SAN JOAQUIN VALLEY UNIFIED
AIR POLLUTION CONTROL DISTRICT

Guideline for Expedited Application Review (GEAR 12)
Motor Vehicle and Mobile Equipment Refinishing Operations

Approved By: _____ Date: 10/4/10
David Warner
Director of Permit Services

Purpose: To outline procedures for the expedited processing of Authority to Construct (ATC) applications for motor vehicle and mobile equipment coating operations.

I. Applicability:

This policy applies to Permit Services' actions relating to and dealing with the permitting of motor vehicle and mobile equipment refinishing operations.

II. Permit Application and Supplementary Forms:

The applicant must complete and submit an ATC application form along with a Coating and Painting Operations Supplemental Form.

III. Application Priority Processing:

The applications will be processed on an expedited basis if a complete application, complete supplemental form and correct filing fees for each permit unit are submitted. The application submittal must include copies of the Material Safety Data Sheets (MSDS) for all proposed coatings.

Final action on all projects will occur within thirty days after the submittal of the complete package. The priority processing will be pre-empted if any of the following applies:

- The application is subject to any public noticing requirements, including school notice per CH&SC 42301.6 (within 1000 feet of any K-12 school), or
- The application is part of a stationary source project where issuance of the permit will affect the outcome of the stationary source project.

IV. Preliminary Review:

The preliminary review engineer will ensure that all the necessary information needed to deem the application complete has been submitted. To meet the expedited time frame, the engineer assigned for preliminary review will deem the project complete within fourteen days of the date the application was received. The project will then be

automatically assigned for final review to the same engineer, who will prepare the application review and finalize the project within thirty days of the application being deemed complete. If the applicant submits a "complete" Authority to Construct application package, a Completeness Letter will not be sent unless requested by the applicant. The engineer shall provide the applicant with an estimate for the processing time and associated hourly fees. This estimate may be provided by email or telephone and shall be noted in the telephone record log for the project.

Upon completion of the application review, the engineer shall submit the application review and draft ATC permit to the lead engineer for review.

V. Application Review:

There are two standard application review documents for the typical motor vehicle and mobile coating operations:

- Motor vehicle and mobile equipment coating operations, with a paint booth and natural gas or LPG fired booth heater *or* without a booth heater
- Motor vehicle and mobile equipment coating operations, without a paint booth

These application review documents can be found on the AIRnet, under Per/Policies/GEARs. The use of these standard Application Review templates will ensure that the following key areas of District Rule 2201 are addressed:

A. That the proposed project complies with the District's BACT requirements as specified in the District's current BACT Clearinghouse.

B. That the proposed project does not trigger offset requirements.

C. That the permit has enforceable daily emission limitations (DELs)

D. That the proposed project complies with all applicable prohibitory rules.

Health Risk Assessment:

District policy APR 1905 states that for projects that result in an increase in emissions associated with a proposed new source or modification, the District perform an analysis to determine the possible impact to the nearest resident or worksite. A Health Risk Assessment (HRA) is not required for a project with a total facility prioritization score of less than or equal to one.

For all motor vehicle and mobile equipment coating projects there will be an increase in daily and annual hazardous air emissions. Therefore, the final review engineer will submit a site specific health risk assessment request for each project.

The following guidelines should be considered when processing the GEAR project.

A. Project location, SIC code and equipment description:

For new facilities, the reviewing engineer will verify that the applicant has provided billing information, billing address, site address and contact information and that this information has been correctly entered into PAS. The reviewing engineer will verify if SIC code 7532 for automotive paint shops is the appropriate SIC code for the proposed automotive refinishing operation and will update the facility's details window in PAS with the appropriate SIC code.

When creating a new ATC in PAS, the following standard equipment description will be used based on the applicant's proposed project.

Equipment Description:

The equipment description is dependent on the type of coating operation proposed by the applicant. Refer to the specific generic application reviews for the type of coating operation proposed.

- Motor vehicle coating operation with a booth with a natural gas or LPG fired booth heater *or* without a booth heater.
- Motor vehicle coating operation without a booth.

