible Official must certify below that all of the information presented in this initial report is accurate and true.

I CERTIFY THE INFORMATION CONTAINED IN THIS REPORT TO BE ACCURATE AND TRUE TO THE BEST OF MY KNOWLEDGE.

_____

(Signature of Responsible Official)

WORKSHEET

A. To find out if control is required:

Check all boxes that apply:

☐ I reported less than 140 gallons in Question 3 (page 1).

☐ I reported less than 200 gallons in Question 3 (page 1) AND reported only transfer machines in Question 4 (page 1).

If you checked either box above and all your machines were installed before 12/9/91, you can STOP HERE. Write NO CONTROL REQUIRED in the shaded box on page 2 for each machine at your plant that was installed before 12/9/91. For those machines installed on or after 12/9/91, continue with the rest of the worksheet.

YOU ARE FINISHED WITH THE WORKSHEET. GO TO QUESTION 6 (page 2).

If you did not check a box above, go to Part B below.

B. Control is required. Fill out Part B for EACH MACHINE at your plant.

Check the appropriate box:

☐ Machine was installed BEFORE 12/9/91.

If you checked this box, your required control is a refrigerated condenser or a carbon adsorber that was installed before 9/22/93. Write REFRIGERATED CONDENSER or CARBON ADSORBER in the shaded box below the machine on page 2.

Control must be installed by 9/22/96.

☐ Machine was installed ON OR AFTER 9/22/93.

If you checked this box, your required control is a dry-to-dry machine with refrigerated condenser.

Write DRY-TO-DRY MACHINE WITH REFRIGERATED CONDENSER in the shaded box below the machine on page 2. NOTE: NO NEW OR USED TRANSFER MACHINES CAN BE INSTALLED AFTER 9/22/93.

Control must be installed when machine is installed.

☐ Machine was installed ON OR AFTER 12/9/91 AND BEFORE 9/22/93.

If you checked this box, your required control is a dry-to-dry machine with refrigerated condenser. Write DRY-TO-DRY MACHINE WITH REFRIGERATED CONDENSER in the shaded box below the machine on page 2.

If the machine you have is NOT a dry-to-dry machine with a refrigerated condenser, the machine must use either a refrigerated condenser or carbon adsorber from 9/22/93 until 9/22/96. On or after 9/22/96, any carbon adsorbers on dry-to-dry machines must be replaced with a refrigerated condenser. If the machine is a transfer machine with a carbon adsorber or a refrigerated condenser, you may keep this installation until 9/22/96. If you plan to keep a dry-to-dry machine with a carbon adsorber or a transfer machine with either a refrigerated condenser or carbon adsorber until 9/22/96, also write this information in the shaded box.

C. To find out if additional control is required:

Check all boxes that apply:

☐ I reported 1,800 gallons or less in Question 3 (page 1).

☐ I reported 2,100 gallons or less in Question 3 (page 1) AND I reported only dry-to-dry machines in Question 4 (page 1).

If you checked either box above, you can STOP HERE. No additional controls are required.

YOU ARE FINISHED WITH THE WORKSHEET. RETURN TO QUESTION 5 (page 2) and write in the dates the controls were or will be installed.

If you did not check a box above, go to Part D below.

D. If additional control is required, fill out Part D for EACH machine at your plant:

Check a box below, if it applies:

☐ Machine is a dry-to-dry machine that was installed ON or AFTER 12/9/91.

If you checked this box, you are also required to install a supplemental carbon adsorber.

Write SUPPLEMENTAL CARBON ADSORBER in the shaded box below the machine on page 2.

☐ Machine is a transfer machine.

If you checked this box, you are also required to install a room enclosure. Write ROOM ENCLOSURE in the shaded box below the machine on page 2.

YOU ARE FINISHED WITH THE WORKSHEET. RETURN TO QUESTION 5 and write in the dates all controls were or will be installed (page 2).

APPENDIX B

COMPLIANCE REPORT FOR POLLUTION PREVENTION

COMPLIANCE REPORT FOR POLLUTION PREVENTION

1. Print or type the following for each separately located dry cleaning plant (facility). The owner of more than one plant must fill out a separate form for each plant.

