SMAQMD BACT CLEARINGHOUSE

ACTIVE

CATEGORY Type: **COATING - AEROSPACE**

BACT Category: ≤ 7,404 lbs VOC/year

BACT Determination Number: 318	**BACT Determination Date:** 9/7/2022

Equipment Information

Permit Number: N/A -- Generic BACT Determination
Equipment Description: PAINT SPRAY BOOTH
Unit Size/Rating/Capacity: Minor Source BACT
Equipment Location:

BACT Determination Information

District Contact: Jeff Quok Phone No.: (279) 207-1145 email: jquok@airquality.org

ROCs	**Standard:**	See Description Below
	Technology Description:	1.Compliance with SMAQMD Rule 456 and aerospace coatings BACT VOC limits (see Tables 1-3 in BACT evaluation) 2.Use of an enclosed gun cleaner
	Basis:	Achieved in Practice
NOx	**Standard:**	For heaters < 1200° F: 20 ppm or 0.024 lb/MMBtu, for heaters ≥ 1200 ° F: 30 ppm or 0.036 lb/MMBtu
	Technology Description:	
	Basis:	Achieved in Practice
SOx	**Standard:**	No Standard
	Technology Description:	
	Basis:	
PM10	**Standard:**	Enclosed paint booth with use of dry filters and use of HVLP, properly maintained
	Technology Description:	
	Basis:	Achieved in Practice
PM2.5	**Standard:**	No Standard
	Technology Description:	
	Basis:	
CO	**Standard:**	For heaters: 400 ppm corrected to 3% O2
	Technology Description:	
	Basis:	Achieved in Practice
LEAD	**Standard:**	
	Technology Description:	
	Basis:	

Comments: For T-BACT see evaluation

Printed: 9/8/2022

SMAQMD BACT CLEARINGHOUSE

ACTIVE

CATEGORY Type: **COATING - AEROSPACE**

BACT Category: > 7,404 pounds VOC per year

BACT Determination Number: 319	**BACT Determination Date:** 9/7/2022

Equipment Information

Permit Number: N/A -- Generic BACT Determination
Equipment Description: PAINT SPRAY BOOTH
Unit Size/Rating/Capacity: Minor Source BACT
Equipment Location:

BACT Determination Information

District Contact: Jeff Quok Phone No.: (279) 207-1145 email: jquok@airquality.org

ROCs	**Standard:**	See Description Below
	Technology Description:	1.Compliance with SMAQMD Rule 456 and aerospace coatings BACT VOC limits 2.Use of enclosed gun cleaner 3.VOC control system with overall capture efficiency ≥90% by weight
	Basis:	Achieved in Practice
NOx	**Standard:**	For heaters < 1200° F: 20 ppm or 0.024 lb/MMBtu, for heaters ≥ 1200 ° F: 30 ppm or 0.036 lb/MMBtu
	Technology Description:	
	Basis:	Achieved in Practice
SOx	**Standard:**	No standard
	Technology Description:	
	Basis:	
PM10	**Standard:**	Enclosed paint booth with use of dry filters and use of HVLP, properly maintained
	Technology Description:	
	Basis:	Achieved in Practice
PM2.5	**Standard:**	No standard
	Technology Description:	
	Basis:	
CO	**Standard:**	For heaters: 400 ppm corrected to 3% O2
	Technology Description:	
	Basis:	Achieved in Practice
LEAD	**Standard:**	
	Technology Description:	
	Basis:	

Comments: For T-BACT see evaluation

Printed: 9/8/2022

777 12th Street, Ste. 300

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Sacramento, CA 95814

BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

DETERMINATION NOS.: 318 & 319

DATE: August 7, 2022

ENGINEER: Jeffrey Quok

Category/General Equip Description: Coating - Aerospace

Equipment Specific Description: Aerospace Coating Operation - Minor Source

Equipment Size/Rating: ≤ 7,404 lbs VOC/year (**BACT #318**)
> 7,404 lbs VOC/year (**BACT #319**)

Previous BACT Det. No.: #182 & #183

These BACT determinations will update Determinations #182 & #183 for paint spray booths used for aerospace coating. Aerospace components are the fabricated part, assembly of parts, or completed unit of any aircraft or space vehicle including integral equipment such as models, mock-ups, prototypes, molds, jigs, tooling, hardware jackets, and test coupons. These BACT determinations will also include stripping and solvent cleaning operations related to aerospace coating operations. Additionally, these determinations are being updated to include T-BACT for HAPs associated with VOC and PM emissions.