X-XXXX-XX-XX:	MOTOR VEHICLE AND MOBILE EQUIPMENT COATING OPERATION WITH HVLP SPRAY GUN(S), A PAINT SPRAY BOOTH WITH DRY EXHAUST FILTERS, AND A X.X MMBTU/HR (NATURAL GAS-FIRED or LPG-FIRED) DRYING BOOTH HEATER
X-XXXX-XX-XX:	MOTOR VEHICLE AND MOBILE EQUIPMENT COATING OPERATION WITH HVLP SPRAY GUN(S)

B. Emission Control Technology Evaluation:

For the coating operation proposing a paint spray booth:

Only PM_{10} and VOC are emitted from the priming and top coating operation. PM_{10} emissions from the priming operation will be controlled by the use of High Volume, Low Pressure (HVLP) spray equipment. For the top coating operation, the applicant has proposed to use a paint spray booth with a dry exhaust filter system for PM_{10} control, HVLP spray equipment for PM_{10} and VOC control. The paint spray booth with a dry exhaust filter system will control PM_{10} emissions by filtering air from inside the paint booth before it is exhausted to the atmosphere. The HVLP spray equipment will control PM_{10} and VOC emissions by having more paint transferred to the desired surfaces than traditional painting equipment. The applicant will be required to use solvents that comply with the VOC content limits as specified in District Rule 4612 for the cleaning of the application equipment.

For the coating operation without a paint spray booth:

Only PM_{10} and VOC are emitted from the priming and top coating operation. The applicant has proposed to use High Volume, Low Pressures (HVLP) spray equipment for PM_{10} and VOC control. The HVLP spray equipment will control PM_{10} and VOC emissions by having more paint transferred to the desired surfaces than traditional painting equipment. The applicant will be required to use solvents that comply with the VOC content limits as specified in District Rule 4612 for the cleaning of the application equipment.

VII. Applicable Rule Compliance Determinations:

Rule 2201 – New and Modified Stationary Source Review Rule (amended 12/18/2008)

Best Available Control Technology (BACT):

BACT Applicability

BACT requirements are triggered on a pollutant-by-pollutant basis and on an emissions unit-by-emissions unit basis for the following*:

a. Any new emissions unit with a potential to emit exceeding 2.0 pounds per day,
b. The relocation from one Stationary Source to another of an existing emissions unit with a potential to emit exceeding 2.0 pounds per day,
c. Modifications to an existing emissions unit with a valid Permit to Operate resulting in an AIPE exceeding 2.0 pounds per day, and/or
d. Any new or modified emissions unit, in a stationary source project, which results in a Major Modification.

*Except for CO emissions from a new or modified emissions unit at a Stationary Source with an SSPE2 of less than 200,000 pounds per year of CO.

See individual Application Review for BACT Applicability

Major Source Determination:

Pursuant to Section 3.23 of District Rule 2201, a Major Source is a stationary source with post project emissions or a Post Project Stationary Source Potential to Emit (SSPE2), equal to or exceeding one or more of the following threshold values. However, Section 3.23.2 states, "for the purposes of determining major source status, the SSPE2 shall not include the quantity of emission reduction credits (ERC) which have been banked since September 19, 1991 for Actual Emissions Reductions that have occurred at the source, and which have not been used on-site." This facility does not contain ERCs which have been banked at the source; therefore, SSPE2 does not have to be adjusted.

For all motor vehicle and mobile equipment coating operations, one of the assumptions the District uses is that the post project VOC annual emissions will be less than 20,000 lbs. For motor vehicle and mobile equipment coating operations that utilize a booth heater, the post project stationary source potential to emit for all the combustion pollutants will be below the Major Source Thresholds for these pollutants, NOx, CO, PM10 and SOx. Therefore, the motor vehicle and mobile equipment coating operation will not become a Major Source as a result of this project.

MAJOR SOURCE THRESHOLDS			
Pollutant	SSPE2 (lb/yr)	Major Source Levels (lb/yr)	Major Source?
NO_x	< 20,000	20,000	No
SO_x	< 140,000	140,000	No
PM_{10}	< 140,000	140,000	No
CO	< 200,00	200,000	No
VOC	19,966	20,000	No

Offset Applicability

Per Section 4.5.3, offset requirements shall be triggered on a pollutant-by-pollutant basis, unless exempt per Section 4.6. Offsets are required if the post-project SSPE2 totals equals or exceeds the following offset threshold for any pollutant. Post project SSPE totals for typical motor vehicle and mobile equipment coating operations processed under this GEAR Policy will not exceed the offset thresholds listed below since VOC emissions are assumed to be and are limited to less than 20,000 lbs. The post-project emissions for the other pollutants will also be below the offset threshold for each pollutant. Therefore, offsets will not be triggered and offset calculations are not typical.

