ACTIVE SMAQMD BACT CLEARINGHOUSE

CATEGORY: **DRY CLEANING UNIT**

BACT Size: Minor Source BACT **DRY CLEANING UNIT DIBUTOXYMETHANE**

BACT Determination Number: 126	**BACT Determination Date:** 8/25/2017

Equipment Information

Permit Number: 24753
Equipment Description: DRY CLEANING UNIT DIBUTOXYMETHANE
Unit Size/Rating/Capacity:
Equipment Location: CLEANERS EXPRESS
7600 GREENHAVEN DR
SACRAMENTO, CA

BACT Determination Information

ROCs	**Standard:**	
	Technology Description:	Closed-loop, Dry-to-Dry, machine with internal refrigerated condenser achieving outlet vapor temperature ≤45ºF, and drying sensor/controller.
	Basis:	Achieved in Practice
NOx	**Standard:**	No Standard
	Technology Description:	
	Basis:	
SOx	**Standard:**	No Standard
	Technology Description:	
	Basis:	
PM10	**Standard:**	No Standard
	Technology Description:	
	Basis:	
PM2.5	**Standard:**	No Standard
	Technology Description:	
	Basis:	
CO	**Standard:**	No Standard
	Technology Description:	
	Basis:	
LEAD	**Standard:**	No Standard
	Technology Description:	
	Basis:	

Comments: This determination includes petroleum and non-halogenated solvents. See BACT Determination Attachment E for operational standards. T-BACT standards are identical to BACT standards.

District Contact: Jeff Quok Phone No.: (916) 874-4863 email: jquok@airquality.org

Printed: 8/29/2017

CATEGORY: **DRY CLEANING UNIT**

BACT Size: Minor Source BACT **DRY CLEANING UNIT SYNTHETIC/HALOGENATED**

BACT Determination Number:	127	**BACT Determination Date:**	**8/25/2017**

Equipment Information

Permit Number: N/A -- Generic BACT Determination
Equipment Description: DRY CLEANING UNIT SYNTHETIC/HALOGENATED
Unit Size/Rating/Capacity:
Equipment Location:

BACT Determination Information

ROCs	**Standard:**	
	Technology Description:	Secondary control machine (ventless dry-to-dry system with internal refrigerated condenser, internal carbon adsorption unit, and drying sensor/controller) achieving solvent conventration in drum ≤300ppmv.
	Basis:	Achieved in Practice
NOx	**Standard:**	No Standard
	Technology Description:	
	Basis:	
SOx	**Standard:**	No Standard
	Technology Description:	
	Basis:	
PM10	**Standard:**	No Standard
	Technology Description:	
	Basis:	
PM2.5	**Standard:**	No Standard
	Technology Description:	
	Basis:	
CO	**Standard:**	No Standard
	Technology Description:	
	Basis:	
LEAD	**Standard:**	No Standard
	Technology Description:	
	Basis:	

Comments: Synthetic solvent is defined as any halogenated hydrocarbon including, but not limited to, tetrachloroethylene (perchloroethylene, Perc, or PCE); 1,1,1-trichloroethane (111-TCA); and trichlorotrifluoroethane (Valclene or CFC-113). See BACT Determination #127 Attachment F for operational standards. T-BACT standards are identical to BACT standards.

District Contact: Jeff Quok Phone No.: (916) 874-4863 email: jquok@airquality.org

777 12th Street, Third Floor

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Sacramento, CA 95814

BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

DETERMINATION NO.: 126 & 127

DATE: August 25, 2017

ENGINEER: Jeffrey Quok

Category/General Equip Description: Dry Cleaning Unit

Equipment Specific Description: Dry Cleaning Unit – Petroleum and Non-Halogenated Solvents (BACT #126)
Dry Cleaning Unit – Synthetic/Halogenated Solvents not including perchloroethylene (BACT #127)

Equipment Size/Rating: Minor Source BACT

Previous BACT Det. No.: Nos. 75 & 80

This BACT determination will update the following determinations:

#75 which was made on August 28, 2013 for dry cleaning units using petroleum solvents.

#80 which was made on March 7, 2014 for dry cleaning units using dibutoxymethane solvents.

A petroleum solvent is hydrocarbon distillate having a minimum flash point of 100°F. A Non-halogenated solvent refers to dry cleaning solvents that contain less than 5% by weight of total halogens (chlorine, bromine, fluorine, and/or iodine). Synthetic solvents include, but are not limited to, tetracholoroethylene (perchloroethylene, Perc, or PCE); 1,1,1-trichloroethane (111-TCA); and trichlorotrifluoroethane (valclene or CFC-113).

Additionally, this determination is being updated to include T-BACT.

This BACT was determined under the project for A/C 24753 (Cleaners Express).

BACT/T-BACT ANALYSIS

A. ACHIEVED IN PRACTICE (Rule 202, §205.1a):

The following control technologies are currently employed as BACT/T-BACT for dry cleaning units that use petroleum or non-halogenated solvents, and synthetic/halogenated solvents not including perchloroethylene by the following air pollution control districts:

<table>
<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>US EPA</td><td>

BACT
Source: EPA RACT/BACT/LAER Clearinghouse (See Attachment A)
RBLC ID: CA-1133 (3/23/2005)

With the use of a Dry-to-Dry Machine with non-vented refrigerated or evaporatively controlled condenser was assumed to achieve a minimum 95% control efficiency. This BACT determination was subsequently superseded by two other determinations (#75 and #80, see Attachment B), which eliminated the 95% control standard for the reasons listed previously.

<table>
<tr><td colspan="2">For Hydrocarbon Dry Cleaning Machine(A)</td></tr>
<tr><td>VOC</td><td>95% Control, Dry-to-Dry Machine with non-vented refrigerated or evaporatively controlled condenser</td></tr>
<tr><td>NOx</td><td>No Standard</td></tr>
<tr><td>SOx</td><td>No Standard</td></tr>
<tr><td>PM10</td><td>No Standard</td></tr>
<tr><td>PM2.5</td><td>No Standard</td></tr>
<tr><td>CO</td><td>No Standard</td></tr>
</table>

(A) This Determination was updated and replaced on 8/28/13 by SMAQMD (see BACT determinations #75 and #80 in Attachment B).

T-BACT
There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:
40 CFR Part 60 Subpart JJJ – Standards of Performance for Petroleum Dry Cleaners: This regulation applies to facilities located at a petroleum dry cleaning plant with a total manufacturers' rated dryer capacity equal or greater than 34 kilograms or 84 pounds. [40 CFR §60.620(a)]

Standards for Volatile Organic Compounds
(A) Each affected dry petroleum solvent dry cleaning dryer that is installed at a petroleum dry cleaning plant after December 14, 1982, shall be a solvent recovery dryer. The solvent recovery dryers shall be installed, operated, and maintained. [40 CFR §60.622(a)]
(B) Each affected petroleum solvent filter that is installed at a petroleum dry cleaning plant after December 14, 1982, shall be a cartridge filter. Cartridge filters shall be drained in their sealed housings for at least 8 hours prior to their removal. [40 CFR §60.622(b)]
(C) Each manufacturer of an affected petroleum solvent dryer shall include leak inspection and leak repair cycle information in the operating manual and on a clearly visible label posted of each affected facility. [40 CFR §60.622(c)]

</td></tr>
</table>

<table>
<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>Air Resources Board (ARB)</td><td>

BACT
Source: ARB BACT Clearinghouse (SMAQMD)
SMAQMD: Permit #18280 (7/21/2005) BACT Determination #19

This BACT determination was found to be the most stringent Achieved in Practice BACT determination published in the ARB clearinghouse. See Attachment B for more information. With the use of a Dry-to-Dry Machine with non-vented refrigerated or evaporatively controlled condenser was assumed to achieve a minimum 95% control efficiency. This BACT determination was subsequently superseded by two other determinations (#75 and #80, see Attachment B), which eliminated the 95% control standard for the reasons listed previously.

<table>
<tr><th colspan="2">For Hydrocarbon Dry Cleaning Machine(A)</th></tr>
<tr><td>VOC</td><td>95% Control, Dry-to-Dry Machine with non-vented refrigerated or evaporatively controlled condenser</td></tr>
<tr><td>NOx</td><td>No Standard</td></tr>
<tr><td>SOx</td><td>No Standard</td></tr>
<tr><td>PM10</td><td>No Standard</td></tr>
<tr><td>PM2.5</td><td>No Standard</td></tr>
<tr><td>CO</td><td>No Standard</td></tr>
</table>

(A) This Determination was updated and replaced on 8/28/13 by SMAQMD. BACT determinations #75 and #80 were not updated by CARB on their BACT Clearinghouse.

T-BACT
There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:
17 CCR, Section 93109 – Air Toxic Control Measure (ATCM) for emissions of Perchloroethylene from Dry Cleaning operations
This ATCM is only applicable for dry cleaning operations that use perchloroethylene solvent. New perchloroethylene machines have been prohibited by this ATCM since January 1, 2008

</td></tr>
<tr><td></td><td>

BACT
Source: SMAQMD BACT Clearinghouse
BACT Determination #75 (8/28/2013) & #80 (3/7/2004)

<table>
<tr><th colspan="2">For Dry Cleaning Unit – Petroleum</th></tr>
<tr><td>VOC</td><td>Refrigerated Condenser, Closed-loop with primary control system(A)</td></tr>
<tr><td>NOx</td><td>No Standard</td></tr>
<tr><td>SOx</td><td>No Standard</td></tr>
<tr><td>PM10</td><td>No Standard</td></tr>
</table>

</td></tr>
</table>

<table>
<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>SMAQMD

SMAQMD</td><td>
<table>
<tr><td>PM2.5</td><td>No Standard</td></tr>
<tr><td>CO</td><td>No Standard</td></tr>
</table>
(A) These Determinations replaced the BACT listed on CARB's BACT Clearinghouse on 8/28/13. These BACT determinations (#75 and #80) were not updated by CARB on their BACT Clearinghouse.

<table>
<tr><td colspan="2">For Dry Cleaning Unit – Dibutoxymethane</td></tr>
<tr><td>VOC</td><td>Refrigerated Condenser, Closed-loop with primary control system(A)</td></tr>
<tr><td>NOx</td><td>No Standard</td></tr>
<tr><td>SOx</td><td>No Standard</td></tr>
<tr><td>PM10</td><td>No Standard</td></tr>
<tr><td>PM2.5</td><td>No Standard</td></tr>
<tr><td>CO</td><td>No Standard</td></tr>
</table>
(A) These Determinations replaced the BACT listed on CARB's BACT Clearinghouse on 8/28/13. These BACT determinations (#75 and #80) were not updated by CARB on their BACT Clearinghouse.

<u>T-BACT</u>
The current BACT determination does not address T-BACT.

<u>RULE REQUIREMENTS:</u>
Rule 444 Petroleum Solvent Dry Cleaning (Adopted 8/13/1981)

This rule only applies to dry cleaning operations using petroleum solvent.

<u>Emission Control Standards</u>
The following emission control requirements specified in Section 302 shall apply only to dry cleaners consuming 2,642 gallons or more of petroleum solvent per year:
1. Limit solvent emissions to the atmosphere to an average of 3.5 kg of solvent per 100 kg of articles dry cleaned, or
2. Install and operate a solvent recovery dryer in a manner such that the dryer remains closed and the recovery phase continues until a final recovered solvent flow rate of not more than 50 ml per minute is attained.

<u>Operating Standards</u>
Section 301.5: The used filtering material is put into a sealed container immediately after removal from the filter, unless the dry cleaning system is equipped with one of the following filtering systems:
a. Cartridge filters containing paper or carbon or a combination thereof which are fully drained in the filter housing for at least 12 hours before removal.
b. Diatomaceous earth filtering system, connected to a centrifugal solvent extractor or other device capable of removing sufficient solvent so that the remaining diatomaceous earth and soil does not contain more than 0.4 kilogram of solvent per kilogram of filter powder and soil removed.
c. Any other type of filtering system or process found by the Air Pollution Control Officer to emit into the atmosphere 1 kilogram or less of solvent in</td></tr>
</table>

District/Agency	Best Available Control Technology (BACT)/Requirements
	the discarded soil, lint and filtering material per 100 kilograms of articles cleaned. The provisions of 301.5 shall not apply if the total collection of still residue and filter waste does not exceed 1.5 gallons per day.

District/Agency	Best Available Control Technology (BACT)/Requirements
South Coast AQMD	**BACT** Source: SCAQMD BACT Guidelines for Non-Major Polluting Facilities, page 41 (Last Revised 12/2/2016)

BACT Guideline, Dry Cleaning					
Subcategory	VOC	NOx	SOx	CO	PM
Perchloroethylene(A)	Delisted as a VOC. See AQMD Rule 1421 – Control of Perchloroethylene Dry Cleaning Operations (06-13-97)	-	-	-	-
Petroleum Solvent(B)	Closed Loop, Dry-to Dry Machine with a Refrigerated Condenser (10-20-2000) or Evaporatively Cooled Condenser (7-9-2004)	-	-	-	-

(A) Rule 1421 implements the federal National Emission Standard for Hazardous Air Pollutant for Perchloroethylene Dry Cleaning Facilities (40 Code of Federal Regulations [CFR] 63.320, *et seq*) and the state Airborne Toxic Control Measure (ATCM) for Emissions of Perchloroethylene from Dry Cleaning Operations (17 California of Regulation [CCR] 93109, *et seq*)

(B) This equipment may also be subject to AQMD Rule 1102 – Dry Cleaners Using Solvent Other Than Perchloroethylene.