BACT/T-BACT ANALYSIS

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

The following control technologies are currently employed as BACT/T-BACT for an Aerospace coating operation by the following agencies and air pollution control districts:

US EPA

BACT
Source: EPA RACT/BACT/LAER Clearinghouse (See Attachment A)
RBLC ID: WA-0344 (10/07/2008)

Aerospace Surface Coating	
VOC	40.8 tons VOC/year emission limit, Compliance with 40 CFR Part 63, Subpart GG and Low VOC vapor pressure cleaning solvents and strippers with low pressure applicators or manual application for depainting

Aerospace Surface Coating	
NOx	No standard
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	No standard

T-BACT

The EPA BACT Clearinghouse did not contain any T-BACT determinations.

RULE REQUIREMENTS

40 CFR 63 Subpart GG – National Emission Standards for Hazardous Air Pollutants for Aerospace Manufacturing and Rework Facilities

This subpart applies to facilities that are engaged, either in part or in whole, in the manufacture or rework of commercial, civil, or military aerospace vehicles or components and that are major sources as defined in §63.2. Although this BACT determination is for minor source categories, these limits will be included for reference.

Subpart GG organic HAP and VOC coating limits are shown below.

Standards: Primers and Topcoats application operations

Coating Type	HAP Limit g/L (lb/gallon)(A)	VOC Limit g/L (lb/gallon)(A)
Primer		
A. General aviation rework facilities	540 (4.5)	540 (4.5)
B. Exterior primer to large commercial air craft components (parts or assemblies) or fully assembled	650 (5.4)	650 (5.4)
C. Large commercial aircraft at existing affected sources that produce fully assembled, large commercial aircraft	350 (2.9)	350 (2.9)
Topcoats		
A. General aviation rework facilities	540 (4.5)	540 (4.5)
B. Other	420 (3.5)	420 (3.5)
Self-Priming topcoats		
A. General aviation rework facilities	540 (4.5)	540 (4.5)
B. Other	420 (3.5)	420 (3.5)

(A) Coating limits for HAP are expressed in terms of mass (grams or pounds) of HAP per volume (liters or gallons) of coating less water. Coating limits for VOC are expressed in terms of mass (grams or pounds) of VOC per volume (liters or gallons) of coating less water and less exempt solvent.