Pollutant	Offset Thresholds (lb/yr)	Offsets Triggered
NOx	20,000	**No**
VOC	20,000	**No**
CO	200,000	**No**
SOx	54,750	**No**
PM_{10}	29,200	**No**

Public Notification

1. Applicability

Public noticing is required for:

a. New Major Sources, which is a new facility that is also a Major Source,
b. Major Modifications,
c. Any new emissions unit with a Potential to Emit greater than 100 pounds during any one day for any one pollutant,
d. Any project which results in the offset thresholds being surpassed, and/or
e. Any project with an SSIPE of greater than 20,000 lb/year for any pollutant.

a. New Major Source

A New Major Source is a new facility, which also becomes a major source for any pollutant. As previously stated, the annual VOC emission from this facility will be limited to less than the Major Source threshold for VOC emissions. Therefore, the facility will not become a Major Source for any pollutant.

For motor vehicle coating operations that utilize a booth heater the post project combustion emissions will also be less than the Major Source thresholds for the combustion pollutants. Therefore, this facility does not become a Major Source for any pollutant and public noticing is not required for New Major Source purposes.

b. Major Modification

As demonstrated previously, this project does not constitute a Major Modification; therefore, public noticing for Major Modification purposes is not required.

c. PE > 100 lb/day

The Daily PE for any pollutant from the typical motor vehicle and mobile equipment coating operation will not exceed the daily PE Public Notice Threshold of 100 lbs/day for any pollutant. Therefore, public noticing is not required for daily emissions greater than 100 lb/day for a new emissions unit.

d. Offset Threshold

As demonstrated above, the SSPE1 and SSPE2 for this project will be less than the offset thresholds. Public Noticing for any offset thresholds being exceeded is not required.

e. SSIPE > 20,000 lb/year

Public notification is required for any permitting action that results in a Stationary Source Increase in Permitted Emissions (SSIPE) of more than

20,000 lb/year of any affected pollutant. According to District policy, the SSIPE is calculated as the Post Project Stationary Source Potential to Emit (SSPE2) minus the Pre-Project Stationary Source Potential to Emit (SSPE1), i.e. SSIPE = SSPE2 – SSPE1. The values for SSPE1 and SSPE2 are calculated according to Rule 2201, Sections 4.9 and 4.10, respectively. The SSIPE is compared to the SSIPE Public Notice thresholds in the following table:

Stationary Source Increase in Permitted Emissions (SSIPE)			
Pollutant	**SSPE2 (lb/yr)**	**SSPE1 (lb/yr)**	**SSIPE (lb/yr)**
NO_x	< 20,000	0	< 20,000
SO_x	< 20,000	0	< 20,000
PM_{10}	< 20,000	0	< 20,000
CO	< 20,000	0	< 20,000
VOC	< 20,000	0	< 20,000

SSIPE will not exceed 20,000 lb/yr for any pollutant. Therefore, public noticing is not required for exceeding the SSIPE thresholds.

2. Public Notice Action

As indicated above the public noticing requirements are not triggered.

Rule 4101 - Visible Emissions

Rule 4101 states that no air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark as, or darker than, Ringelmann 1 or 20% opacity. As long as the equipment is properly maintained and operated, compliance with the visible emissions limit is expected. The following general condition will appear on each ATC permit.

- {15} No air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark as, or darker than, Ringelmann 1 or 20% opacity. [District Rule 4101] N

Rule 4102 - Public Nuisance

Rule 4102 states that no air contaminant shall be released into the atmosphere that causes a public nuisance.