Owner/operator_____

Company Name_____

Mailing Address_____

City_____State_____Zip_____

Plant Address (If Different Than Mailing Address)

Street Address_____

City_____State_____

Phone Number _____

2. Write in the total volume of perchloroethylene (perc) purchased for ALL of the machines at the dry cleaning plant over the past 12 months (based on actual purchase receipts):

_____gallons

3. The following pollution prevention practices must be performed at your plant starting on 12/20/93.

- Conduct a weekly leak detection and repair program to inspect all dry cleaning equipment for leaks that are obvious from sight, smell, or touch. NOTE: This program is required only every other week (biweekly) if you reported NO CONTROLS REQURIED in the INITIAL NOTIFICATION REPORT.
- Repair leaks within 24 hours after they are found, or order repair parts within 2 working days after detecting a leak that needs repair parts. Install the repair parts by 5 working days after they are received.
- Keep a log of the weekly (or biweekly) results of the leak detection and repair program.
- Follow good housekeeping practices, which include keeping all perc and wastes containing perc in covered containers with no leaks, draining cartridge filters in closed containers, and keeping machine doors shut when clothing is not being transferred.
- Operate and maintain all dry cleaning equipment according to manufacturers' instructions.

4. The following records must be kept at your plant:

- A log of the results of the leak detection and repair program.
- A log of the amount of perc purchased for the past 12 months, calculated each month.

- The operation and maintenance manuals for all dry cleaning equipment at the plant.

5. Print or type the name and title of the Responsible Official for the dry cleaning plant:

_____

Name Title

A Responsible Official can be:

- The president, vice president, secretary, or treasurer of the company that owns the dry cleaning plant,
- An owner of the dry cleaning plant,
- The manager of the dry cleaning plant, or
- A government official if the dry cleaning plant is owned by the Federal, State, City, or County government, or
- A ranking military officer if the dry cleaning plant is located at a military base.

The Responsible Official must certify the statement below.

I CERTIFY THE INFORMATION CONTAINED IN THIS REPORT TO BE ACCURATE AND TRUE TO THE BEST OF MY KNOWLEDGE AND THAT THIS PLANT IS IN COMPLIANCE WITH THE POLLUTION PREVENTION PRACTICES LISTED IN THIS REPORT.

_____

(Signature of Responsible Official)

APPENDIX C

COMPLIANCE REPORT FOR CONTROL REQUIREMENTS

COMPLIANCE REPORT FOR CONTROL REQUIREMENTS

1. Print or type the following for each separately located dry cleaning plant (facility). The owner of more than one plant must fill out a separate form for each plant.

   Owner/operator_____

   Company Name_____

   Mailing Address_____

   City_____State_____Zip_____

   Plant Address (If Different Than Mailing Address)

   Street Address_____

   City_____State_____

   Phone Number _____

2. Write in the total volume of perchloroethylene (perc) purchased for the dry cleaning plant over the last 12 months (based on actual purchase receipts):

   _____gallons

3. Fill out the table below for each machine at your plant. Use the WORKSHEET on pages 5 and 6 of the INITIAL NOTIFICATION REPORT to determine required controls. A copy of the INITIAL NOTIFICATION REPORT is attached.

	Machine Type (Dry-to-Dry or Transfer)	Date Machine Purchased	Required Control	Date Control Installed
1.				
2.				
3.				
4.				
5.				
6.				
7.				

4. If you listed a required control in Question 3 (page 1) for any machine at your plant, you must monitor your control.

To find out what type of monitoring is required,

Check ☐ all boxes that apply:

☐ I use a refrigerated condenser on a dry-to-dry machine to meet the required control.

If you checked this box, you are required to perform a weekly monitoring test to show that the temperature on the outlet side of the refrigerated condenser is less than or equal to 45 degrees Fahrenheit.

☐ I use a refrigerated condenser on a transfer machine to meet the required control.

If you checked this box, you are required to perform a weekly monitoring test to show that the temperature on the outlet side of the refrigerated condenser on the transfer dryer is less than or equal to 45 degrees Fahrenheit AND that the difference between the inlet and the outlet temperature of the refrigerated condenser on the transfer washer is greater than or equal to 20 degrees Fahrenheit.

☐ I use a carbon adsorber on a dry-to-dry or a transfer machine to meet the required control, OR

☐ I use a supplemental carbon adsorber on a dry-to-dry machine and the exhaust passes through the carbon adsorber IMMEDIATELY UPON door opening.

If you checked either of the two boxes above, you are required to perform a weekly monitoring test with a colorimetric detector tube to show that the concentration of perc in the exhaust from the carbon adsorber is not over 100 parts per million.