T-BACT
There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:
Reg IX, Rule 1102 Dry Cleaners Using Solvent Other Than Perchloroethylene
(Amended 11/17/2000)

<table>
<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>South Coast AQMD</td><td>This rule applies to all persons owning or operating a dry cleaning facility using solvent other than perchloroethylene. Effective January 1, 2005 a person shall not operate any transfer machine.

<u>Operating Standards</u>
A person shall not operate a solvent dry cleaning facility except in accordance with the following:

<u>General Specifications</u>
(A) For any dry cleaning system that is equipped with cartridge filters containing paper or carbon or a combination thereof, the cartridge filters shall be fully drained in a sealed filter house for at least 24 hours before removal.

<u>Specifications for Transfer Machines</u>
(A) Materials which have been dry cleaned shall be transferred to the dryer by hand or in an enclosed transfer cart within five minutes after they are removed from the washer.
(B) The washer doors shall not be opened to transfer materials which have been dry cleaned unless there are an adequate number of dryers ready to take up the washed load.
(C) The solvent recovery dryer shall remain closed until there is no visible flow in the sight glass of the condenser for at least one minute.
(D) A solvent recovery dryer or an equivalent control device that reduces VOC emissions from drying tumblers by at least 90 percent by weight shall be installed and operated.
(E) The overall gallons of solvent used shall be less than 4.5 pounds per 100 pounds of materials cleaned.</td></tr>
<tr><td>San Joaquin Valley Unified APCD</td><td><u>BACT</u>
Source: SJVUAPCD BACT
Guideline 4.1.2 – Petroleum Solvent Dry Cleaning (4/8/2004)

<table>
<tr><th colspan="2">Petroleum Solvent Dry Cleaning</th></tr>
<tr><td>VOC</td><td>Dry-to-Dry machine vented to vapor control device</td></tr>
<tr><td>NOx</td><td>No Standard</td></tr>
<tr><td>SOx</td><td>No Standard</td></tr>
<tr><td>PM10</td><td>No Standard</td></tr>
<tr><td>PM2.5</td><td>No Standard</td></tr>
<tr><td>CO</td><td>No Standard</td></tr>
</table>
<u>T-BACT</u>
There are no T-BACT standards published in the clearinghouse for this category.

<u>RULE REQUIREMENTS:</u>
Rule 4672 – Petroleum Solvent Dry Cleaning Operations (Amended 12/17/1992)
This rule only applies to dry cleaning operations that use petroleum solvent.</td></tr>
</table>

District/Agency	Best Available Control Technology (BACT)/Requirements
San Joaquin Valley Unified APCD	Operating Standards Section 5.5 The used filtering material shall be put into a sealed container immediately after removal from the filter, unless the dry cleaning system is equipped with one of the following filter systems: (A) Cartridge filters containing paper or carbon or a combination thereof which are fully drained in a sealed filter housing for at least 24 hours before being discarded, or 12 hours if the filter is dried in a dryer vented to an emission control device; or (B) Reduce the petroleum solvent content in all filtration wastes to one (1.0) kilograms or less per 100 kilograms dry weight of articles dry cleaned, before disposal, and exposure to the atmosphere. Section 5.7 Articles which have been cleaned shall be transferred to the dryer within five (5) minutes after they are received from the washer, or shall be stored in closed transfer carts. Section 5.8 Emission Control Requirements: A person shall not operate any petroleum solvent dry cleaner unless one of the following requirements is satisfied: Add-On-Control Device: All exhaust gases from drying tumblers, washers, and cabinets are vented through a control device, which reduces total emissions of petroleum solvent vapors by at least 90 percent by weight. Solvent Recovery Dryer: A solvent recovery dryer that recovers at least 90 percent of petroleum solvent by weight shall be installed. For the purpose of determining compliance with the 90 percent recovery efficiency of this Section, three kilograms of petroleum solvent emitted per 100 kilograms dry weight of articles cleaned shall be deemed to be in compliance. Section 5.9 The flow rate of recovered solvent from the solvent recovery dryer at the termination of the recovery cycle shall not exceed 0.05 liter per minute.

District/Agency	Best Available Control Technology (BACT)/Requirements
San Diego APCD	**BACT** Source: NSR Requirements for BACT (June 2011) There is no BACT Determination listed for dry cleaning operations. **T-BACT** There are no T-BACT standards published in the clearinghouse for this category.

<table>
<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>San Diego APCD</td><td>
<u>RULE REQUIREMENTS:</u>
Regulation 4, Rule 67.2 – Dry Cleaning Equipment Using Petroleum-Based Solvent (Revised 5/15/1996)

This rule only applies to dry cleaning units that use petroleum-based solvents.

<u>Operating Standards</u>
All cartridge type filters are drained in the filter housing for at least 24 hours before discarding the cartridges or drained for at least 12 hours and dried in a closed dryer.

Articles which have been dry cleaned are transferred to the dryer within five minutes after they are removed from the washer, or are kept covered.

The dryer remains closed and the recovery phase continues until there is no visible flow in the sight glass of the condenser for at least one minute.

A person shall not operate a dry cleaning facility unless the total emissions of petroleum-based organic solvent to the atmosphere from all drying tumblers and drying cabinets, over each operating day, are reduced by at least 90 percent by weight. This provision does not apply to any dry cleaning facility which does not consume more than 600 gallons of petroleum-based organic solvent in any consecutive twelve-month period.

A person shall not install and operate a new or replacement solvent filter and purification system unless the system employs cartridge filters containing paper or carbon or a combination thereof and the system does not include a diatomaceous earth filtering system.
</td></tr>
<tr><td>Bay Area AQMD</td><td>
<u>BACT</u>
Source: BAAQMD BACT
Guideline 58.2.1 Drycleaner – Petroleum Solvent (3/10/1995)
Guideline 58.3.1 Drycleaner – Valclene & Other Synthetic Solvents (1/27/1999)

<table>
<tr><td colspan="2">Drycleaner – Petroleum Solvent</td></tr>
<tr><td>VOC</td><td>Closed loop machine (ventless dry-to-dry system with internal refrigerated condenser achieving outlet vapor temperature ≤45ºF, and drying sensor/controller)</td></tr>
<tr><td>NOx</td><td>No Standard</td></tr>
<tr><td>SOx</td><td>No Standard</td></tr>
<tr><td>PM10</td><td>No Standard</td></tr>
<tr><td>PM2.5</td><td>No Standard</td></tr>
<tr><td>CO</td><td>No Standard</td></tr>
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<table>
<tr><td>Drycleaner – Valclene & Other Synthetic Solvents</td></tr>
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</td></tr>
</table>

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<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>Bay Area AQMD</td><td>
<table>
<tr><td>VOC</td><td>Secondary Control Machine (ventless dry-to-dry system with internal refrigerated condenser, internal carbon adsorption unit, and drying sensor/controller) achieving solvent concentration in drum ≤300ppmv(A),(B)</td></tr>
<tr><td>NOx</td><td>No Standard</td></tr>
<tr><td>SOx</td><td>No Standard</td></tr>
<tr><td>PM10</td><td>No Standard</td></tr>
<tr><td>PM2.5</td><td>No Standard</td></tr>
<tr><td>CO</td><td>No Standard</td></tr>
<tr><td>NPOC (C)</td><td>Secondary Control Machine (ventless dry-to-dry system with internal refrigerated condenser, internal carbon adsorption unit, and drying sensor/controller) achieving solvent concentration in drum ≤300ppmv(A),(B)</td></tr>
</table>
(A) Closed loop machines (ventless dry-to-dry system with internal refrigerated condenser achieving outlet vapor temperature ≤45ºF, and drying sensor/controller) at existing non-residential facilities are allowed to be “relocated” to a non-residential facility that is owned and operated by the same owner/operator as the previous existing facility (Regulation 11, Rule 16, Sections 104 and 250).
(B) Per BAAQMD’s Permit Handbook, Chapter 10.5 Synthetic Solvent Drycleaning, Perchloroethylene (perc) and n-probyl bromide (nPB) are considered synthetic solvents. Only perc is considered a NPOC and nPB is considered a VOC.
(C) Non-Precursor Organic Compounds (NPOC) are defined as organic compounds which have negligible photochemical reactivity. A list of NPOCs can be found in BAAQMD’s *Definition: Non-Precursor Organic Compounds* document: http://www.baaqmd.gov/~/media/files/engineering/npoc.pdf?la=en.

T-BACT
Source: BAAQMD BACT
Guideline 58.2.1 Drycleaner – Petroleum Solvent (3/10/1995)
Guideline 58.3.1 Drycleaner – Valclene & Other Synthetic Solvents (1/27/1999)

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<tr><td>Drycleaner – Valclene & Other Synthetic Solvents</td></tr>
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<tr><td>VOC</td><td>Secondary Control Machine (ventless dry-to-dry system with internal refrigerated condenser, internal carbon adsorption unit, and drying sensor/controller) achieving solvent concentration in drum ≤300ppmv(A),(B)</td></tr>
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(B) Per BAAQMD’s Permit Handbook, Chapter 10.5 Synthetic Solvent Drycleaning, Perchloroethylene (perc) and n-probyl bromide (nPB) are considered synthetic solvents. Only perc is considered a NPOC and nPB is considered a POC.

<u>RULE REQUIREMENTS:</u>
Reg 8, Rule 17 – Non-Halogenated Solvent Dry Cleaning Operations (3/1/2009) This rule applies to any person who performs dry cleaning or related operations using non-halogenated solvents or solvents containing less than 5% by weight of total halogens. Facilities installed prior to September 5, 1990, consuming less than 10,000 liters (2,642 gallons) of petroleum solvent per year are exempt from Section 302, Emission Control Requirements for Existing Transfer Machines.

Effective March 4, 2009 the following operations are prohibited:
1. Installation or replacement of any vented machine.
2. Installation or replacement of any transfer machine.
3. Solvent dip tank operations using solvent.
4. Use of any drying cabinet for materials dry cleaned with solvent.
5. Use of a separate washer or drying tumbler with any closed-loop machine. Wet materials shall not be transferred to or from any closed-loop machine.

<u>Operating Standards</u>
Section 301.4: Waste cartridge Solvent Evaporation Minimization: Cartridge filters shall be drained in the filter housing for at least 8 hours or placed in an enclosed device including a solvent recovery dryer until dry before being discarded.

Section 301.5: Hazardous Waste: All hazardous waste from dry cleaning operations shall be maintained and transported in sealed non-reactive containers and shall be treated or disposed of as set forth in California State law regarding hazardous waste disposal as described in Title 22, Division 4.5 of the California Code of Regulations

Section 301.6: Existing Transfer Operations: Materials that have been cleaned in a transfer washer must be transferred to the dryer within 2 minutes after they are removed from the washer.

Section 301.7: Solvent Recovery: A still, or any muck cooker, shall not exceed 75% of its capacity, or an alternative level recommended by the manufacturer. A still or any muck cooker, shall be cooled below 38°C (100°F) before emptying or cleaning.
</td></tr>
</table>

District/Agency	Best Available Control Technology (BACT)/Requirements
Bay Area AQMD	Section 301.8: Wastewater Evaporation: Wastewater evaporators shall be manually filled and operated to ensure that no visible liquid solvent or visible emulsion is allowed to vaporize. An evaporator shall be directly vented outside the facility unless a secondary phase separator and a liquid phase carbon adsorber are used to remove solvent from the wastewater. A secondary phase separator shall be equipped with a sight gauge (or solvent detector/alarm) and a drain valve. Equipment shall be maintained according to manufacturer's recommendations. As an alternative to evaporation, wastewater shall be properly stored and transported as hazardous waste in accordance with subsection 301.5. Emission Control Requirements for Existing Transfer Machines, Section 302: Section 302.1, Add-On Control Device: All exhaust gases from drying tumblers, washers, and cabinets are vented through an approved and properly functioning control device, which reduces the total emissions of precursor organic compounds by at least 85% by weight. Section 302.2, Solvent Recovery Dryer: A solvent recovery dryer shall recover at least 85% by weight solvent. For the purpose of determining compliance with the 85% recovery efficiency of this subsection, 3 kilograms of solvent emitted per 100 kilograms dry weight of materials cleaned shall be deemed in compliance. In addition, the solvent flow rate from the water separator of such recovery dryer shall not exceed 15 milliliters per minute at the termination of the recovery cycle. Section 304: Equipment requirements: Any person using petroleum and/or other non-halogenated solvent to dry clean materials must use a closed-loop machine. Section 306: Specifications for closed-loop machines: Section 306.1: Shall not exhaust to the atmosphere or workroom during operation except when a vacuum pump exhausts to maintain a continuous vacuum. Section 306.2: Shall have a primary control system that operates during both the heated and cool down phases of the drying cycle to reduce the mass of the solvent in the recirculating air stream. Section 306.3: Shall have a refrigerated condenser, or a chilled water condenser, or a District-approved primary control system that has been demonstrated to achieve a solvent recovery performance equal to or exceeding that of a typical refrigerated or water-chilled condenser. Section 306.4: Shall not require the addition of any form of water to the primary control system that results in the physical contact between the water and solvent. Section 307: Water-repelling Operations: All water-repelling operations shall be performed in a closed-loop machine. Open spraying of water-repelling solution containing more than 1% by weight of solvent is prohibited. Reg 11, Rule 16 – Perchloroethylene and Synthetic Solvent Dry Cleaning