- {98} No air contaminant shall be released into the atmosphere which causes a public nuisance. [District Rule 4102]

Rule 4201 – Particulate Matter Concentration

The purpose of this rule is to protect the ambient air quality by establishing a particulate matter emission standard. This rule applies to any source operation, which emits or may emit dust, fumes, or total suspended particulate matter. This rule states that a person shall not release or discharge into the atmosphere from any single source operation, dust, fumes, or total suspended particulate matter emissions from an exhaust stack in excess of 0.1 grain/dscf, as determined by the test methods in section 4.0.

Typical automotive paint spray booths have an airflow of 10,000 cfm – 18,000 cfm. To be conservative in grain loading emissions calculations, a figure of 5,000 dscfm will be used.

Using the worst case daily PM10 emissions calculated in Section VI.C.2.a, of GEAR template 12a, and assuming that PM10 = 100% PM:

$$\text{Emissions (grain/dscf)} = \frac{1.6 \text{ lb-PM/day} \times 7{,}000 \text{ grain/lb}}{14{,}000 \text{ dscf/min} \times 60 \text{ min/hr} \times 24 \text{ hr/day}}$$

PM emissions = 0.001 grain/dscf

The calculated emission concentration is well below the required Rule limit of 0.1 grain-PM/dscf. Therefore, compliance is with this Rule is expected. The following condition will be listed on the proposed ATC to ensure compliance:

- {14} Particulate matter emissions shall not exceed 0.1 grains/dscf in concentration. [District Rule 4201]

Rule 4612 - Motor Vehicle and Mobile Equipment Refinishing Operations – Phase II

Compliance with District Rule 4612 requirements will be addressed in the specific application review for each project.

If the applicant is proposing to use a paint spray booth with a "natural gas fired" curing oven or a "LPG fired" curing oven and only uses PUC-regulated natural gas or PUC-regulated LPG, then Prohibitory Rule 4801 should be referenced.

Rule 4801 - Sulfur Compounds

Section 3.1 states that a person shall not discharge into the atmosphere sulfur compounds, which would exist as a liquid or gas at standard conditions, exceeding a concentration of two-tenths (0.2) percent by volume calculated as sulfur dioxide (SO_2) at the point of discharge on a dry basis averaged over 15 consecutive minutes.

Using the ideal gas equation and the emission factors presented in Section VII, the sulfur compound emissions are calculated as follows:

$$\text{Volume } SO_2 = \frac{n\,RT}{P}$$

With:

N = moles SO_2
T (Standard Temperature) = 60°F = 520°R
P (Standard Pressure) = 14.7 psi
R (Universal Gas Constant) = $\frac{10.73\,psi \cdot ft^3}{lb \cdot mol \cdot °R}$

Natural Gas Combustion:
EPA F-Factor for Natural Gas = 8,578 dscf/MMBtu at 60 °F

$$\frac{0.00285\,lb-SOx}{MMBtu} \times \frac{MMBtu}{8{,}578\,dscf} \times \frac{1\,lb \cdot mol}{64\,lb} \times \frac{10.73\,psi \cdot ft^3}{lb \cdot mol \cdot °R} \times \frac{520°R}{14.7\,psi} \times \frac{1{,}000{,}000 \cdot parts}{million} = 2.0\frac{parts}{million}$$

Sulfur Concentration = 2.0 ppmv < 2,000 ppmv (or 0.2%)

LPG/Propane Combustion:
EPA F-Factor for LPG/Propane = 8,578 dscf/MMBtu at 60 °F

$$\frac{0.017\,lb-SOx}{MMBtu} \times \frac{MMBtu}{8{,}578\,dscf} \times \frac{1\,lb \cdot mol}{64\,lb} \times \frac{10.73\,psi \cdot ft^3}{lb \cdot mol \cdot °R} \times \frac{520°R}{14.7\,psi} \times \frac{1{,}000{,}000 \cdot parts}{million} = 12\frac{parts}{million}$$

Sulfur Concentration = 12 ppmv < 2000 ppmv (or 0.2%)

Therefore, compliance with District Rule 4801 requirements is expected.