☐ I use a supplemental carbon adsorber on a dry-to-dry machine and the exhaust passes through the carbon adsorber BEFORE the machine door is opened.

If you checked this box, you are required to perform a weekly monitoring test with a colorimetric detector tube to show that the concentration of perc inside the dry cleaning machine drum at the end of the drying cycle is not over 300 parts per million.

☐ I use a room enclosure on a transfer machine.

If you checked this box, you are required to vent all air from inside the room enclosure through a carbon adsorber. The room enclosure must be constructed of materials impermeable to perc, must be designed and operated to maintain a negative pressure at all times while the transfer machine is operating, and must exhaust to a carbon adsorber.

5. Print or type the name and title of the Responsible Official for the dry cleaning facility:

Name _____ Title _____

Examples of Responsible Officials:

- The president, vice president, secretary, or treasurer of the company that owns the dry cleaning facility,
- An owner of the dry cleaning facility,
- The manager of the dry cleaning facility, or
- A government official if the dry cleaning facility is owned by the Federal, State, City, or County government,
- A ranking military officer if located at a military base.

The Responsible Official must certify below that all of the information presented in this initial report is accurate and true.

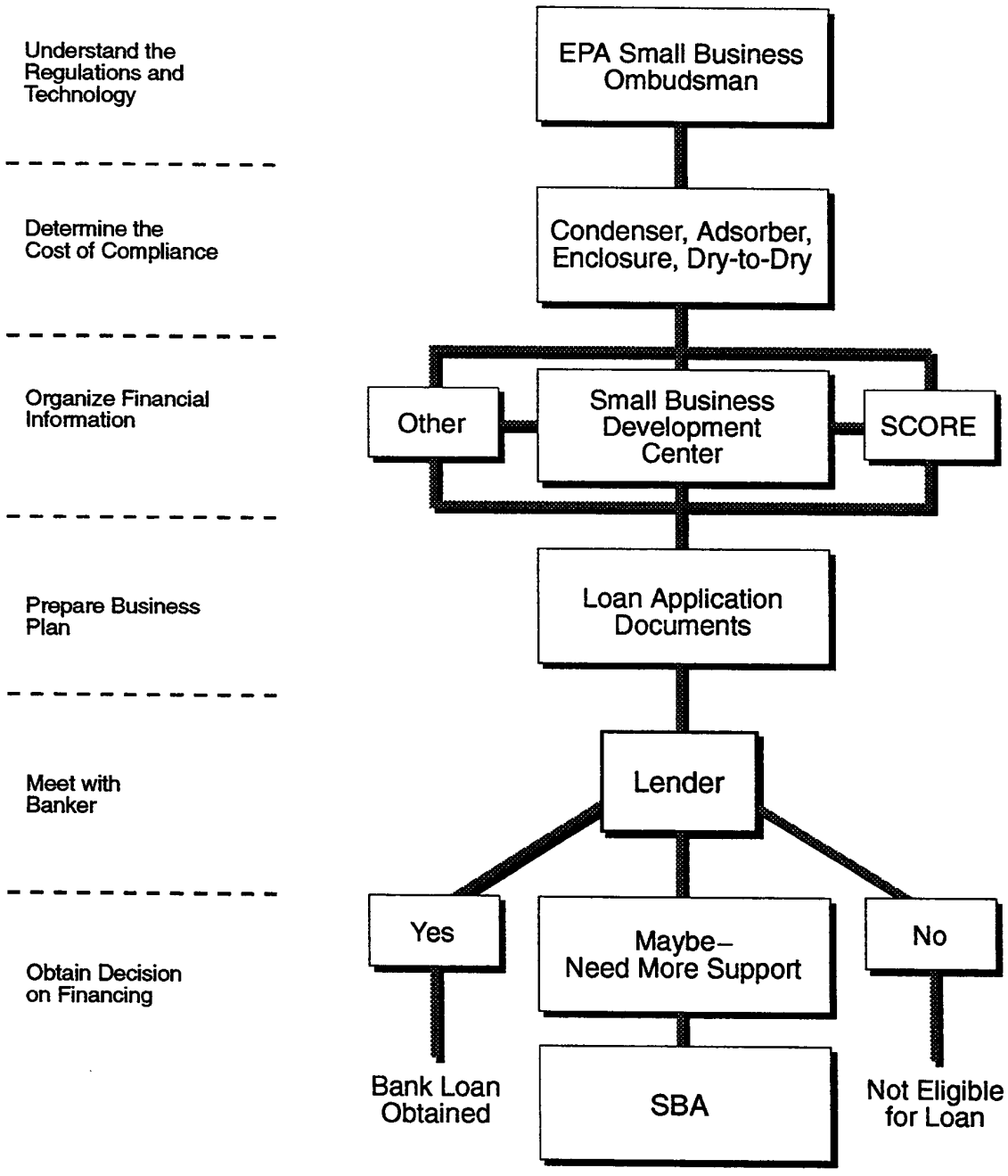
I CERTIFY THE INFORMATION CONTAINED IN THIS REPORT TO BE ACCURATE AND TRUE TO THE BEST OF MY KNOWLEDGE AND THAT THIS PLANT IS IN COMPLIANCE WITH ALL APPLICABLE CONTROL DEVICE AND MONITORING REQUIREMENTS LISTED IN THIS REPORT.