District/Agency	Best Available Control Technology (BACT)/Requirements
Bay Area AQMD	Operations (3/1/2009) This rule applies to any person who sells or distributes Perc or any other synthetic solvent to any dry cleaning facility located within the District, or who sells, distributes, installs, owns or operates within the District any dry cleaning equipment that uses or contains Perc or any other synthetic solvent. Rule 16 defines synthetic solvents as any halogenated hydrocarbon including, but not limited to tetrachloroethylene (perchloroethylene, Perc, or PCE), 1,1,1-trichloroethane (111-TCA); and trichlorotriflouroethane (Valclene or CFC-113) Equipment Requirements Section 302: Any person using synthetic solvent to dry clean materials in a non-residential facility shall use only the following equipment: A. A Secondary control machine B. In addition to the dry cleaning equipment above, a ventilation system that meets the requirements of subsection 307.2, Regulation 2, Rule 1, Section 301, and Regulation 2, Rule 2, Section 302 shall be installed and operated. If the off-site cancer risk caused by the facility is less than 10 in a million, the ventilation system requirement shall be waived by the APCO. Section 303: Any person using synthetic solvent to dry clean materials in a co-residential facility shall use only the following equipment: A. For any new or replacement machine: 1. A secondary control machine B. For an existing machine: 1. A secondary control machine, or 2. A closed-loop machine with a fugitive control system that meets the provisions of subsection 305.4 C. In addition to the dry cleaning equipment above, a vapor barrier room and a ventilation system that meets the requirements of subsection 307.1, Regulation 2, Rule 1, Section 301 and Regulation 2, Rule 5, Section 302 shall be installed and operated. Section 305: Specifications for Required Equipment: See Attachment D for Specifications for Required Equipment. Section 307: Ventilation Requirements: See Attachment D for Ventilation Requirements. Operating Standards Section 309: Required Good Operating Practices: See Attachment D for Good Operating Practices.

The following control technologies have been identified and are ranked based on stringency:

SUMMARY OF ACHIEVED IN PRACTICE CONTROL TECHNOLOGIES	
VOC (BACT & T-BACT)	For Petroleum and Non-Halogenated Solvents 1. Closed-loop, Dry-to-Dry Machine with non-vented refrigerated condenser or evaporatively controlled condenser. The 95% Control Efficiency for VOC is considered achieved in practice by the use of the equipment previously listed [SMAQMD, SCAQMD, EPA, ARB] 2. Dry-to-Dry machine vented to vapor control device and 90% control. [SJVUAPCD] 3. Closed loop machine (ventless dry-to-dry system with internal refrigerated condenser achieving outlet vapor temperature ≤45ºF, and drying sensor/controller). [BAAQMD] 4. See Attachment E for operating Standards. [BAAQMD(A), SCAQMD(A), SJVAPCD, SMAQMD, SDAPCD] For Synthetic/Halogenated Solvents(B)(C) 1. Secondary control machine (ventless dry-to-dry system with internal refrigerated condenser, internal carbon adsorption unit, and drying sensor/controller) achieving solvent concentration in drum ≤300ppmv. [BAAQMD] 2. See Attachment F for operating standards. [BAAQMD]
NOx	No Standard
SOx	No Standard
PM10	No Standard
PM2.5	No Standard
CO	No Standard
NPOC(D) (BACT & T-BACT)	For Synthetic/Halogenated Solvents(B)(C) 1. Secondary control machine (ventless dry-to-dry system with internal refrigerated condenser, internal carbon adsorption unit, and drying sensor/controller) achieving solvent concentration in drum ≤300ppmv. [BAAQMD] 2. See Attachment F for operating standards. [BAAQMD]

(A) Both BAAQMD and SCAQMD rules have operating standards for existing transfer machines, however SCAQMD now prohibits the operation of transfer machines and BAAQMD prohibits the installation of new transfer machines. Therefore, transfer machine operating standards were not included as BACT.

(B) Closed loop machines (ventless dry-to-dry system with internal refrigerated condenser achieving outlet vapor temperature ≤45ºF, and drying sensor/controller) at existing non-residential facilities are allowed to be "relocated" to a non-residential facility that is owned and operated by the same owner/operator as the previous existing facility (BAAQMD Regulation 11, Rule 16, Sections 104 and 250).

(C) Per BAAQMD's Permit Handbook, Chapter 10.5 Synthetic Solvent Drycleaning, Perchloroethylene (perc) and n-probyl bromide (nPB) are considered synthetic solvents. Only perc is considered a NPOC and nPB is considered a VOC.

(D) Non-Precursor Organic Compounds (NPOC) are defined as organic compounds which have negligible photochemical reactivity. A list of NPOCs can be found in BAAQMD's *Definition: Non-Precursor Organic Compounds* document.

The following control technologies have been identified as the most stringent, achieved in practice control technologies:

BEST CONTROL TECHNOLOGIES ACHIEVED		
Pollutant	**Standard**	**Source**
VOC (BACT & T-BACT)	<u>For Petroleum and Non-Halogenated Solvents</u> 1. Closed-loop, Dry-to-Dry machine with internal refrigerated condenser achieving outlet vapor temperature ≤45ºF, and drying sensor/controller. The 95% Control Efficiency for VOC is considered achieved in practice by the use of the equipment previously listed. 2. See Attachment E for operating standards(A). <u>For Synthetic/Halogenated Solvents(B)(C)</u> 1. Secondary control machine (ventless dry-to-dry system with internal refrigerated condenser, internal carbon adsorption unit, and drying sensor/controller) achieving solvent concentration in drum ≤300ppmv. 2. See Attachment F for operating standards.	SMAQMD, SCAQMD, BAAQMD, EPA, ARB BAAQMD, SCAQMD, SJVAPCD, SMAQMD, SDAPCD BAAQMD
NOx	No Standard	
SOx	No Standard	
PM10	No Standard	
PM2.5	No Standard	
CO	No Standard	
NPOC(C) (T-BACT)	<u>For Synthetic/Halogenated Solvents(B)(C)</u> 1. Secondary control machine (ventless dry-to-dry system with internal refrigerated condenser, internal carbon adsorption unit, and drying sensor/controller) achieving solvent concentration in drum ≤300ppmv. 2. See Attachment F for operating standards.	BAAQMD

(A) Both BAAQMD and SCAQMD rules have operating standards for existing transfer machines, however SCAQMD now prohibits the operation of transfer machines and BAAQMD prohibits the installation of new transfer machines. Therefore, transfer machine operating standards were not included as BACT.

(B) Closed loop machines (ventless dry-to-dry system with internal refrigerated condenser achieving outlet vapor temperature ≤45ºF, and drying sensor/controller) at existing non-residential facilities are allowed to be "relocated" to a non-residential facility that is owned and operated by the same owner/operator as the previous existing facility (BAAQMD Regulation 11, Rule 16, Sections 104 and 250).

(C) Per BAAQMD's Permit Handbook, Chapter 10.5 Synthetic Solvent Drycleaning, Perchloroethylene (perc) and n-probyl bromide (nPB) are considered synthetic solvents. Only perc is considered a NPOC and nPB is considered a VOC.

(D) Non-Precursor Organic Compounds (NPOC) are defined as organic compounds which have negligible photochemical reactivity. A list of NPOCs can be found in BAAQMD's *Definition: Non-Precursor Organic Compounds* document.

B. TECHNOLOGICALLY FEASIBLE AND COST EFFECTIVE (Rule 202, §205.1.b.):

Technologically Feasible Alternatives:

Any alternative basic equipment, fuel, process, emission control device or technique, singly or in combination, determined to be technologically feasible by the Air Pollution Control Officer.
The table below shows the technologically feasible alternatives identified as capable of reducing emissions beyond the levels determined to be "Achieved in Practice" as per Rule 202, §205.1.a.

BEST CONTROL TECHNOLOGIES ACHIEVED	
Pollutant	**Standard**
VOC	1. Thermal Oxidizer 2. Carbon Adsorber
NOx	No other technologically feasible option identified
SOx	No other technologically feasible option identified
PM10	No other technologically feasible option identified
PM2.5	No other technologically feasible option identified
CO	No other technologically feasible option identified
T-BACT	
TAC	Same as T-BACT for VOCs and NPOC

Cost Effective Determination:
After identifying the technologically feasible control options, a cost analysis is performed to take into consideration economic impacts for all technologically feasible controls identified.

Maximum Cost per Ton of Air Pollutants Controlled

1. A control technology is considered to be cost-effective if the cost of controlling one ton of that air pollutant is less than the limits specified below (except coating operations):

Pollutant	Maximum Cost ($/ton)
ROG	17,500
NO_X	24,500
PM10	11,400
SO_X	18,300
CO	TBD if BACT triggered

Cost Effectiveness Analysis Summary

Assumptions made
- Carbon Adsorption system achieves a minimum of 95% VOC control efficiency
- Oxidizer system achieves a minimum of 95% VOC control efficiency

- Operation is based on 8 hours/day, 6 days/week, and 52 weeks/year.
- Usage for the analysis is 1.4 lbs solvent/hr, see below for derivation.

SMAQMD Rule 444 §302 requires that no more than 3.5 kg (7.7 lb) of solvent be emitted per 100 kg (220 lb) of articles dry cleaned or that petroleum dry cleaning units shall meet a maximum recovered solvent flow rate of 50 mL/min (0.0018 cfm) during the closed recovery phase.

To be conservative, the control options will be evaluated at the first option of Rule 444. This corresponds to an emission rate of 1.4 lb of solvent per 40 lb dryer load capacity. It is assumed that one load of laundry can be done an hour. Assuming 1.4 lbs solvent/hr, operation of 12 hours/day, 6 days/week, and 52 weeks/year, and a VOC control efficiency of 95%, gives a yearly controlled VOCs of 2.5 tons/year.

Carbon Adsorber:
As shown in Attachment G, the cost effectiveness for the add-on carbon adsorber system to control VOC was calculated to be **$18,929/ton**. The following basic parameters were used in the analysis.

Equipment Life = 10 years

Total Capital Investment = $10,210.98

Direct Annual Cost = $27,102.83 per year

Indirect Annual Cost = $4,316.01 per year

Total Annual Cost = $31,418.84 per year

VOC Removed = 1.66 tons per year

Cost of VOC Removal = $18,929 per ton reduced

Therefore, the add-on carbon adsorber system is considered not cost effective and is eliminated.

Thermal Oxidizer:
As shown in Attachment H, the cost effectiveness for the add-on thermal oxidizer system to control VOC was calculated to be **$137,605/ton**. The following basic parameters were used in the analysis.

Equipment Life = 10 years

Direct Cost = $127,660

Direct Annual Cost = $187,744.17 per year

Indirect Annual Cost = $40,658.81 per year

Total Annual Cost = $228,402.98 per year

VOC Removed = 1.66 tons per year

Cost of VOC Removal = $137,605 per ton reduced

Therefore, the add-on thermal oxidizer system is considered not cost effective and is eliminated.

C. SELECTION OF BACT:

Based on the above analysis, BACT for VOC, NOx, SOx, PM10, PM2.5, CO, and NPOC will remain at what is currently achieved in practice.

#126 - BACT FOR DRY CLEANING UNITS – PETROLEUM AND NON-HALOGENATED SOLVENTS		
Pollutant	**Standard**	**Source**
VOC	1. Closed-loop, Dry-to-Dry machine with internal refrigerated condenser achieving outlet vapor temperature ≤45ºF, and drying sensor/controller. 2. See Attachment E for operational standards.	SMAQMD, SCAQMD, BAAQMD, EPA, ARB BAAQMD, SCAQMD, SJVAPCD, SMAQMD, SDAPCD
NOx	No Standard	
SOx	No Standard	
PM10	No Standard	
PM2.5	No Standard	
CO	No Standard	

#126 - T-BACT FOR DRY CLEANING UNITS – PETROLEUM AND NON-HALOGENATED SOLVENTS (A)		
Pollutant	**Standard**	**Source**
VOC	1. Closed-loop, Dry-to-Dry machine with internal refrigerated condenser achieving outlet vapor temperature ≤45ºF, and drying sensor/controller. 2. See Attachment E for operational standards.	SMAQMD, SCAQMD, BAAQMD, EPA, ARB BAAQMD, SCAQMD, SJVAPCD, SMAQMD, SDAPCD

(A) In September 2015 California Air Resources Board (ARB) released a notice Alternative Solvents: Health and Environmental Impacts providing current information on health and environmental impacts of current alternative solvents used in dry cleaning. While there are studies that show some alternative solvents have toxic and carcinogenic potential, none of the alternative solvents have undergone formal evaluation for identification as a Toxic Air Contaminant (TAC).