California Environmental Quality ACT (CEQA)

The California Environmental Quality Act (CEQA) requires each public agency to adopt objectives, criteria, and specific procedures consistent with CEQA Statutes and CEQA Guidelines for administering its responsibilities under CEQA, including the orderly evaluation of projects and preparation of environmental documents. Consistent with these requirements, the San Joaquin Valley Air Pollution Control District (District) has adopted procedures and guidelines for implementing CEQA. The District's Environmental Review Guidelines (ERG) establishes procedures for avoiding unnecessary delay during the District's permitting process while ensuring that significant environmental impacts are thoroughly and consistently addressed. The ERG includes policies and procedures to be followed when processing permits for projects that are exempt under CEQA.

The State Legislature granted a number of exemptions from CEQA, including projects that require only ministerial approval. Based upon analysis of its own laws and consideration of CEQA provisions, the District has identified a limited number of District permitting activities considered to be ministerial approvals. As set forth in §4.2.1 of the ERG, projects permitted consistent with the District's Guidelines for Expedited Application Review (GEAR) are standard application reviews in which little or no discretion is used in issuing Authority to Construct (ATC) documents. Thus, issuance of such ATCs is ministerial and not subject to CEQA provisions.

VII. Authority to Construct Conditions:

To ensure uniformity, a standard set of conditions will be used for all applications (see Attached ATC Conditions). Additional conditions may be necessary on a site-specific basis due to New Source Review requirements and/or health risk assessment requirements. The applicable general conditions for this automotive refinishing operation are available in PAS under "Source Category GEAR 12 – Motor Vehicle and Mobile Equipment Refinishing Operations".

Appendices:

Appendix A: Top-down BACT analysis

Top-Down BACT Analysis for the Automotive Spray Painting Operations, < 5.0 MMBtu/hr

Oxides of nitrogen (NO_x) are generated from the combustion of the gaseous fuel. A majority of the NO_x emissions are formed from the high temperature reaction of nitrogen and oxygen in the inlet air. The rest of the NO_x emissions are formed from the reaction of fuel-bound nitrogen with oxygen in the inlet air. Heaters for automotive paint booth applications are typically in the 400 – 800 kBtu/hr range although some applications exceed 1.0 MMBtu/hr. Control technologies such as low-NO_x burners are not available for these small booth heaters.

Top-Down BACT Analysis for NO_x Emissions:

Step 1 - Identify all control technologies

The SJVAPCD BACT Clearinghouse guideline 4.2.1, (Last Updated xx/xx/xxxx), identifies achieved in practice and technologically feasible BACT control technologies for automotive spray painting operations, with or without a < 5.0 MMBtu heater for NO_x emissions as follows:

1) Natural gas or LPG fired burner (achieved in practice).

Step 2 - Eliminate Technologically Infeasible Options

The above listed technology is technologically feasible.

Step 3 - Rank Remaining Control Technologies by Control Effectiveness

1) Natural gas or LPG fired burner.

Step 4 - Cost Effectiveness Analysis

There is only one control technology identified and this technology is the achieved-in-practice control technology. Therefore, a cost effectiveness analysis is not required.

Step 5 - Select BACT for NO_x

Natural gas or LPG fired burner is selected as BACT for NO_x emissions and meets the District BACT requirements for this category and class of source.

Top-Down BACT Analysis for VOC Emissions:

Step 1 - Identify All Possible Control Technologies

The SJVAPCD BACT Clearinghouse guideline 4.2.1, (Last Updated xx/xx/xxxx), identifies achieved in practice and technologically feasible BACT control technologies for automotive spray painting operations, with or without a < 5.0 MMBtu heater for VOC emissions as follows:

1) HVLP spray guns, coatings compliant with District rules - achieved in practice.
2) VOC capture and control system (incineration or carbon adsorption) - technologically feasible

Step 2 - Eliminate Technologically Infeasible Options

None of the above listed control technologies are technologically infeasible.

Step 3 - Rank Remaining Control Technologies by Control Effectiveness

1. VOC capture and control system: 95% control - technologically feasible.
2. HVLP guns: 75% transfer efficiency - achieved in practice.

Step 4 - Cost Effectiveness Analysis - VOC capture and control systems

Design Parameters for booth control technologies:

Exhaust Gas Flow Rate (Q):	14,000 cfm
VOC (lb/day):	54.7 lb-VOC/day
VOC (ton/year):	10 ton-VOC/year

(1) Capture and Incineration:

The cost of a thermal incineration unit is estimated using the calculations from Chapter 11 of Air Pollution Control - A Design Approach by C. David Cooper and F.C. Alley.