_____

(Signature of Responsible Official)

APPENDIX D FINANCING OPTIONS & RESOURCES FOR DRY CLEANERS

Obtaining Financing



Key Contacts for Help with the Clean Air Act

Sources of expertise at the state level on the impact of the Clean Air Act on small businesses include EPA Small Business Ombudsmen, Directors of the Small Business Assistance Program (SBAP) Technical Programs, and others in various state government positions. The following list identifies key contacts in each state and most territories.

Small Busn. Ombudsman	Dir. of SBAP Tech Program	"Other" Contact
Alabama		
James Moore,Ombudsman Alabama Dept. of Env. Mgmt. P.O. Box 301463 Montgomery, AL 36130-1463 205-271-7700 FAX 205-271-7950	James Moore Dual role as Ombudsman and SBAP Principal	Not Available
Alaska		
Not Available	Robert Hughes ADEC/AQMS 410 Willoughby Ave. Juneau, AK 99801-1795 907-465-5100 FAX 907-465-5129	Not Available
American Samoa		
Not Available	Not Available	Not Available
Arizona		
Betsey Westell AZ Dept. of Env. Quality 3033 N. Central Ave., 8th Fl. Phoenix, AZ 85012 602-207-2242 FAX 602-207-2218	Elliot Bloom AZ DEQ/OAQ 3033 N. Central Ave. Phoenix, AZ 85012 602-207-2372 FAX 602-207-2366	Not Available
Arkansas		
Not Available	Courtney Garland DPE/Air Division P.O. Box 8913 Little Rock, AR 72219 501-562-7444 FAX 501-562-4632	Not Available
California		
Peter Venturini, Chief (Temporary) Stationary Source Div., ARB 2020 L Street, P.O. Box 2815 Sacramento, CA 95814 916-445-0650 FAX 916-445-5023	Richard Corey CA EPA - Air Res. Bd. Stationary Source 2020 L Street. P.O. Box 2815 Sacramento, CA 95814 916-323-1079 FAX 916-445-5023	Jean Woeckener CA EPA - Air Res. Bd. Stationary Source 2020 L Street, P.O. Box 2815 Sacramento, CA 95814 916-323-4883 FAX 916-445-5023
LaRonda Bowen, Asst. Director South Coast Air Mgmt. District Small Bus. Asst. Office 21865 E. Copley Dr. Diamond Bar, CA 91765 909-396-3225 FAX 909-396-3335	Natalia Porche SCAQMD/SBAP 21865 Copely Dr. Diamond Bar, CA 91765 909-396-3218 FAX 909-396-3335	Erin Craig, Director, BEAC UC Extension 3120 DeLaCruz Santa Clara, CA 95054 408-748-2161 FAX 408-748-7388

Small Busn. Ombudsman	Dir. of SBAP Tech Program	"Other" Contact
Colorado		
Geoffrey Hier Asst. Dir. Office of Regulatory Reform Dept. of Reg. Agencies 1560 Broadway, Suite 1530 Denver, CO 80202 303-894-7839 FAX 303-894-7834	Not Available	Nick Melliadis Air Pollution Control Division Dept. of Health 4300 Cherry Creek Dr., S. Denver, CO 80222-1530 303-692-3175 FAX 303-782-5493 Carol Lyons PRC Environ. Mgmt. Inc. 1099 18th St., Suite 1960 Denver, CO 80202
Connecticut		
Tracy Babbidge SBAP Ombudsman Dept. Env. Prot. 76 Elm Street Hartford, CT 06106 203-566-2690 FAX Z03-566-6144	Bob Kaliszewski Permits Ombudsman Dept. Env. Prot., Env. Quality Div. 76 Elm Street Hartford, CT 06106 203-566-4113 FAX 203-566-7932	Not Available
Delaware		
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Estimated Cost Of Compliance