#127 - BACT FOR DRY CLEANING UNITS – SYNTHETIC/HALOGENATED SOLVENTS EXCLUDING PERCHLOROETHYLENE		
Pollutant	**Standard**	**Source**
VOC	1. Secondary control machine (ventless dry-to-dry system with internal refrigerated condenser, internal carbon adsorption unit, and drying sensor/controller) achieving solvent concentration in drum ≤300ppmv. 2. See Attachment F for operational standards.	BAAQMD
NOx	No Standard	
SOx	No Standard	
PM10	No Standard	
PM2.5	No Standard	
CO	No Standard	

#127 - T-BACT FOR DRY CLEANING UNITS – SYNTHETIC/HALOGENATED SOLVENTS EXCLUDING PERCHLOROETHYLENE (A)	
Standard for All TACs	**Source**
1. Secondary control machine (ventless dry-to-dry system with internal refrigerated condenser, internal carbon adsorption unit, and drying sensor/controller) achieving solvent concentration in drum ≤300ppmv. 2. See Attachment F for operational standards.	BAAQMD

(A) In September 2015 California Air Resources Board (ARB) released a notice Alternative Solvents: Health and Environmental Impacts providing current information on health and environmental impacts of current alternative solvents used in dry cleaning. While there are studies that show some alternative solvents have toxic and carcinogenic potential, none of the alternative solvents have undergone formal evaluation for identification as a Toxic Air Contaminant (TAC).

REVIEWED BY: _____ **DATE:** _____

APPROVED BY: _____ **DATE:** 8/30/17

Attachment A

Review of BACT Determinations published by EPA

List of BACT determinations published in EPA's RACT/BACT/LAER Clearinghouse (RBLC) for Dry Cleaning – Petroleum Solvents and Dry Cleaning – PERC/Chlorinated Solvents

RBLC#	Permit Date(A)	Process Code (A)	Rating	Pollutant	Standard	Case-By-Case Basis
CA-1133	3/23/2005	49.003	4.5 HP	VOC	Equivalent 95% Reduction	BACT-PSD
CA-0994	12/27/2002	49.003	78 gal/qtr	VOC	6.41 lb VOC/gal	LAER
CA-1036	05/03/2000	49.003	45 lbm per load	VOC	20 gal/month	BACT-PSD
CA-0832	03/12/1998	49.003	N/A	VOC	29 lb/day	BACT-PSD

(A) Process code 49.003 is Dry Cleaning – Petroleum Solvents, Process code 49.002 is Dry Cleaning – PERC/Chlorinated solvents (no determinations in Clearinghouse)

= Selected as the most stringent BACT determination achieved in practice.

Attachment B

Review of BACT Determinations published by ARB

List of BACT determinations published in ARB's BACT Clearinghouse for Dry Cleaning:

Capacity	Source	Date	NOx	VOC	CO	PM10	SOx
4.5 HP	SMAQMD	07/21/2005	N/A	95% Reduction	N/A	N/A	N/A

= Selected as the most stringent BACT determination achieved in practice.

Attachment C

BACT Determinations published by Various AQMDs and APCDs

Technology Transfer Network
Clean Air Technology Center - RACT/BACT/LAER Clearinghouse

Pollutant Information

Click on the Process Information button to see more information about the process associated with this pollutant.
Or click on the Process List button to return to the list of processes.

RBLC Home | New Search | Search Results | Facility Information | Process List | Process Information | Pollutant Information

Help

FINAL

RBLC ID: CA-1133
Corporate/Company: PARADISE CLEANERS
Facility Name: PARADISE CLEANERS
Process: DRY CLEANING

Pollutant: Volatile Organic Compounds (VOC)
CAS Number: VOC

Pollutant Group(s): Volatile Organic Compounds (VOC),
Substance Registry System: Volatile Organic Compounds (VOC)

Pollution Prevention/Add-on Control Equipment/Both/No Controls Feasible: P
P2/Add-on Description: REFRIGERATED CONDENSER

Test Method: Unspecified — EPA/OAR Methods | All Other Methods

Percent Efficiency:	0
Compliance Verified:	Unknown
EMISSION LIMITS:	
Case-by-Case Basis:	BACT-PSD
Other Applicable Requirements:	N/A
Other Factors Influence Decision:	Unknown
Emission Limit 1:	95.0000 % REDUCTION NA
Emission Limit 2:	0
Standard Emission Limit:	0
COST DATA:	
Cost Verified?	No
Dollar Year Used in Cost Estimates:	
Cost Effectiveness:	0 $/ton
Incremental Cost Effectiveness:	0 $/ton
Pollutant Notes:	

California Environmental Protection Agency
Air Resources Board

BACT Determination Detail

Category

Source Category:	Dry Cleaning
SIC Code	7216
NAICS Code	812320

Emission Unit Information

Manufacturer:	Firbimatic Ecopro
Type:	Dry Cleaning
Model:	AM 918
Equipment Description:	hydro carbon dry cleaning machine
Capacity / Dimentions	4.5 hp
Fuel Type	None-applicable
Multiple Fuel Types	
	Variable (8/5/52)

Operating Schedule (hours/day)/(days/week)/ (weeks/year)e	
Function of Equipment	dry cleaning
VOC Limit	95
VOC Limit Units	NA
VOC Average Time	NA
VOC Control Method	Pollution Prevention
VOC Control Method Desc	Refrigerated Condenser
VOC Percent Control Efficiency	
VOC Cost Effectiveness (%/ton)	
VOC Incremental Cost Effectiveness (%/ton)	
VOC Cost Verified (Y/N)	
VOC Dollar Year	

Project / Permit Information

Application/Permit No.:	18280
Application Completeness Date:	
	New Construction

New Construction/Modification:	
ATC Date:	03-23-2005
PTO Date:	07-21-2005
Startup Date:	07-21-2005
Technology Status:	BACT Determination
Source Test Available:	No
Source Test Results:	

Facility / District Information

Facility Name:	Paradise Cleaners
Facility Zip Code:	95610
Facility County:	Sacramento
District Name:	Sacramento Metropolitan AQMD
District Contact:	Paul Glanville
Contact Phone No.:	916-874-4800
Contact E-Mail:	pglanville@airquality.org

Notes

Notes:

Report Error In Determination

SMAQMD BACT CLEARINGHOUSE

CATEGORY: **DRY CLEANING UNIT**

BACT Size: Minor Source BACT

DRY CLEANING UNIT PETROLEUM

BACT Determination Number: 75	**BACT Determination Date:** 8/28/2013

Equipment Information

Permit Number: 23897
Equipment Description: DRY CLEANING UNIT PETROLEUM
Unit Size/Rating/Capacity: All; Petroleum Solvent
Equipment Location: VOGUE CLEANERS
3437 ARDEN WAY
SACRAMENTO, CA

BACT Determination Information

ROCs	**Standard:**	Refrigerated condenser
	Technology Description:	Closed-loop with Primary Control System - Refrigerated Condenser
	Basis:	Achieved in Practice
NOx	**Standard:**	
	Technology Description:	
	Basis:	
SOx	**Standard:**	
	Technology Description:	
	Basis:	
PM10	**Standard:**	
	Technology Description:	
	Basis:	
PM2.5	**Standard:**	
	Technology Description:	
	Basis:	
CO	**Standard:**	
	Technology Description:	
	Basis:	
LEAD	**Standard:**	
	Technology Description:	
	Basis:	

Comments: Last BACT determination - 3/23/05.

District Contact: Ady Santos Phone No.: (916) 874 - 4858 email: asantos@airquality.org

Printed: 7/20/2017

CATEGORY: **DRY CLEANING UNIT**

BACT Size: Minor Source BACT **DRY CLEANING UNIT DIBUTOXYMETHANE**

BACT Determination Number:	80	**BACT Determination Date:**	**3/7/2014**

Equipment Information

Permit Number: 24107
Equipment Description: DRY CLEANING UNIT DIBUTOXYMETHANE
Unit Size/Rating/Capacity: All; SolvonK4
Equipment Location: SWANSONS CLEANERS
3900 WINTERS ST
SACRAMENTO, CA

BACT Determination Information

ROCs	**Standard:**	Refrigerated Condenser
	Technology Description:	Closed-loop with Primary Control System -- Refrigerated Condenser
	Basis:	Achieved in Practice
NOx	**Standard:**	
	Technology Description:	
	Basis:	
SOx	**Standard:**	
	Technology Description:	
	Basis:	
PM10	**Standard:**	
	Technology Description:	
	Basis:	
PM2.5	**Standard:**	
	Technology Description:	
	Basis:	
CO	**Standard:**	
	Technology Description:	
	Basis:	
LEAD	**Standard:**	
	Technology Description:	
	Basis:	

Comments:

District Contact: Ady Santos Phone No.: (916) 874 - 4858 email: asantos@airquality.org

Printed: 7/20/2017

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guidelines for Non-Major Polluting Facilities*

10-20-2000 Rev. 0
7-9-2004 Rev. 1

Equipment or Process: Dry Cleaning

	Criteria Pollutants					
Subcategory/ Rating/Size	**VOC/ODC**	**NOx**	**SOx**	**CO**	**PM_{10}**	**Inorganic**
Perchloroethylene	Delisted as a VOC. See SCAQMD Rule 1421 – Control of Perchloroethylene Dry Cleaning Operations[1] (06-13-97)					
Petroleum Solvent[2]	Closed Loop, Dry-to-Dry Machine with a Refrigerated Condenser (10-20-2000) or Evaporatively Cooled Condenser (7-9-2004)					

[1] Rule 1421 implements the federal National Emission Standard for Hazardous Air Pollutant for Perchloroethylene Dry Cleaning Facilities (40 Code of Federal Regulations [CFR] 63.320, *et seq*) and the state Airborne Toxic Control Measure (ATCM) for Emissions of Perchloroethylene from Dry Cleaning Operations (17 California of Regulation [CCR] 93109, *et seq*).

[2]This Equipment may also be subject to AQMD Rule 1102 – Dry Cleaners Using Solvent Other Than Perchloroethylene.

* Means those facilities that are not major polluting facilities as defined by Rule 1302 - Definitions

Back

Best Available Control Technology (BACT) Guideline 4.1.2 B

Emissions Unit:	Petroleum Solvent Dry Cleaning	**Equipment Rating:**	70 lb/load
Facility:	Signature Cleaners	**References:**	ATC # C-1160-2-0; Project # 1040167
Location:	Fresno	**Date of Determination:**	4/8/2004

Pollutant	**BACT**
VOC	dry-to-dry machine vented to vapor control device

BACT Status	**Comment**
Small Emitter	

Best Available Control Technology (BACT) Guideline 4.1.2 A

Emissions Unit:	Petroleum solvent dry cleaning operation	**Equipment Rating:**	110 lb washer and100 lb dryer
Facility:	Modesto Steam Laundry & Cleaners	**References:**	ATC #: N-2032-3-0 Project #: 970756
Location:	Modesto	**Date of Determination:**	3/12/1998

Pollutant	**BACT**
CO	BACT NOT TRIGGERED
NOx	BACT NOT TRIGGERED
PM10	BACT NOT TRIGGERED
SOx	BACT NOT TRIGGERED
VOC	Transfer equipment with solvent recovery dryer

BACT Status	**Comment**
Small Emitter	
Achieved in Practice	

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guideline

Source Category

Source:	***Drycleaner - Petroleum Solvent***	Revision:	*2*
		Document #:	*58.2.1*
Class:	*All*	Date:	*03/10/95*

Determination

POLLUTANT	BACT 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice	TYPICAL TECHNOLOGY
POC	1. *n/d* 2. *Closed loop machine (ventless dry-to-dry system with internal refrigerated condenser achieving outlet vapor temperature $\leq 45^{o}F$, and drying sensor/controller)*[a,T]	1. *n/d* 2. *BAAQMD Approved Design and Operation*[a,T]
NOx	1. *n/a* 2. *n/a*	1. *n/a* 2. *n/a*
SO_2	1. *n/a* 2. *n/a*	1. *n/a* 2. *n/a*
CO	1. *n/a* 2. *n/a*	1. *n/a* 2. *n/a*
PM_{10}	1. *n/a* 2. *n/a*	1. *n/a* 2. *n/a*
NPOC	1. *n/a* 2. *n/a*	1. *n/a* 2. *n/a*

References

a. BAAQMD
T. TBACT

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guideline

Source Category

Source:	***Drycleaner - Valclene & Other Synthetic Solvents***	Revision:	*3*
		Document #:	*58.3.1*
Class:	***All***	Date:	*01/27/99*

Determination

POLLUTANT	BACT 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice	TYPICAL TECHNOLOGY
POC	1. *n/a* 2. *n/a*	1. *n/a* 2. *n/a*
NOx	1. *n/a* 2. *n/a*	1. *n/a* 2. *n/a*
SO_2	1. *n/a* 2. *n/a*	1. *n/a* 2. *n/a*
CO	1. *n/a* 2. *n/a*	1. *n/a* 2. *n/a*
PM_{10}	1. *n/a* 2. *n/a*	1. *n/a* 2. *n/a*
NPOC	1. *n/d* 2. *Secondary Control Machine (ventless dry-to-dry system with internal refrigerated condenser, internal carbon adsorption unit, and drying sensor/controller) achieving solvent concentration in drum ≤300 ppmv*[a,T,E]	1. *n/d* 2. *BAAQMD Approved Design and Operation*[a,T,E]

References

a. BAAQMD Regulation 11, Rule 16
T. TBACT.
E. Exception: Closed loop machines (ventless dry-to-dry system with internal refrigerated condenser achieving outlet vapor temperature ≤45°F, and drying sensor/controller) at existing non-residential facilities are allowed to be "relocated" to a non-residential facility that is owned and operated by the same owner/operator as the previous existing facility (Regulation 11, Rule 16, Sections 104 and 250).