Capital Cost:

The purchase price for a packaged thermal incinerator fits the following formula:
$P(\$) = aQ_{50}^{b}$
Where Q_{50} = flue gas flow rate (scfm)
a,b = regression parameters from Table 11.5

For a thermal incinerator, the average heat exchanger efficiency is 50%. At this efficiency, a = 4,920 and b = 0.389.

$P = (4,920) \times 14,000^{0.389} = \$201,748$

Total Capital Investment:

The total capital investment is equal to 1.25 times the purchase cost. The sales tax and freight charges total 8% of the base equipment cost. Finally, adjusting from 1988 dollars to 2009 dollars (multiply by 1.5775 or 2.75% inflation/yr).

Therefore, TCI (2009 dollars) = $201,748 x (1.25) x (1.08) x (1.5775) = $429,647

Pursuant to the District's BACT Policy section X, (Revised 11/9/99), the annual cost of installing and maintaining the thermal oxidizer will be calculated as follows. The installation cost will be spread over the expected life of the thermal oxidizer which is estimated at 10 years and using the capital recovery equation (Equation 1). A 10% interest rate is assumed in this equation and the assumption will be made that the equipment has no salvage value at the end of the ten-year cycle.

Where:

A = Annualized total capital investment cost
P = present value of capital
CRF = capital recovery factor = $i(i+1)^n / (i+1)^n-1$
i = interest rate = 10%
n = useful lifetime of equipment in years = 10

$CRF = 0.1(0.1 +1)^{10} / (1+0.1)^{10} - 1 = 0.1627$

$A = P \times CRF$

$A = \$429,647 \times 0.1627 = \$69,904/yr$

Operating and Maintenance Costs:

The Direct annual costs include labor (operating, supervisory, and maintenance), maintenance materials, electricity, and fuel.

Heat of Combustion for waste gas stream:

Note: All VOCs are assumed to be ethylene for calculation purposes.

Molecular Weight	= 28.05
heat of combustion -dHc	= 20,276 Btu/lb
Daily VOC emissions rate	= 54.7 lb/day
Blower flow rate	= 14,000 ft^3/min = 20,160,000 ft^3/day
-dh(c)	= 54.7 lb/day x 20,276 Btu/lb ÷ 20,160,000 ft^3/day
	= 0.055 Btu/ft^3

Assuming the waste gas is principally air, with a molecular weight of 28.97 and a corresponding density of 0.0739 lb/scf, the heat of combustion per pound of incoming waste gas is:

$-dh(c) = 0.055 \text{ Btu/ft}^3 \div 0.0739 \text{ lb/ft}^3 = 0.744 \text{ Btu/lb}$

Fuel Flow Requirement:

$$Q(fuel) = \frac{Pw \times Qw \times \{Cp \times [1.1 \times Tf - Tw - 0.1 \times Tr] - [-dh(c)]\}}{\{P(ef) \times [-dh(m) - 1.1 \times Cp \times (Tf - Tr)]\}}$$

Where:

Pw	= 0.0739 lb/ft^3
Cp	= 0.255 Btu/lb-°F
Qw	= 14,000 ft^3/min
-dh(m)	= 21,502 Btu/lb for methane
Tr	= 77 °F assume ambient conditions
P(ef)	= 0.055 lb/ft^3 m, methane at 77 °F, 1 atm
Tf	= 1,600 °F
Tw	= 1,150 °F

$$Q(fuel) = \frac{0.0739 \times 14{,}000 \times \{0.255 \times [(1.1 \times 1{,}600) - 1{,}150 - (0.1 \times 77)] - [0.744]\}}{\{0.055 \times [21{,}502 - (1.1 \times 0.255) \times (1{,}600 - 77)]\}}$$

Q(fuel) = 158,131 ÷ 1,155 = 136.9 ft^3/min

Fuel Cost:

The cost for natural gas shall be based upon the average price of natural gas sold to "Commercial Consumers" in California for the years 2007 and 2008.[1]