If you are an existing small area source:

1. Facilities with only dry-to-dry machines (consuming less than 140 gallons of perc per year).

Capital:	None
Annual operating:	None
Annual recordkeeping	$345
Total annualized costs:	**$345**

2. Facilities with only transfer machines (consuming less than 200 gallons of perc per year).

Capital:	None
Annual operating:	None
Annual recordkeeping	$345
Total annualized costs:	**$345**

3. Facilities with both dry-to-dry and transfer machines (consuming less than 140 gallons of perc per year).

Capital:	None
Annual operating:	None
Annual recordkeeping	$345
Total annualized costs:	**$345**

If you are a new small area source:

1. Facilities with only dry-to-dry machines (consuming less than 140 gallons of perc per year).

Capital:	None
Annual operating:	None
Annual recordkeeping	$345
Total annualized costs:	**$345**

2. Facilities with both dry-to-dry and transfer machines (consuming less than 140 gallons of perc per year).

Capital:	None
Annual operating:	None
Annual recordkeeping	$345
Total annualized costs:	**$345**

3. For any of the above facilities that purchase new machines (dry-to-dry):
   Note that cost data for this category are limited and that the values below are estimated based on larger sources.

Capital:	$16,700 to $20,800
Annual Operating:	$300
Annual recordkeeping	$345
Total annualized costs:	**$2,500**

If you are an existing large area source:

1. Facilities with only dry-to-dry machines (consuming between 140 and 2,100 gallons of perc per year).

Capital:	None
Annual Operating:	None
Annual recordkeeping	$345 to $1,620
Total annualized costs:	**$345 to $1,620**

2. Facilities with only transfer machines (consuming between 200 and 1,800 gallons of perc per year).

Capital:	None
Annual Operating:	None
Annual recordkeeping	$345 to $1,620
Total annualized costs:	**$345 to $1,620**

3. Facilities with both dry-to-dry and transfer machines (consuming between 140 and 1,800 gallons of perc per year).

Capital:	None
Annual Operating:	None
Annual recordkeeping	$345 to $1,620
Total annualized costs:	**$345 to $1,620**

If you are a new large area source:

1. Facilities with only dry-to-dry machines (consuming between 140 and 2,100 gallons of perc per year).

Capital:	None
Annual Operating:	None
Annual recordkeeping	$345 to $1,620
Total annualized costs:	**$345 to $1,620**

2. Facilities with both dry-to-dry and transfer machines (consuming between 140 and 1,800 gallons of perc per year).

Capital:	None
Annual operating:	None
Annual recordkeeping	$345 to $1,620
Total annualized costs:	**$345 to $1,620**

3. For any of the above facilities that purchase new machines (dry-to-dry).

Capital:	$20,800 to $47,000
Annual operating:	-$1,490 to $231
Annual recordkeeping	$345 to $1,620
Total annualized costs:	**$3,410 to $10,500**

If you are an existing major source:

1. Facilities with only dry-to-dry machines (consuming greater than 2,100 gallons of perc per year).

Capital:	None
Annual operating:	None
Annual recordkeeping	$345 to $439
Total annualized costs:	**$345 to $439**

2. Facilities with only transfer machines (consuming greater than 1,800 gallons of perc per year).

Capital:	$14,300 to $15,300
Annual operating:	-$8,169 to $323
Annual recordkeeping	$345 to $439
Total annualized costs:	**-$8,540 to $8,450**

If you are a new major source:

1. Facilities with only dry-to-dry machines (consuming greater than 2,100 gallons of perc per year).

Capital:	None
Annual operating:	None
Annual recordkeeping	$345 to $439
Total annualized costs:	**$345 to $439**

2. Facilities with only transfer machines (consuming greater than 1,800 gallons of perc per year).

Capital:	$14,300 to $15,300
Annual operating:	$-8,169 to $323
Annual recordkeeping	$345 to $439
Total annualized costs:	**-$8,540 to $8,450**

3. For any of the above facilities that purchase new machines (dry-to-dry).

Capital:	$29,600 to $157,000
Annual operating:	-$10,300 to $466
Annual recordkeeping	$345 to $439
Total annualized costs:	**$4,240 to $15,300**

U.S. SMALL BUSINESS ADMINISTRATION

APPLICATION FOR BUSINESS LOAN (UP TO $100,000)

It is not necessary to hire outside assistance for preparation of the application. Names and fees of anyone assisting in preparation of this form must be disclosed.