Attachment D

BAAQMD Rule Requirements for Perc and Synthetic Solvents

FOR PERC AND SYNTHETIC SOLVENTS

Section 11-16-305: Specifications for Required Equipment: Dry cleaning equipment shall meet the following specifications:

305.1: A primary control system shall:

1. Operate during both the heated and cool-down phases of the drying cycle to reduce the mass of solvent in the recirculating air stream;
2. Not exhaust to the workroom or atmosphere except through a fugitive control system after the drying cycle is complete.
3. Not require the addition of any form of water to the primary control system that results in physical contact between the water and solvent;
4. For refrigerated condensers only:
   a. Be capable of achieving an outlet vapor temperature, downstream of any bypass, of less than or equal to 45° F during cool-down; and
   b. Have a temperature indicator (a thermocouple with a digital display, a graduated thermometer with a minimum range from 0° F to 150° F, or an equivalent temperature indicator) which measures the temperature of the outlet vapor stream, downstream of any bypass of the condenser, and is easily visible to the operator.
   c. Closed-loop machines and converted machines that are installed or modified after December 21, 1994 shall have a drying sensor/controller that complies with subsection 309.1.1.b. This provision applies also to primary control systems on closed-loop machines equipped with secondary control; the drying sensor activates the secondary control system.
5. For equivalent closed-loop vapor recovery systems:
   a. Use a technology that has been demonstrated, pursuant to the requirements of Section 502, to achieve a solvent concentration of 8,600 ppmv (measured as Perc) or less in each test and
   b. Have a device that measures the solvent concentration, or a demonstrated surrogate parameter, in the drum at the end of each drying cycle, before the machine door is opened and any fugitive control system activates, and indicates if the concentration is above or below 8,600 ppmv (measured as Perc). This device shall be installed such that the reading is easily visible to the operator and shall control the drying cycle. This device shall be considered a drying sensor/controller that is subject to subsection 309.1.1.b.

305.2 A converted machine shall meet all of the following requirements:

1. All process vents that exhaust to the atmosphere or workroom during washing, extraction, or drying shall be sealed. Machines may be exhausted through a fugitive control system after the drying cycle is complete.
2. The converted machine shall use an appropriately sized primary control system to recover solvent vapor during the heated and cooldown phases of the drying cycle.
   a. A refrigerated condenser shall be considered appropriately sized, for a machine converted on or after May 4, 1994, if both of the following conditions are met:
      (1) The water-cooled condensing coils are replaced with refrigerant-cooled condensing coils; and
      (2) The compressor of the refrigerated condenser has a capacity, in horsepower (hp) that is no less than the minimum capacity, determined as follows:

$$Minimum\ Capacity(hp) = \frac{Capacity of the\ Machine(lbs)}{12}$$

   b. A refrigerated condenser shall be considered appropriately sized, for a machine converted prior to May 4, 1994, if either of the conditions is met:
      (1) The refrigerated condenser meets the specifications for new conversions in subsection 305.2.2.a; or
      (2) There is no reduction in the design air flow of the machine to the refrigerated condenser and the refrigerated condenser achieves, and maintains for 3 minutes, an outlet vapor temperature, measured downstream of the condenser and any bypass of the condenser, of less than or equal to 45° F within 10 minutes of the initiation of cool-down.

3. The converted machine shall operate with no liquid leaks and no vapor leaks. Any seal, gasket, or connection determined to have a liquid leak or vapor leak shall be replaced.

305.3 A Secondary System shall:

1. Be designed to function with a primary control system or be designed to function as a combined primary control system and secondary control system that meets all of the applicable requirements of this section;
2. Not exhaust to the workroom or atmosphere except when also used as a fugitive control system (subject to subsection 305.4);
3. Not require the addition of any form of water to the secondary control system that results in physical contact between the water and solvent;
4. Use a technology that has been demonstrated, pursuant to the requirements of Section 502, to achieve a solvent concentration in the drum of 300 ppmv or less measured as Perc (600 ppmv as methane, C1) in each test;
5. Have a holding capacity equal to or greater than 200 percent of the maximum quantity of solvent vapor expected in the drum prior to activation of the system; and
6. For add-on secondary control systems only, the system shall be sized and capable of reducing the solvent concentration in the drum from 8,600 ppmv or greater to 300 ppmv or less measured as Perc (600 ppmv as methane, C1) in the maximum volume of recirculating air in the dry cleaning machine and all contiguous piping.

305.4 Ventilation of solvent laden air from the drum or other intended openings of a dry cleaning machine is allowable only through a fugitive control system (or secondary control system also functioning as a fugitive control system) after the drying cycle is complete and prior to opening of the door or seal.

1. Except as required by subsection 305.4.2, emissions from any fugitive control system installed after December 21, 1994 shall be exhausted through a stack that extends a minimum of 5 feet above the roof of the building.
2. Only for machines subject to subsections 301.4.2, 301.5.3, 303.2.2: a fugitive control device shall:
   a. Operate a fan that produces a volumetric airflow of at least 100 actual cubic feet per minute (ACFM) for at least 10 seconds immediately prior to or as the loading door or seal is opened; or shall maintain the concentration of solvent at 25 ppmv measured as Perc (50 ppmv as methane, C1) or less when measured 6 inches from the center of the open loading door or seal;
   b. Reduce the emissions of solvent in the exhaust air to a concentration less than 100 ppmv measured as Perc (200 ppmv as methane, C1) at the outlet;
   c. Exhaust all emissions through a stack that extends a minimum of 5 feet above the roof of the building or any adjacent building, whichever is higher; and
   d. Be operated, maintained, and regenerated according to the manufacturer's recommendations. Desorption or replacement of adsorption canisters shall be performed periodically, and at a minimum, shall be performed each time dry cleaning equipment exhausted to the fugitive control system has operated the allowable number of loads for its rated capacity in accordance with the following formula:

$$Maximum\ loads\ per\ regeneration = \frac{75 \times [lbs\ of\ carbon\ in\ fugitive\ control\ system]}{rated\ capacity\ of\ drycleaning\ machine\ (in\ lbs)}$$

3. The APCO shall evaluate and approve alternative desorption/replacement schedules for other adsorbent materials. Desorption shall be performed with the minimum steam pressure (or hot air temp

11-16-307 Ventilation Requirements: Except as provided by subsections 301.5, 302.2, and 303.3, the following ventilation requirements shall be met:

307.1 Co-residential Facilities: Any person that operates dry cleaning equipment in any co-residential facility shall install and operate a vapor barrier room and ventilation system in order to minimize

exposure to affected residents. All dry cleaning machines and related equipment that may emit solvent shall be totally enclosed within a vapor barrier room that:

1. Is properly constructed of approved diffusion resistant materials;
2. Is continuously exhausted with a ventilation fan(s) that:
   a. Has a volumetric airflow of at least 1000 actual cubic feet per minute (ACFM),
   b. Produces an air change rate of at least one air change every five minutes, and
   c. Exhausts all emissions through a stack that extends a minimum of 5 feet above the roof of the residential building or any adjacent building, whichever is higher; and
3. Is maintained in good operating condition.

307.2 Non-residential Facilities: Any person who operates dry cleaning equipment in any non-residential facility shall install and operate a ventilation system in order to minimize exposure to off-site persons. Emissions from dry cleaning machines and related equipment shall be captured and exhausted by a ventilation system that:

1. Includes shrouds, hoods, rooms, walls, flexible barriers (e.g. plastic sheeting), or other structures designed to capture fugitive emissions;
2. Is exhausted with a ventilation fan(s) that operates whenever the dry cleaning machines and related equipment are operated and:
   a. Has a volumetric airflow of at least 1000 actual cubic feet per minute (ACFM)
   b. Produces either:
      (1) Capture velocities greater than 100 feet per minute at openings of the capture structures of subsection 1, or
      (2) An air change rate of at least one air change every ten minutes of a working region that has air movement restricted by the structures in subsection 1, and
   c. Exhausts emissions through a stack that extends a minimum of 5 feet above the roof of the building or any adjacent building, whichever is higher; and
3. Is maintained in good operating condition.

11-16-308 Water-repelling Operations: Any person who performs water-repelling operations shall ensure that the following is met:

308.1 Except as prohibited in Section 304, all water-repelling operations shall be performed in a closed-loop machine or a converted machine. Open spraying of water-repelling solution containing more than 1 percent by weight of solvent is prohibited.

11-16-309 Required Good Operating Practices: The prohibitions and/or requirements applicable to Perc dry cleaning facilities provided in Sections 93109(i)(2) and (3), Title 17, of the California Code of Regulations, effective March 4, 2009, shall apply to any dry cleaning facility using any synthetic solvent. In addition, all dry cleaning equipment shall be maintained in good condition and operated properly, so that all of the following applicable requirements are met:

309.1 Operation and maintenance requirements: The trained operator, or his/her designee, shall operate and maintain all components of the dry cleaning system in accordance with the requirements of this section and the conditions specified in the facility's operating permit. For operations not specifically addressed, the components shall be operated and maintained in accordance with the manufacturer's recommendations. Each operation and maintenance function and the date performed shall be recorded on an operation and maintenance checklist.

1. Refrigerated condensers shall:
   a. Be operated to ensure that exhaust gases are recirculated until the air-vapor stream temperature on the outlet side of the refrigerated condenser, downstream of any bypass, is less than or equal to 45° F and
   b. For closed–loop machines and converted machines that are installed or modified after December 21, 1994: have a drying sensor/controller that is designed to extend the drying time at least 4 minutes beyond the point that solvent recovery rate is less than 40 ml/min or solvent vapor concentration in the drum is less than 8600 ppmv (measured as Perc). Drying

sensors shall be maintained in good operating condition and properly operated at all times.

2. Primary control systems, other than refrigerated condensers, shall be operated to ensure that exhaust gases are recirculated until the solvent concentration in the drum is less than or equal to 8,600 ppmv (measured as Perc) at the end of the drying cycle, before the machine door is opened and any fugitive control system activates.
3. Vapor adsorbers used as a primary control system or secondary control system shall be operated to ensure that air and solvent vapors are recirculated at less than 45° F or at the temperature recommended by the manufacturer for optimum adsorption. These vapor adsorbers shall be desorbed according to manufacturer's recommendations but not less frequently than minimum requirements of subsection 305.42.d. No solvent vapors shall be routed to the atmosphere during routine operation or desorption.
4. Effective April 1, 1996, the trained operator, or her/his designee, shall check for solvent breakthrough at the outlet of any vapor adsorption system (external vapor adsorber, secondary control system, and any fugitive control system subject to subsection 305.4.2) that exhausts to the atmosphere, at least on a weekly basis. The operator shall also perform a weekly check for fugitive emissions from machines with fugitive control systems subject to subsection 305.4.2; the detector shall be held 6 inches from the center of an open loading door immediately upon opening the door and prior to unloading cleaned materials. The results of all checks shall be entered on an operation and maintenance checklist. The breakthrough check shall be performed while the vapors are venting to the vapor adsorption system at the end of the last drying cycle prior to a regular desorption using one of the following techniques:
    a. A colorimetric detector tube,
    b. A halogenated-hydrocarbon detector,
    c. A portable gas analyzer, or
    d. An alternative method approved by the APCO that meets provisions of Section 601.
5. Cartridge filters and adsorptive cartridge filters shall be handled using one of the following methods:
    a. Drained in the filter housing, before disposal, for no less than: 24 hours for cartridge filters and 48 hours for adsorptive cartridge filters. If the filters are then transferred to a separate device to further reduce the volume of solvent, this treatment shall be done in a system that routes any vapor to a primary control system, with no exhaust to the atmosphere or workroom.
    b. Dried, stripped, sparged, or otherwise treated, within the sealed filter housing, to reduce the volume of solvent contained in the filter.
6. A still, and any muck cooker, shall not exceed 75 percent of its capacity, or an alternative level recommended by the manufacturer. A still, and any muck cooker, shall cool to 100° F (38° C) or less before emptying or cleaning.
7. Button and lint traps shall be inspected and cleaned each working day and the lint placed in a tightly sealed container.
8. All parts of the dry cleaning system where solvent may be exposed to the atmosphere or workroom shall be kept closed at all times except when access is required for proper operation and maintenance.
9. Wastewater evaporators shall be manually filled and operated to ensure that no visible liquid solvent or visible emulsion is allowed to vaporize. An evaporator shall be directly vented outside the facility unless a secondary phase separator and a liquid phase carbon adsorber are used to remove solvent from the wastewater. A secondary phase separator shall be equipped with a sight gauge (or solvent detector/alarm) and a drain valve. Equipment shall be maintained according to manufacturer's recommendations. As an alternative to evaporation, wastewater shall be properly stored and transported as hazardous waste in accordance with subsection 11.
10. All waste from dry cleaning operations including solvent still residue; filter waste; solvent-laden lint; and used filtration cartridges must be maintained and transported in sealed non-reactive containers and shall be treated or disposed of as set forth in California State law regarding hazardous waste disposal as described in Title 22, Division 4.5 of the California Code of Regulations.

309.2 Leak check and repair requirements: The trained operator, or her/his designee, shall conduct and maintain an effective leak check monitoring and Bay Area Air Quality Management District March 4, 2009 11-16-17 repair program. The facility shall use a leak inspection checklist that includes the following components: hose and pipe connections, unions, couplings, valves, door gaskets, filter head gaskets, pumps, solvent base tanks, solvent and waste storage containers, water separators, filter sludge recovery units or muck cookers, distillation units and condensers, diverter valves, lint basket, lint storage, and cartridge filter housings. The trained operator, or her/his designee, shall record the status of each component on the checklist.