2007	= $10.20/thousand ft^3 total monthly average
2008	= $11.72/thousand ft^3 total monthly average
Average for two years	= $10.96/thousand ft^3 total monthly average

Assumptions:

1 therm = 100,000 Btus
1,000 ft^3 = 10 therms
Average Rate = $1.96/therm = $0.0110/ft^3

136.9 ft^3/min x 1,440 min/day x 300 day/yr x $0.0110/ft^3 = $650,548/yr

Electricity Requirement:

Gas Flow rate (Q)	= 14,000 ft^3/min
Pressure drop (dP)	= 4 inches
Motor Efficiency (e)	= 0.6

Electrical use (kW)	= 1.17 x 10^{-4} x Q x dP ÷ e
Electrical use (kW)	= 1.17 x 10^{-4} x 14,000 x 4 ÷ 0.6
Electrical use	= 11.2 kW

[1] Energy Information Administration/Natural Gas Monthly October 2009; Average Price of Natural Gas Sold to Commercial Consumers by State, 2007 - 2008

Average cost of electricity to commercial users in California [2]:
2008 = $0.1302
2009 = $0.1385
AVG = $0.1344

Electric Cost ($/yr) = 11.2 kW x 24 hr/day x 300 day/yr x $0.1344/kW-hr
Electric Cost = $10,830/yr

Total Annualized Cost (Data From: Annual Costs for Thermal and Catalytic Incinerators, Table 3.10 - OAQPS Control Cost Manual, Fourth Edition)

Total Annualized Cost				
Category	Sub-Category	Units	Unit Cost	Total Amount
Operating Labor				
	Operator	0.5 hr/shift	$25.92/hr	$3,888
	Supervisor		15% of operator	$583
Maintenance				
	Labor	0.5 hr/shift	$28.52/hr	$4,278
Materials	100% of Labor			$4,278
Utilities				
	Natural Gas			$650,548
	Electricity			$10,830
Indirect Annual Cost (IC)				
	Overhead	60% of Labor Cost	0.6 x $8,749	$5,249
	Administrative Charge	2% TCI	0.02 x $69,904	$1,398
	Property Taxes	1% TCI	0.01 x $69,904	$699
	Insurance	1% TCI	0.01 x $69,904	$699
Total Annual Cost				$682,450

[2] Energy Information Administration/Electric Power Monthly November 2009; Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State, 2007 - 2009

Controlled Cost per ton of emissions:

VOCs controlled = 20,000 lb-VOC/yr x 0.98 x 1 ton/2,000 lb = 9.8 ton-VOC/yr

Cost/ton of emissions ($/ton)= ($69,904/yr + $682,450) ÷ 9.8 ton
Cost/ton of emissions = $76,771/ton

The VOC cost effectiveness threshold is $17,500 per ton (per BACT Policy addendum dated 8/14/2008). Since the calculated controlled cost exceeds the cost effective value of $17,500/ton for VOC, a capture and incineration system is deemed not cost effective for this project.

(2) Carbon Adsorption:

Carbon adsorption occurs when air containing VOCs is blown through a carbon unit and the VOCs are adsorbed onto the surface of the cracks in the activated carbon particles.

Two main areas of cost are the cost of the device itself, replacement of the saturated carbon, and the operating cost of the carbon adsorption system. To size the vessel needed for a typical auto body repair shop, the carbon requirement must be analyzed:

Since carbon can adsorb 20% of its weight in VOCs, and the control efficiency of carbon adsorption is 95%, the total amount of carbon required per year can be determined as follows:

VOCs controlled = 20,000 lb-VOC/yr x 0.95 x 1 ton/2,000 lb = 9.5 ton-VOC/yr

Carbon required = 20,000 lb-VOC/yr x 0.95 x 1 lb-Carbon/0.2 lb-VOC =
95,000 lb-Carbon/yr

It's not reasonable to expect a small business to perform or pay for frequent carbon replacement and regeneration, so a single vessel with an annual carbon replacement schedule is proposed (100,000 lbs).

The cost of a carbon adsorption system sized for a typical 14,000 scfm enclosed automotive spray booth is estimated using the calculations from Chapter 12 of Air Pollution Control - A Design Approach by C. David Cooper and F.C. Alley.