Individual	Full Address
Corporate Name (If any) Trade Name & Street Address City _____ County _____ State ____ Zip _____ Type of Business	Date Established
#Employees **(Incl. Subsidiaries & Affiliates)** Include owners & managers Before Loan _____ After Loan _____ Bank of Business Account: IRS Tax ID #	

MANAGEMENT **(Proprietor, partners, officers, directors owning 20% or more of the company)**

Name SOCIAL SECURITY #	Complete Address	% Owned	*Military Service From To	*Race	*Sex

*This data is collected for statistical purposes only. It has no bearing on the credit decision to approve or decline this application. Disclosure is voluntary.

U.S. Citizen? Yes ___ No ___ If no, include a copy of Alien Registration Card (Form I 151 or I 551) Alien Registration #_____

Are any of the above individuals (a) presently under indictment, on parole or probation, or have they ever been (b) charged for any criminal offense other than a minor vehicle violation, or (c) convicted, placed on pretrial diversion, or placed on any form of probation including adjudication withheld pending probation for any criminal offense other than a minor vehicle violation? Yes ___ No ___ **If yes, loan request must be submitted under regular 7(a) loan program.**

Have you or any officer of your company ever been involved in bankruptcy or insolvency proceedings? If yes, provide details to bank. Yes ___ No ___

Are you or your business involved in any pending lawsuits? If yes, provide details to bank. Yes ___ No ___

DESCRIBE YOUR BUSINESS OPERATION:

IS BUSINESS ENGAGED IN EXPORT TRADE? Yes ___ No ___ DO YOU INTEND TO BEGIN EXPORTING AS A RESULT OF THIS LOAN? Yes ___ No ___

SUMMARY OF MANAGEMENT'S BUSINESS EXPERIENCE & EDUCATIONAL BACKGROUND:

LOAN REQUEST: HOW MUCH, FOR WHAT, WHY IT IS NEEDED

INDEBTEDNESS: Furnish information on ALL BUSINESS debts, contracts, notes, and mortgages payable. Indicate by an (*) items to be paid with loan proceeds.

To Whom Payable	Original Amount	Original Date	Present Balance	Rate of Interest	Maturity Date	Monthly Payment	Collateral	Current or Past Due
	$		$			$		
	$		$			$		
	$		$			$		
	$		$			$		

PREVIOUS SBA OR OTHER GOVERNMENT FINANCING: If you or any principals or affiliates have ever requested Government Financing complete the following:

Name of Agency	Loan Number	Date Approved	$ Amount	Loan Balance	Status

If you make a statement that you know to be false or if you over value a security in order to help obtain a loan under provisions of the Small Business Act, you can be fined up to $5,000 or be put in jail for up to two years, or both.

If applicant is a proprietor or general partner, sign here: By: _____ Title _____ Date _____

If corporation sign below: Corporate Name _____

By: _____ Date: _____ Attested By: _____

Signature of President Signature of Corporate Secretary

FOR BANK USE ONLY

LENDER'S APPLICATION FOR GUARANTY

Name of Lender | Address | Telephone(A/C) | Fax #

Applicant's Trade Name

We request SBA to guarantee _____% of a loan in the amount of $_____ for ___ years, with monthly P&I payments of $_____ beginning _____ month(s) from date of note. **(If applicable: Interest only payment to begin _____ months from date of note).**
The interest rate is to be fixed at _____% **OR** variable with a base rate of _____%, spread _____%, and an adjustment period of _____.

Lender Experience with Applicant:

CREDIT REPORTS (CR): CR Company _____ Risk Score _____ Summary of Business Credit:

OWNERS, GUARANTORS, AND CO-SIGNERS:
Owners of 20% or more of business must guarantee the note. Lender must obtain personal credit reports on all owners, guarantors, and co-signers.