1. The trained operator, or her/his designee, shall inspect the dry cleaning system for liquid leaks on a weekly basis.
2. The trained operator, or her/his designee, shall inspect the dry cleaning system for vapor leaks on a weekly basis using one of the following techniques:
   a. A halogenated-hydrocarbon detector,
   b. A portable gas analyzer measuring 1 cm. away from the dry cleaning system according to ARB Test Method 21 (Section 94124, Title 17, of the California Code of Regulations), or
   c. An alternative method approved by the APCO that meets provisions of Section 601.
3. Any liquid leak, or vapor leak that has been detected by the operator shall be noted on the checklist and repaired according to the requirements of this section. If the leak is not repaired at the time of detection, the leaking component shall be physically marked or tagged in a manner that is readily observable by a District inspector.
4. Any liquid leak, or vapor leak detected by the District, which has not been so noted on the checklist and marked on the leaking component of the dry cleaning system, shall constitute a violation of this section. For enforcement purposes, the District shall identify the presence of a vapor leak by determining solvent concentration:
   a. With a portable analyzer measured 1 cm. away from the dry cleaning system according to ARB Test Method 21 (Section 94124, Title 17, of the California Code of Regulations) or
   b. By an alternative method approved by the APCO that meets provisions of Section 601.
5. Any liquid leak or vapor leak shall be repaired immediately upon detection, unless one or both of the following apply:
   a. If repair parts are not available at the facility, the parts shall be ordered within two working days of detecting such a leak. Such repair parts shall be installed within two working days after receipt. A facility with a leak that has not been repaired by the end of the 7th working day after detection shall not operate the dry cleaning equipment, until the leak is repaired, unless the District has granted the facility a leak-repair extension
   b. The APCO may grant a leak-repair extension to a facility, for a single period of 30 days or less, if the APCO finds that:
      (1) The delay in repairing the leak could not have been avoided by action on the part of the facility,
      (2) The facility used reasonable preventive measures and acted promptly to initiate the repair,
      (3) The leak would not significantly increase exposure of solvent or other toxic compounds near the facility, and
      (4) The facility is in compliance with all other requirements of this section and has a history of compliance.
6. Effective March 4, 2009, facilities using solvent must keep on the facility premises a spare set of gaskets for each machine, minimally comprised of the following 5 gaskets: loading door, still, lint trap, button trap, and water separator.
7. Effective March 4, 2009, facilities must keep on the facility premises a spare lint filter for each machine.

11-16-309 Required Good Operating Practices: The prohibitions and/or requirements applicable to Perc dry cleaning facilities provided in Sections 93109(i)(2) and (3), Title 17, of the California Code of Regulations, effective March 4, 2009, shall apply to any dry cleaning facility using any synthetic solvent. In addition, all dry cleaning equipment shall be maintained in good condition and operated properly, so that all of the following applicable requirements are met:

309.1 Operation and maintenance requirements: The trained operator, or his/her designee, shall operate and maintain all components of the dry cleaning system in accordance with the requirements of this section and the conditions specified in the facility's operating permit. For operations not specifically addressed, the components shall be operated and maintained in accordance with the manufacturer's recommendations. Each operation and maintenance function and the date performed shall be recorded on an operation and maintenance checklist.

1. Refrigerated condensers shall:
   a. Be operated to ensure that exhaust gases are recirculated until the air-vapor stream temperature on the outlet side of the refrigerated condenser, downstream of any bypass, is less than or equal to 45° F and
   b. For closed–loop machines and converted machines that are installed or modified after December 21, 1994: have a drying sensor/controller that is designed to extend the drying time at least 4 minutes beyond the point that solvent recovery rate is less than 40 ml/min or solvent vapor concentration in the drum is less than 8600 ppmv (measured as Perc). Drying sensors shall be maintained in good operating condition and properly operated at all times.
2. Primary control systems, other than refrigerated condensers, shall be operated to ensure that exhaust gases are recirculated until the solvent concentration in the drum is less than or equal to 8,600 ppmv (measured as Perc) at the end of the drying cycle, before the machine door is opened and any fugitive control system activates.
3. Vapor adsorbers used as a primary control system or secondary control system shall be operated to ensure that air and solvent vapors are recirculated at less than 45° F or at the temperature recommended by the manufacturer for optimum adsorption. These vapor adsorbers shall be desorbed according to manufacturer's recommendations but not less frequently than minimum requirements of subsection 305.4.2.d. No solvent vapors shall be routed to the atmosphere during routine operation or desorption.
4. Effective April 1, 1996, the trained operator, or her/his designee, shall check for solvent breakthrough at the outlet of any vapor adsorption system (external vapor adsorber, secondary control system, and any fugitive control system subject to subsection 305.4.2) that exhausts to the atmosphere, at least on a weekly basis. The operator shall also perform a weekly check for fugitive emissions from machines with fugitive control systems subject to subsection 305.4.2; the detector shall be held 6 inches from the center of an open loading door immediately upon opening the door and prior to unloading cleaned materials. The results of all checks shall be entered on an operation and maintenance checklist. The breakthrough check shall be performed while the vapors are venting to the vapor adsorption system at the end of the last drying cycle prior to a regular desorption using one of the following techniques:
   a. A colorimetric detector tube,
   b. A halogenated-hydrocarbon detector,
   c. A portable gas analyzer, or
   d. An alternative method approved by the APCO that meets provisions of Section 601.
5. Cartridge filters and adsorptive cartridge filters shall be handled using one of the following methods:
   a. Drained in the filter housing, before disposal, for no less than: 24 hours for cartridge filters and 48 hours for adsorptive cartridge filters. If the filters are then transferred to a separate device to further reduce the volume of solvent, this treatment shall be done in a system that routes any vapor to a primary control system, with no exhaust to the atmosphere or workroom.
   b. Dried, stripped, sparged, or otherwise treated, within the sealed filter housing, to reduce the volume of solvent contained in the filter.
6. A still, and any muck cooker, shall not exceed 75 percent of its capacity, or an alternative level recommended by the manufacturer. A still, and any muck cooker, shall cool to 100° F (38° C) or less before emptying or cleaning.
7. Button and lint traps shall be inspected and cleaned each working day and the lint placed in a tightly sealed container.

8. All parts of the dry cleaning system where solvent may be exposed to the atmosphere or workroom shall be kept closed at all times except when access is required for proper operation and maintenance.
9. Wastewater evaporators shall be manually filled and operated to ensure that no visible liquid solvent or visible emulsion is allowed to vaporize. An evaporator shall be directly vented outside the facility unless a secondary phase separator and a liquid phase carbon adsorber are used to remove solvent from the wastewater. A secondary phase separator shall be equipped with a sight gauge (or solvent detector/alarm) and a drain valve. Equipment shall be maintained according to manufacturer's recommendations. As an alternative to evaporation, wastewater shall be properly stored and transported as hazardous waste in accordance with subsection 11.
10. All waste from dry cleaning operations including solvent still residue; filter waste; solvent-laden lint; and used filtration cartridges must be maintained and transported in sealed non-reactive containers and shall be treated or disposed of as set forth in California State law regarding hazardous waste disposal as described in Title 22, Division 4.5 of the California Code of Regulations.

309.2 Leak check and repair requirements: The trained operator, or her/his designee, shall conduct and maintain an effective leak check monitoring and Bay Area Air Quality Management District March 4, 2009 11-16-17 repair program. The facility shall use a leak inspection checklist that includes the following components: hose and pipe connections, unions, couplings, valves, door gaskets, filter head gaskets, pumps, solvent base tanks, solvent and waste storage containers, water separators, filter sludge recovery units or muck cookers, distillation units and condensers, diverter valves, lint basket, lint storage, and cartridge filter housings. The trained operator, or her/his designee, shall record the status of each component on the checklist.

1. The trained operator, or her/his designee, shall inspect the dry cleaning system for liquid leaks on a weekly basis.
2. The trained operator, or her/his designee, shall inspect the dry cleaning system for vapor leaks on a weekly basis using one of the following techniques:
   a. A halogenated-hydrocarbon detector,
   b. A portable gas analyzer measuring 1 cm. away from the dry cleaning system according to ARB Test Method 21 (Section 94124, Title 17, of the California Code of Regulations), or
   c. An alternative method approved by the APCO that meets provisions of Section 601.
3. Any liquid leak, or vapor leak that has been detected by the operator shall be noted on the checklist and repaired according to the requirements of this section. If the leak is not repaired at the time of detection, the leaking component shall be physically marked or tagged in a manner that is readily observable by a District inspector.
4. Any liquid leak, or vapor leak detected by the District, which has not been so noted on the checklist and marked on the leaking component of the dry cleaning system, shall constitute a violation of this section. For enforcement purposes, the District shall identify the presence of a vapor leak by determining solvent concentration:
   a. With a portable analyzer measured 1 cm. away from the dry cleaning system according to ARB Test Method 21 (Section 94124, Title 17, of the California Code of Regulations) or
   b. By an alternative method approved by the APCO that meets provisions of Section 601.
5. Any liquid leak or vapor leak shall be repaired immediately upon detection, unless one or both of the following apply:
   a. If repair parts are not available at the facility, the parts shall be ordered within two working days of detecting such a leak. Such repair parts shall be installed within two working days after receipt. A facility with a leak that has not been repaired by the end of the 7th working day after detection shall not operate the dry cleaning equipment, until the leak is repaired, unless the District has granted the facility a leak-repair extension.
   b. The APCO may grant a leak-repair extension to a facility, for a single period of 30 days or less, if the APCO finds that:
      (1) The delay in repairing the leak could not have been avoided by action on the part of the facility,
      (2) The facility used reasonable preventive measures and acted promptly to initiate the

repair,

(3) The leak would not significantly increase exposure of solvent or other toxic compounds near the facility, and

(4) The facility is in compliance with all other requirements of this section and has a history of compliance.

6. Effective March 4, 2009, facilities using solvent must keep on the facility premises a spare set of gaskets for each machine, minimally comprised of the following 5 gaskets: loading door, still, lint trap, button trap, and water separator.
7. Effective March 4, 2009, facilities must keep on the facility premises a spare lint filter for each machine.

Attachment E

BACT Operational Standards for Dry Cleaning Units – Petroleum and Non-Halogenated Solvents

Operational Standards

Emission Control Requirements:
A person shall not operate any petroleum solvent dry cleaner unless one of the following requirements are satisfied: [SJVAPCD]

1. All exhaust gasses from drying tumblers, washers, and cabinets vented through a control device which reduces 90% by weight; OR
2. Solvent recovery dryer that recovers 90% solvent by weight. (3 kg of petroleum solvent emitted per 100 kg dry weight articles.)

Specifications for closed-loop machines:
A closed-loop dry cleaning machine: [BAAQMD]

1. Shall not exhaust to the atmosphere or workroom during operation except when a vacuum pump exhausts to maintain a continuous vacuum.
2. Shall have a primary control system that operates during both the heated and cool down phases of the drying cycle to reduce the mass of the solvent in the recirculating air stream.
3. Shall have a refrigerated condenser, or a chilled water condenser, or a District-approved primary control system that has been demonstrated to achieve a solvent recovery performance equal to or exceeding that of a typical refrigerated or water-chilled condenser.
4. Shall not require the addition of any form of water to the primary control system that results in the physical contact between the water and solvent.

Filter Requirements:
A person shall not install and operate a new or replacement solvent filter and purification system unless the system employs cartridge filters containing paper or carbon or a combination thereof and the system does not include a diatomaceous earth filtering system. [SDAPCD]

The used filtering material shall be put into a sealed container immediately after removal from the filter, unless the dry cleaning system is equipped with one of the following filter systems: [SJVAPCD]

1. Cartridge filters containing paper or carbon or a combination thereof which are fully drained in a sealed filter housing for at least 24 hours before being discarded, or 12 hours if the filter is dried in a dryer vented to an emission control device; or
2. Reduce the petroleum solvent content in all filtration wastes to one (1.0) kilograms or less per 100 kilograms dry weight of articles dry cleaned, before disposal, and exposure to the atmosphere.

Hazardous Waste: All hazardous waste from dry cleaning operations shall be maintained and transported in sealed non-reactive containers and shall be treated or disposed of as set forth in California State law regarding hazardous waste disposal as described in Title 22, Division 4.5 of the California Code of Regulations. [BAAQMD]

Solvent Recovery: A still, or any muck cooker, shall not exceed 75% of its capacity, or an alternative level recommended by the manufacturer. A still or any muck cooker, shall be cooled below 38°C (100°F) before emptying or cleaning. [BAAQMD]

Wastewater Evaporation: Wastewater evaporators shall be manually filled and operated to ensure that no visible liquid solvent or visible emulsion is allowed to vaporize. An evaporator shall be directly vented outside the facility unless a secondary phase separator and a liquid phase carbon adsorber are used to remove solvent from the wastewater. A secondary phase separator shall be equipped with a sight gauge (or solvent detector/alarm) and a drain valve. Equipment shall be maintained according to manufacturer's recommendations. As an alternative to evaporation, wastewater shall be properly stored and transported as hazardous waste in accordance with California State law regarding hazardous waste disposal as described in Title 22, Division 4.5 of the California Code of Regulations. [BAAQMD]

Water-repelling Operations: All water-repelling operations shall be performed in a closed-loop machine. Open spraying of water-repelling solution containing more than 1% by weight of solvent is prohibited. [BAAQMD]

Attachment F

BACT Operational Standards for Dry Cleaning Units – Synthetic/Halogenated Solvents Not Including Perchloroethylene

Equipment Requirements

Section 302: Any person using synthetic solvent to dry clean materials in a non-residential facility shall use only the following equipment:

1. A Secondary control machine
2. In addition to the dry cleaning equipment above, a ventilation system that meets the requirements of subsection 307.2, Regulation 2, Rule 1, Section 301, and Regulation 2, Rule 2, Section 302 shall be installed and operated. If the off-site cancer risk caused by the facility is less than 10 in a million, the ventilation system requirement shall be waived by the APCO.