Capital Cost:

The purchase price for a carbon-steel package adsorber, complete with fan, instrumentation and piping can be estimated from the following relationship equation:
$PEC\ (\$) = 50{,}000 + 0.277M_c^{1.200}$

Where PEC = Purchase price in 1977 dollars
M_c = mass of carbon in the system

$PEC = 50,000 + (0.277)(100,000^{1.200})$
$= 50,000 + (0.277)(1,000,000)$
$= 50,000 + (277,000)$

PEC = $327,000

Total Capital Investment:

The total capital investment is equal to 1.25 times the purchase cost. The sales tax and freight charges total 8% of the base equipment cost. Finally, adjusting from 1977 dollars to 2009 dollars, multiply by 2.75% inflation/yr (1.88).

Therefore,

TCI (2009 dollars) = ($327,000) x (1.25) x (1.08) x (1.88) = $829,926

Pursuant to the District's BACT Policy section X, (Revised 11/9/99), the annual cost of installing and maintaining the thermal oxidizer will be calculated as follows. The installed cost will be spread over the expected life of the carbon adsorption system which is estimated at 10 years and using the capital recovery equation (Equation 1). A 10% interest rate is assumed in this equation and the assumption will be made that the equipment has no salvage value at the end of the ten-year cycle.

Where:

A = Annualized total capital investment cost
P = present value of capital
CRF = capital recovery factor = $i(i+1)^n / (i+1)^n-1$
i = interest rate = 10%
n = useful lifetime of equipment in years = 10

$CRF = 0.1(0.1 +1)^{10} / (1+0.1)^{10} - 1 = 0.1627$
$A = P \times CRF$

A = $829,926 x 0.1627 = $135,028/yr

Operating Cost (Annualized Equipment Cost and Carbon Replacement Cost):

Assuming a 2009 price for carbon of $1.26/lb*
*Note: The cost estimate for bulk activated carbon was provided to the District by Siemens Water Technology Corp. on 2/10/2009.

Cost of carbon = 95,000 lb-Carbon/yr x $1.26/lb = $119,381/yr
Annualized cost of equipment = $135,028/yr
Total annual cost = $119,381/yr + $135,028/yr = $254,410/yr

This is the cost of purchasing carbon for the carbon adsorption system and the capital cost of the equipment itself. Additional energy costs for instrumentation and process equipment and labor costs exist but will not be evaluated.

Controlled Cost per ton of emissions:

As shown above, the amount of reduction from a carbon adsorption system will equal:

VOCs controlled = 20,000 lb-VOC/yr x 0.95 x 1 ton/2,000 lb = 9.5 ton-VOC/yr

Cost/ton of emissions ($/ton)= $254,410 $/yr ÷ 9.5 ton-VOC/yr = $26,780

Cost/ton of emission = $26,780/ton-VOC

The VOC cost effectiveness threshold is $17,500 per ton (per BACT Policy addendum dated 8/14/2008). Since the calculated controlled cost exceeds the cost effective value of $17,500/ton for VOC, a carbon adsorption system is deemed not cost effective for this project.

Step 5 - Select BACT

Capture and control is not cost effective, therefore, the next highest level of control, HVLP spray guns and low VOC coatings and solvents in compliance with District Rule 4612 is selected as BACT for this category and class of source.

Top-Down BACT Analysis for PM_{10} Emissions:

Step 1 - Identify all control technologies

The SJVAPCD BACT Clearinghouse guideline 4.2.1, (Last Updated xx/xx/xxxx), identifies achieved in practice and technologically feasible BACT for automotive spray painting operations, with or without a < 5.0 MMBtu heater for PM_{10} emissions as follows:

1) Spray booth with exhaust filters (achieved in practice).

Step 2 - Eliminate Technologically Infeasible Options

The above listed technology is technologically feasible.

Step 3 - Rank Remaining Control Technologies by Control Effectiveness

1) Spray booth with exhaust filters (95% control).

Step 4 - Cost Effectiveness Analysis

Only one control technology identified and this technology is achieved in practice, therefore, cost effectiveness analysis not necessary.

Step 5 - Select BACT for PM10

Spray booth with exhaust filters is selected as BACT for PM_{10} emissions is selected as BACT for this category and class of source.