Name (Indicate co-signers with *)	Address	Individual Credit Reports Analysis

Personal F/S: **Lender should obtain signed personal financial statements for all owners, guarantors, and co-signers.**
Do owners' personal unpledged liquid assets exceed $50,000 (not including IRA, CV Life Insurance, or savings for education)? _____
Comments on personal resources, including any supplementary or outside sources of income available for debt service or to secure loan:

P&L: Average annual gross sales last 3 years (if applicable) $_____
Year end cash flow last 3 years (if applicable) FY____,$_____, FY____,$_____, FY____,$_____
One year projected cash flow after owner's compensation $_____ Total annual debt service (including interest) after the loan $_____
Comments on repayment ability:

Pro Forma Balance Sheet: Debt/NW Ratio _____ Current Ratio (CA/CL) _____ Comments or balance sheet:

IF NEW BUSINESS OR FOR PURCHASE OF EXISTING BUSINESS, AMOUNT OF APPLICANT INJECTION - CASH $_____ OTHER $_____

Assessment of management's character and capability

Bank Analysis of Risk

Collateral Market Value *		Use of Proceeds:	
Inventory	$_____	Inventory	$_____
Equipment	$_____	Fixed Assets	$_____
A/R	$_____	Real Estate	$_____
R/E **	$_____	Note Payment	$_____
_____	$_____	Working Capital	$_____
_____	$_____	SBA Payoff	$_____
		TOTAL	$_____

* Value determined by:
(Lender) (Appraisal)
Other_____
** Furnish Legal Description

For loans over $50,000 and up to $100,000, the following must be submitted:
1. **Lender's internal loan report, including cash flow analysis and pro forma balance sheet**
2. **Income tax schedule C or front page of corporate returns for past 3 years (if applicable)**
3. **Personal F/S's for all guarantors**

IF LOAN IS TO PURCHASE AN EXISTING BUSINESS
Include copy of terms of sale and F/S on the existing business. Also, comments on any benefit to the business as a result of the change of ownership. Are buyer and seller related? _____
State relationship _____

I submit this application to SBA for approval subject to the terms and conditions outlined above. Without the participation of SBA to the extent applied for we would not be willing to make this loan, and in our opinion the financial assistance applied for is not otherwise available on reasonable terms. I certify that none of the Lender's employees, officers, director or substantial stockholders (more than 10%) have a financial interest in the applicant.

Signature of Lender Official: | Title | Date

DRY CLEANER EQUIPMENT PAYBACKS

(100,000 POUNDS OF CLOTHES PER YEAR)

TRANSFER MACHINE (UNCONTROLLED)

(5 TO 10 THOUSAND POUNDS PER BARREL)

SAVES ABOUT 8 BARRELS OF SOLVENT PER YEAR

(ABOUT A 7 YEAR PAYBACK FOR A USED DRY-TO-DRY MACHINE)

DRY-TO-DRY MACHINE (UNCONTROLLED)

(10 TO 20 THOUSAND POUNDS PER BARREL)

SAVES ABOUT 4 BARRELS OF SOLVENT PER YEAR

(ABOUT A 7 YEAR PAYBACK FOR A REFRIGERATED CONDENSER)

DRY-TO-DRY WITH REFRIGERATED CONDENSER

(20 TO 40 THOUSAND POUNDS PER BARREL)

DRY CLEANER EQUIPMENT PAYBACKS

* THE PAYBACK AND SAVINGS WILL BE MORE FOR BIGGER DRY CLEANERS

  FOR EXAMPLE, A 200,000 POUND PER YEAR DRY CLEANER WILL HAVE AN EQUIPMENT PAYBACK IN ABOUT 3 AND 1/2 YEARS

* THE PAYBACK AND SAVINGS WILL BE LESS FOR SMALLER DRY CLEANERS

  FOR EXAMPLE, A 50,000 POUND PER YEAR DRY CLEANER WILL HAVE AN EQUIPMENT PAYBACK IN ABOUT 14 YEARS

* THE PAYBACK TIME ON A NEW DRY-TO-DRY MACHINE OVER AN UNCONTROLLED TRANSFER MACHINE IS ABOUT 10 YEARS

APPENDIX E EQUIPMENT MANUFACTURERS & SUPPLIERS

Key

1 - Activated Carbon
2 - Carbon Recovery Units
3 - Drycleaning Equipment
4 - Filters
5 - Pollution Control Equipment
6 - Solvent Reclamation
7 - Distillation Units