Section 303: Any person using synthetic solvent to dry clean materials in a co-residential facility shall use only the following equipment:

1. For any new or replacement machine:
    1. A secondary control machine
2. For an existing machine:
    1. A secondary control machine, or
    2. A closed-loop machine with a fugitive control system that meets the provisions of subsection 305.4
3. In addition to the dry cleaning equipment above, a vapor barrier room and a ventilation system that meets the requirements of subsection 307.1, Regulation 2, Rule 1, Section 301 and Regulation 2, Rule 5, Section 302 shall be installed and operated.

305.1: A primary control system shall:

1. Operate during both the heated and cool-down phases of the drying cycle to reduce the mass of solvent in the recirculating air stream;
2. Not exhaust to the workroom or atmosphere except through a fugitive control system after the drying cycle is complete.
3. Not require the addition of any form of water to the primary control system that results in physical contact between the water and solvent;
4. For refrigerated condensers only:
    a. Be capable of achieving an outlet vapor temperature, downstream of any bypass, of less than or equal to 45° F during cool-down; and
    b. Have a temperature indicator (a thermocouple with a digital display, a graduated thermometer with a minimum range from 0° F to 150° F, or an equivalent temperature indicator) which measures the temperature of the outlet vapor stream, downstream of any bypass of the condenser, and is easily visible to the operator.
    c. Closed-loop machines and converted machines that are installed or modified after December 21, 1994 shall have a drying sensor/controller that complies with subsection 309.1.1.b. This provision applies also to primary control systems on closed-loop machines equipped with secondary control; the drying sensor activates the secondary control system.
5. For equivalent closed-loop vapor recovery systems:
    a. Use a technology that has been demonstrated, pursuant to the requirements of Section 502, to achieve a solvent concentration of 8,600 ppmv (measured as Perc) or less in each test and
    b. Have a device that measures the solvent concentration, or a demonstrated surrogate parameter, in the drum at the end of each drying cycle, before the machine door is opened and any fugitive control system activates, and indicates if the concentration is above or below 8,600 ppmv (measured as Perc). This device shall be installed such that the reading is easily visible to the operator and shall control the drying cycle. This device shall be considered a drying sensor/controller that is subject to subsection 309.1.1.b.

305.2 A converted machine shall meet all of the following requirements:

1. All process vents that exhaust to the atmosphere or workroom during washing, extraction, or drying shall be sealed. Machines may be exhausted through a fugitive control system after the drying cycle is complete.
2. The converted machine shall use an appropriately sized primary control system to recover

solvent vapor during the heated and cooldown phases of the drying cycle.

a. A refrigerated condenser shall be considered appropriately sized, for a machine converted on or after May 4, 1994, if both of the following conditions are met:
   (1) The water-cooled condensing coils are replaced with refrigerant-cooled condensing coils; and
   (2) The compressor of the refrigerated condenser has a capacity, in horsepower (hp) that is no less than the minimum capacity, determined as follows:

$$Minimum\ Capacity(hp) = \frac{Capacity of the\ Machine(lbs)}{12}$$

b. A refrigerated condenser shall be considered appropriately sized, for a machine converted prior to May 4, 1994, if either of the conditions is met:
   (1) The refrigerated condenser meets the specifications for new conversions in subsection 305.2.2.a; or
   (2) There is no reduction in the design air flow of the machine to the refrigerated condenser and the refrigerated condenser achieves, and maintains for 3 minutes, an outlet vapor temperature, measured downstream of the condenser and any bypass of the condenser, of less than or equal to 45° F within 10 minutes of the initiation of cool-down.

3. The converted machine shall operate with no liquid leaks and no vapor leaks. Any seal, gasket, or connection determined to have a liquid leak or vapor leak shall be replaced.

305.3 A Secondary System shall:

1. Be designed to function with a primary control system or be designed to function as a combined primary control system and secondary control system that meets all of the applicable requirements of this section;
2. Not exhaust to the workroom or atmosphere except when also used as a fugitive control system (subject to subsection 305.4);
3. Not require the addition of any form of water to the secondary control system that results in physical contact between the water and solvent;
4. Use a technology that has been demonstrated, pursuant to the requirements of Section 502, to achieve a solvent concentration in the drum of 300 ppmv or less measured as Perc (600 ppmv as methane, C1) in each test;
5. Have a holding capacity equal to or greater than 200 percent of the maximum quantity of solvent vapor expected in the drum prior to activation of the system; and
6. For add-on secondary control systems only, the system shall be sized and capable of reducing the solvent concentration in the drum from 8,600 ppmv or greater to 300 ppmv or less measured as Perc (600 ppmv as methane, C1) in the maximum volume of recirculating air in the dry cleaning machine and all contiguous piping.

305.4 Ventilation of solvent laden air from the drum or other intended openings of a dry cleaning machine is allowable only through a fugitive control system (or secondary control system also functioning as a fugitive control system) after the drying cycle is complete and prior to opening of the door or seal.

1. Except as required by subsection 305.4.2, emissions from any fugitive control system installed after December 21, 1994 shall be exhausted through a stack that extends a minimum of 5 feet above the roof of the building.
2. Only for machines subject to subsections 301.4.2, 301.5.3, 303.2.2: a fugitive control device shall:
   a. Operate a fan that produces a volumetric airflow of at least 100 actual cubic feet per minute (ACFM) for at least 10 seconds immediately prior to or as the loading door or seal is opened; or shall maintain the concentration of solvent at 25 ppmv measured as Perc (50 ppmv as methane, C1) or less when measured 6 inches from the center of the open loading door or seal;
   b. Reduce the emissions of solvent in the exhaust air to a concentration less than 100 ppmv measured as Perc (200 ppmv as methane, C1) at the outlet;
   c. Exhaust all emissions through a stack that extends a minimum of 5 feet above the roof of the

building or any adjacent building, whichever is higher; and

d. Be operated, maintained, and regenerated according to the manufacturer's recommendations. Desorption or replacement of adsorption canisters shall be performed periodically, and at a minimum, shall be performed each time dry cleaning equipment exhausted to the fugitive control system has operated the allowable number of loads for its rated capacity in accordance with the following formula:

$$Maximum\ loads\ per\ regeneration = \frac{75 \times [lbs\ of\ carbon\ in\ fugitive\ control\ system]}{rated\ capacity\ of\ drycleaning\ machine\ (in\ lbs)}$$

3. The APCO shall evaluate and approve alternative desorption/replacement schedules for other adsorbent materials. Desorption shall be performed with the minimum steam pressure (or hot air temp

11-16-307 Ventilation Requirements: Except as provided by subsections 301.5, 302.2, and 303.3, the following ventilation requirements shall be met:

307.1 Co-residential Facilities: Any person that operates dry cleaning equipment in any co-residential facility shall install and operate a vapor barrier room and ventilation system in order to minimize exposure to affected residents. All dry cleaning machines and related equipment that may emit solvent shall be totally enclosed within a vapor barrier room that:

1. Is properly constructed of approved diffusion resistant materials;
2. Is continuously exhausted with a ventilation fan(s) that:
   a. Has a volumetric airflow of at least 1000 actual cubic feet per minute (ACFM),
   b. Produces an air change rate of at least one air change every five minutes, and
   c. Exhausts all emissions through a stack that extends a minimum of 5 feet above the roof of the residential building or any adjacent building, whichever is higher; and
3. Is maintained in good operating condition.

307.2 Non-residential Facilities: Any person who operates dry cleaning equipment in any non-residential facility shall install and operate a ventilation system in order to minimize exposure to off-site persons. Emissions from dry cleaning machines and related equipment shall be captured and exhausted by a ventilation system that:

1. Includes shrouds, hoods, rooms, walls, flexible barriers (e.g. plastic sheeting), or other structures designed to capture fugitive emissions;
2. Is exhausted with a ventilation fan(s) that operates whenever the dry cleaning machines and related equipment are operated and:
   a. Has a volumetric airflow of at least 1000 actual cubic feet per minute (ACFM)
   b. Produces either:
      (1) Capture velocities greater than 100 feet per minute at openings of the capture structures of subsection 1, or
      (2) An air change rate of at least one air change every ten minutes of a working region that has air movement restricted by the structures in subsection 1, and
   c. Exhausts emissions through a stack that extends a minimum of 5 feet above the roof of the building or any adjacent building, whichever is higher; and
3. Is maintained in good operating condition.

11-16-308 Water-repelling Operations: Any person who performs water-repelling operations shall ensure that the following is met:

308.1 Except as prohibited in Section 304, all water-repelling operations shall be performed in a closed-loop machine or a converted machine. Open spraying of water-repelling solution containing more than 1 percent by weight of solvent is prohibited.

11-16-309 Required Good Operating Practices: The prohibitions and/or requirements applicable to Perc dry cleaning facilities provided in Sections 93109(i)(2) and (3), Title 17, of the California Code of Regulations, effective March 4, 2009, shall apply to any dry cleaning facility using

any synthetic solvent. In addition, all dry cleaning equipment shall be maintained in good condition and operated properly, so that all of the following applicable requirements are met:

309.1 Operation and maintenance requirements: The trained operator, or his/her designee, shall operate and maintain all components of the dry cleaning system in accordance with the requirements of this section and the conditions specified in the facility's operating permit. For operations not specifically addressed, the components shall be operated and maintained in accordance with the manufacturer's recommendations. Each operation and maintenance function and the date performed shall be recorded on an operation and maintenance checklist.

1. Refrigerated condensers shall:
   a. Be operated to ensure that exhaust gases are recirculated until the air-vapor stream temperature on the outlet side of the refrigerated condenser, downstream of any bypass, is less than or equal to 45° F and
   b. For closed–loop machines and converted machines that are installed or modified after December 21, 1994: have a drying sensor/controller that is designed to extend the drying time at least 4 minutes beyond the point that solvent recovery rate is less than 40 ml/min or solvent vapor concentration in the drum is less than 8600 ppmv (measured as Perc). Drying sensors shall be maintained in good operating condition and properly operated at all times.
2. Primary control systems, other than refrigerated condensers, shall be operated to ensure that exhaust gases are recirculated until the solvent concentration in the drum is less than or equal to 8,600 ppmv (measured as Perc) at the end of the drying cycle, before the machine door is opened and any fugitive control system activates.
3. Vapor adsorbers used as a primary control system or secondary control system shall be operated to ensure that air and solvent vapors are recirculated at less than 45° F or at the temperature recommended by the manufacturer for optimum adsorption. These vapor adsorbers shall be desorbed according to manufacturer's recommendations but not less frequently than minimum requirements of subsection 305.42.d. No solvent vapors shall be routed to the atmosphere during routine operation or desorption.
4. Effective April 1, 1996, the trained operator, or her/his designee, shall check for solvent breakthrough at the outlet of any vapor adsorption system (external vapor adsorber, secondary control system, and any fugitive control system subject to subsection 305.4.2) that exhausts to the atmosphere, at least on a weekly basis. The operator shall also perform a weekly check for fugitive emissions from machines with fugitive control systems subject to subsection 305.4.2; the detector shall be held 6 inches from the center of an open loading door immediately upon opening the door and prior to unloading cleaned materials. The results of all checks shall be entered on an operation and maintenance checklist. The breakthrough check shall be performed while the vapors are venting to the vapor adsorption system at the end of the last drying cycle prior to a regular desorption using one of the following techniques:
   a. A colorimetric detector tube,
   b. A halogenated-hydrocarbon detector,
   c. A portable gas analyzer, or
   d. An alternative method approved by the APCO that meets provisions of Section 601.
5. Cartridge filters and adsorptive cartridge filters shall be handled using one of the following methods:
   a. Drained in the filter housing, before disposal, for no less than: 24 hours for cartridge filters and 48 hours for adsorptive cartridge filters. If the filters are then transferred to a separate device to further reduce the volume of solvent, this treatment shall be done in a system that routes any vapor to a primary control system, with no exhaust to the atmosphere or workroom.
   b. Dried, stripped, sparged, or otherwise treated, within the sealed filter housing, to reduce the volume of solvent contained in the filter.
6. A still, and any muck cooker, shall not exceed 75 percent of its capacity, or an alternative level recommended by the manufacturer. A still, and any muck cooker, shall cool to 100° F (38° C) or less before emptying or cleaning.
7. Button and lint traps shall be inspected and cleaned each working day and the lint placed in a

tightly sealed container.