ADCO Chemical Company - 1, 4
Sedalia, MO
816-826-3300

Air Quality Laboratories - 5
Santa Monica, CA
310-395-3888

American Laundry Machinery - 3
Cincinnati, OH
513-731-5500

Banasch's Inc. - 3
Cincinnati, OH
513-731-2040

Boewe Passat - 3
Wichita Falls, TX
817-723-1065

Berring Industries - 3
Miami, FL
305-653-1600

Cafco/Esco - 3
Greer, SC
803-877-3946

Caled Signal Chemical - 1, 4, 6, 7
Wayne, NJ
201-696-7575

C & L Supply Company - 1, 2, 3, 4, 6, 7
Sulphur, LA
318-527-7012

Columbia Machine Corporation - 3, 4, 7
Baltimore, MD
800-356-5634

Consolidated Laundry Equipment Company - 3
Raleigh, NC
919-832-4624

DC Filter & Chemical, Inc. - 4, 6, 7
Sandusky, OH
419-626-3967

Detrex Corporation - 2, 3
Bowling Green, KY
502-782-2411

The Dexter Company - 3
Fairfield, IA
515-472-5131

Diversitron Corporation 3
Fresh Meadows, NY
800-221-0600

Dynamic International Equipment Co. - 3
Bridgeview, IL
708-598-8550

Fluormatic Midwest Ltd. - 3, 4
Villa Park, IL
798-833-3200

Hoffman/New Yorker, Inc. - 3
Paterson, NJ
201-278-5620

Hoyt Corporation - 1, 2, 3, 5, 6, 7
Westport, MA
508-636-8811

International Laundry Machinery - 2, 3, 4, 6
Houston, TX
713-524-3037

Jensen Corporation -3
Fort Lauderdale, FL
305-974-6300

Key

1 - Activated Carbon
2 - Carbon Recovery Units
3 - Drycleaning Equipment
4 - Filters
5 - Pollution Control Equipment
6 - Solvent Reclamation
7 - Distillation Units

Kirk's Suede-Life
Chicago, Il
800-447-5475

Kleen-Rite, Inc.- 4, 6
St. Louis, MO
314-353-1712

R.J. Kool Company - 3
Cedar Rapids, IA
319-364-1592

Linklean, Inc. - 3
Paterson, NJ
201-278-4615

Marvel Manufacturing Company - 3
San Antonio, TX
512-344-8551

MCF Systems, Inc. - 6
Decatur, GA
404-593-9434

Met-Pro Corporation - 1, 2
Harleysville, PA
215-723-6751

Miraclean Equipment & Mfr. Co. - 2, 3, 4, 6, 7
Trevose, PA
215-322-6900

Multimatic Corporation - 2, 3, 4, 7
Northvale, NJ
201-767-9600

Omega Cleaning Systems -3, 4, 5
Montreal, Quebec, Canada
514-737-0551

PROS - 3, 4
Minneapolis, MN
800-950-7767

Realstar, USA -3
Los Angeles, CA
818-764-4014

Renzacci of America - 2, 3, 4, 7
Long Beach, CA
310-442-1257

R.R. Street & Company, Inc. - 4, 6, 7
Oak Brook, IL
708-571-4242

Safety Kleen Corporation - 4, 5, 6
Elgin, IL
708-697-8460

Spencer USA, Inc. - 3
Scottsdale, AZ
602-451-7717

Talley Machinery Corporation - 3, 4, 6, 7
Greensboro, NC
919-292-4110

USA Distributors - 3, 4, 6, 7
Dallas, TX
214-942-3766

Valve Equipment Company - 3
Van Nuys, CA
800-962-6203

VIC Manufacturing Company - 3
Minneapolis, MN
612-781-6601

Key

1 - Activated Carbon
2 - Carbon Recovery Units
3 - Drycleaning Equipment
4 - Filters
5 - Pollution Control Equipment
6 - Solvent Reclamation
7 - Distillation Units

WascoClean - 3
Inwood, NY
516-371-4400

Western State Design - 3
Hayward, CA
510-786-9271

Note: The University of Tennessee Center for Industrial Services does not endorse any of the companies and/or products listed above. Most of the companies listed have branch offices in Tennessee or distributors that serve the southeast United States.

NOTICE

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