8. All parts of the dry cleaning system where solvent may be exposed to the atmosphere or workroom shall be kept closed at all times except when access is required for proper operation and maintenance.
9. Wastewater evaporators shall be manually filled and operated to ensure that no visible liquid solvent or visible emulsion is allowed to vaporize. An evaporator shall be directly vented outside the facility unless a secondary phase separator and a liquid phase carbon adsorber are used to remove solvent from the wastewater. A secondary phase separator shall be equipped with a sight gauge (or solvent detector/alarm) and a drain valve. Equipment shall be maintained according to manufacturer's recommendations. As an alternative to evaporation, wastewater shall be properly stored and transported as hazardous waste in accordance with subsection 11.
10. All waste from dry cleaning operations including solvent still residue; filter waste; solvent-laden lint; and used filtration cartridges must be maintained and transported in sealed non-reactive containers and shall be treated or disposed of as set forth in California State law regarding hazardous waste disposal as described in Title 22, Division 4.5 of the California Code of Regulations.

309.2 Leak check and repair requirements: The trained operator, or her/his designee, shall conduct and maintain an effective leak check monitoring and Bay Area Air Quality Management District March 4, 2009 11-16-17 repair program. The facility shall use a leak inspection checklist that includes the following components: hose and pipe connections, unions, couplings, valves, door gaskets, filter head gaskets, pumps, solvent base tanks, solvent and waste storage containers, water separators, filter sludge recovery units or muck cookers, distillation units and condensers, diverter valves, lint basket, lint storage, and cartridge filter housings. The trained operator, or her/his designee, shall record the status of each component on the checklist.

1. The trained operator, or her/his designee, shall inspect the dry cleaning system for liquid leaks on a weekly basis.
2. The trained operator, or her/his designee, shall inspect the dry cleaning system for vapor leaks on a weekly basis using one of the following techniques:
   a. A halogenated-hydrocarbon detector,
   b. A portable gas analyzer measuring 1 cm. away from the dry cleaning system according to ARB Test Method 21 (Section 94124, Title 17, of the California Code of Regulations), or
   c. An alternative method approved by the APCO that meets provisions of Section 601.
3. Any liquid leak, or vapor leak that has been detected by the operator shall be noted on the checklist and repaired according to the requirements of this section. If the leak is not repaired at the time of detection, the leaking component shall be physically marked or tagged in a manner that is readily observable by a District inspector.
4. Any liquid leak, or vapor leak detected by the District, which has not been so noted on the checklist and marked on the leaking component of the dry cleaning system, shall constitute a violation of this section. For enforcement purposes, the District shall identify the presence of a vapor leak by determining solvent concentration:
   a. With a portable analyzer measured 1 cm. away from the dry cleaning system according to ARB Test Method 21 (Section 94124, Title 17, of the California Code of Regulations) or
   b. By an alternative method approved by the APCO that meets provisions of Section 601.
5. Any liquid leak or vapor leak shall be repaired immediately upon detection, unless one or both of the following apply:
   a. If repair parts are not available at the facility, the parts shall be ordered within two working days of detecting such a leak. Such repair parts shall be installed within two working days after receipt. A facility with a leak that has not been repaired by the end of the 7th working day after detection shall not operate the dry cleaning equipment, until the leak is repaired, unless the District has granted the facility a leak-repair extension
   b. The APCO may grant a leak-repair extension to a facility, for a single period of 30 days or less, if the APCO finds that:
      (1) The delay in repairing the leak could not have been avoided by action on the part of the facility,

(2) The facility used reasonable preventive measures and acted promptly to initiate the repair,
(3) The leak would not significantly increase exposure of solvent or other toxic compounds near the facility, and
(4) The facility is in compliance with all other requirements of this section and has a history of compliance.

6. Effective March 4, 2009, facilities using solvent must keep on the facility premises a spare set of gaskets for each machine, minimally comprised of the following 5 gaskets: loading door, still, lint trap, button trap, and water separator.
7. Effective March 4, 2009, facilities must keep on the facility premises a spare lint filter for each machine.

Attachment G

Carbon Adsorption Cost Effectiveness Analysis

COST EFFECTIVENESS ANALYSIS FOR CARBON ADSORPTION

This cost effectiveness analysis was performed using EPA's OAQPS Control Cost Manual
EPA publication no. 450/3-90-006

FACILITY NAME:

LOCATION:

PERMIT NO.:

EQUIPMENT DESCRIPTION: Dry Cleaning

VOC Parameters

VOC of concern	Petroleum Naptha
Cost of pure VOC ($/ton)	100
Molecular weight of VOC (Refer to Control Cost Manual, pg 3-63)	99
Emission rate (lbs/hr - inlet)	1.4
Inlet concentration (ppm)	94
k factor (Refer to Control Cost Manual, pg 4-11)	0.551
m factor (Refer to Control Cost Manual, pg 4-11)	0.11
Partial pressure (psi)	0.001378909

Gas Parameters

Total gas flow rate (acfm - inlet)	1,000
Total gas pressure (psi - inlet)	14.7

Equipment Parameters

Removal efficiency (%)	95.0%
Adsorption time (hours)	8
Desorption time (hours)	16
Number of adsorbing beds	1
Number of Desorbing beds	1
Equipment life (years)	10

Operating Parameters

Hours per day	8
Days per week	6
Weeks per year	52

Carbon Requirements

VOC Emissions with max operation	((1.4 lbs VOC/hr)*(8 hours/day)*(6 days/week)*(52 weeks/year))/(2000 lbs/ton)	1.75
Controlled VOC Emissions with max operation (tons/year)	(VOC Emissions)*(0.95)	1.66
Carbon working capacity (lb VOC/lb carbon)		0.25
Amount of carbon needed (lbs)	(lbs VOC emitted)/(0.25 lb VOC/lb carbon)	13,978
Carbon cost	($1.5/lb carbon)*(lbs carbon)	$20,966
Carbon life (years)		5

Direct Costs:

Purchased Equipment Cost		
Adsorber and auxiliary equipment		$7,800.00
Instrumentation	1% of equipment cost ($7800)*0.1	$780.00
Sales taxes	(7800)*0.085 (CA sales tax)	$663.00
Freight	5% of equipment cost ($7800)*0.05	$390.00
Purchased Equipment Cost	($7800+$780+$663+$390)	$9,633.00

Direct installation costs	Canister carbon adsorption doesn't require site prep and building costs	
Foundations & supports		$ -
Handling & erection		$ -
Electrical		$ -
Piping		$ -
Insulation		$ -
Painting		$ -
Direct installation costs		$ -

Indirect Costs:

Indirect Costs (installation)		
Engineering		$ -
Construction and field expenses		$ -
Contractor fees		$ -
Start-up	2% of equipment cost ($9663)*0.02	$192.66
Performance test	1% of equipment cost ($9663)*0.01	$96.33
Contingencies	3% of equipment cost ($9663)*0.03	$288.99
Total Indirect Costs	($192.66+$96.33+$288.99)	$577.98
Total Capital Investment	($9633.00+$577.98)	$10,210.98

Interest Rate		0.04
Equipment Life (years)		10
Capital Recovery Factor (CRF)		0.1233
Capital recovery cost	($10210.98*0.1233)	$1,258.92
Capital Recovery Inflation adjustment	$1258.92*[(1+0.0275)^6]	$1,481.46
Direct Annual Costs		
Labor wage ($/hr)		12.96
operator hour (hrs/shift)		0.5
shifts per day (shift/day)		1
days of work per year (days/year)		312
Operator labor		
Operator	($12.96)*(0.5 hours/shift)*(1 shift/day)*(312 days/year)	$2,021.76
Supervisor		$0.00
Material	equal to operator costs	$2,021.76
Replacement labor		$0.00
Utilities		
Electrical Cost		
kW/hp		0.746
hp		10
hours/year		2496
kWh price	(Based on District's Avg. Electricity Rate for an Industrial Operation as approved on 10/17/16)	0.1124
Electrical	(0.746 kw/hp)*(10 hp)*(2,496 hours/year)*($0.1124/kwh)	$2,092.91
Total Direct Annual Costs (without carbon costs)		$6,136.43
Indirect Annual Costs		
Overhead	60% of maintenance labor and materials	$2,426.11
Administrative Charges	2% of Total Capital Investment	$204.22
Property Tax	1% of Total Capital Investment	$102.11
Insurance	1% of Total Capital Investment	$102.11
Total Indirect Annual Costs (without Capital Recovery)		$2,834.55

Ton VOC controlled		1.66
Carbon needed		13,978
Cost of Carbon per year	(lb carbon)*($1.50/lb carbon)	$20,966.40

Total Annual Costs	($1,481.46+$6,136.43+$2,834.55+$20,966.40)	$31,418.84
Cost of VOC Removal	(total annual cost)/(1.66 tons VOC)	$18,928.83

Determination of Maximum Annual VOC Limit Not Requiring Add-on BACT

Annual Direct Operating Cost (without carbon costs)	$6,136.43
Annual Indirect Operating Cost	$4,316.01
Capitol Recovery Cost	$1,481.46
Carbon working capacity (lb carbon/lb VOC)	0.25
Annual tons controlled VOC	1.66
Control Efficiency	0.950
Amount of Carbon Needed	13,978
Cost of Carbon	$18,928.83
Total Annual Cost	$31,418.84
Cost per ton VOC Controlled	$18,928.83

Attachment H

Thermal Oxidizer Cost Effectiveness Analysis

COST EFFECTIVENESS ANALYSIS FOR THERMAL INCINERATION

This cost effectiveness analysis was performed using EPA's OAQPS Control Cost Manual
EPA publication no. 450/3-90-006

FACILITY NAME:
LOCATION:
PERMIT NO.:
EQUIPMENT DESCRIPTION: Dry Cleaning

VOC Parameters

VOC of concern	Petroleum Naptha
Molecular weight of VOC	99
Heat of combustion (Btu/lb)	18,200
Heating value of VOC (Btu/scf)	4,527
Emission rate (lbs/hr - inlet)	1.4
Inlet concentration (ppm)	12

Gas Parameters

Total gas flow rate (scfm - inlet)	7500
Total gas pressure (psi - inlet)	14.7
Inlet gas temperature (deg F)	120

Equipment Parameters

Level of energy recovery (0%, 35%, 50% or 70%)	0%
Control efficiency (%)	95.0%
Equipment life (years)	10

Operating Parameters

Hours per day	8
Days per week	6
Weeks per year	52
Shifts per day	1

Incinerator Parameters

Volumetric heat of combustion of effluent (Btu/scf)	0.05
Heat of combustion per pound of effluent (Btu/lb)	0.74
Temperature Required for incineration (deg F)	1,400.00
Gas temperature at exit of pre-heater (deg F)	500.00
Effluent gas temperature (deg F)	1020

Electricity Usage

Price of electricity ($/kWh)	$0.11
System fan (kWh/yr)	29,203.20
Total Power Used (kWh/yr)	29,203.20

Gas Usage

Price of gas ($/1000 cu.ft.)	$8.04
Auxiliary fuel required (scfm)	148.84

CAPITAL COST

Direct Costs:		
Incinerator		$80,000
Auxiliary equipment (if not included above)		$0
	Equipment Cost (A)	**$80,000**
Instrumentation (0.1A if not included above)		$8,000
Sales taxes (0.085A)		$6,200
Freight (0.05A)		$4,000
	Total Equipment Cost (B)	**$98,200**
Direct Installation Costs:		
Foundation & Supports (0.08B)		$7,856
Handling & erection (0.14B)		$13,748
Electrical (0.04B)		$3,928
Piping (0.02B)		$1,964
Insulation for duct work (0.01B)		$982
Painting (0.01B)		$982
	Direct Installation Cost	**$29,460**
Site preparation		$0
Facilities & buildings		$0
	Total Direct Costs	**$127,660**
Indirect Costs (installation)		
Engineering (0.10B)		$9,820
Construction & field expenses (0.05B)		$4,910
Contractor fees (0.10B)		$9,820
Start-up (0.02B)		$1,964
Performance test (0.01B)		$982
Contingencies (0.03B)		$2,946
	Total Indirect Costs	**$30,442**
TOTAL CAPITAL INVESTMENT		**$158,102**

ANNUAL COST

Direct Annual Costs

Operating Cost		
	Operator (@ $12.96/hr & .5 hr per shift)	$2,021.76
	Supervisor (15% of operator)	$303.26
	Operating materials	$0.00
Maintenance		
	Labor (@14.26/hr & .5 hr per shift)	$2,224.56
	Material (same as labor)	$2,224.56
Utilities		
	Price of electricity ($/kWh)	$0.11
	Price of gas ($/1000 cu.ft.)	$8.04
	Electricity ($/yr)	$1,752.19
	Natural Gas ($/yr)	$179,217.83
	Total Direct Costs	**$187,744.17**

Indirect Annual Costs

Overhead	$4,064.49
Administrative charges	$3,162.04
Property taxes	$1,581.02
Insurance	$1,581.02
Interest rate (%)	5%
Equipment life (years)	10
CRF	0.1627
Capital recovery	$25,723.20
Capital Recovery Inflation Adjustment	$30,270.24
Total Indirect Costs	**$40,658.81**

TOTAL ANNUAL COST	**$228,402.98**

Annual Cost ($/yr)	$228,402.98
Annual Emissions Reductions (tons/yr)	1.66

(annual emissions based on BACT determination limit for add-on controls)

COST PER TON OF VOCs REDUCED ($/ton)	$137,605.42