Standards: Specialty Coating Application Operations

Coating Type	HAP Limit g/L (lb/gallon)[(A)]	VOC Limit g/L (lb/gallon)[(A)]
Ablative Coating	600 (5.0)	600 (5.0)
Adhesion Promoter	890 (7.4)	890 (7.4)
Adhesive Bonding Primers: Cured at 250 °F or below	850 (7.1)	850 (7.1)
Adhesive Bonding Primers: Cured above 250 °F	1030 (8.6)	1030 (8.6)
Commercial Interior Adhesive	760 (6.3)	760 (6.3)
Cyanoacrylate Adhesive	1,020 (8.5)	1,020 (8.5)
Fuel Tank Adhesive	620 (5.2)	620 (5.2)
Nonstructural Adhesive	360 (3.0)	360 (3.0)
Rocket Motor Bonding Adhesive	890 (7.4)	890 (7.4)
Rubber-based Adhesive	850 (7.1)	850 (7.1)
Structural Autoclavable Adhesive	60 (0.5)	60 (0.5)
Structural Nonautoclavable Adhesive	850 (7.1)	850 (7.1)
Antichafe Coating	660 (5.5)	660 (5.5)
Bearing Coating	620 (5.2)	620 (5.2)
Caulking and Smoothing Compounds	850 (7.1)	850 (7.1)
Chemical Agent-Resistant Coating	550 (4.6)	550 (4.6)
Clear Coating	720 (6.0)	720 (6.0)
Commercial Exterior Aerodynamic Structure Primer	650 (5.4)	650 (5.4)
Compatible Substrate Primer	780 (6.5)	780 (6.5)
Corrosion Prevention System	710 (5.9)	710 (5.9)
Cryogenic Flexible Primer	645 (5.4)	645 (5.4)
Cryoprotective Coating	600 (5.0)	600 (5.0)
Dry Lubricative Material	880 (7.3)	880 (7.3)
Electric or Radiation-Effect Coating	800 (6.7)	800 (6.7)
Electrostatic Discharge and Electromagnetic Interference (EMI) Coating	800 (6.7)	800 (6.7)
Elevated-Temperature Skydrol-Resistant Commercial Primer	740 (6.2)	740 (6.2)
Epoxy Polyamide Topcoat	660 (5.5)	660 (5.5)
Fire-Resistant (interior) Coating	800 (6.7)	800 (6.7)
Flexible Primer	640 (5.3)	640 (5.3)
Flight-Test Coatings: Missile or Single Use Aircraft	420 (3.5)	420 (3.5)

Coating Type	HAP Limit g/L (lb/gallon)(A)	VOC Limit g/L (lb/gallon)(A)
Flight-Test Coatings: All Other	840 (7.0)	840 (7.0)
Fuel-Tank Coating	720 (6.0)	720 (6.0)
High-Temperature Coating	850 (7.1)	850 (7.1)
Insulation Covering	740 (6.2)	740 (6.2)
Intermediate Release Coating	750 (6.3)	750 (6.3)
Lacquer	830 (6.9)	830 (6.9)
Bonding Maskant	1,230 (10.3)	1,230 (10.3)
Critical Use and Line Sealer Maskant	1,020 (8.5)	1,020 (8.5)
Seal Coat Maskant	1,230 (10.3)	1,230 (10.3)
Metallized Epoxy Coating	740 (6.2)	740 (6.2)
Mold Release	780 (6.5)	780 (6.5)
Optical Anti-Reflective Coating	750 (6.3)	750 (6.3)
Part Marking Coating	850 (7.1)	850 (7.1)
Pretreatment Coating	780 (6.5)	780 (6.5)
Rain Erosion-Resistant Coating	850 (7.1)	850 (7.1)
Rocket Motor Nozzle Coating	660 (5.5)	660 (5.5)
Scale Inhibitor	880 (7.3)	880 (7.3)
Screen Print Ink	840 (7.0)	840 (7.0)
Extrudable/Rollable/Brushable Sealant	280 (2.3)	280 (2.3)
Sprayable Sealant	600 (5.0)	600 (5.0)
Silicone Insulation Material	850 (7.1)	850 (7.1)
Solid Film Lubricant	880 (7.3)	880 (7.3)
Specialized Function Coating	890 (7.4)	890 (7.4)
Temporary Protective Coating	320 (2.7)	320 (2.7)
Thermal Control Coating	800 (6.7)	800 (6.7)
Wet Fastener Installation Coating	675 (5.6)	675 (5.6)
Wing Coating	850 (7.1)	850 (7.1)

(A) Coating limits for HAP are expressed in terms of mass (grams or pounds) of HAP per volume (liters or gallons) of coating less water. Coating limits for VOC are expressed in terms of mass (grams or pounds) of VOC per volume (liters or gallons) of coating less water and less exempt solvent.

Inorganic HAP emissions

An owner or operator of a new or existing primer, topcoat, or specialty coating application operation in which any of the coatings that are spray-applied and contain inorganic HAP shall comply with the following applicable requirements:

1. Apply these coatings in a booth, hangar, or portable enclosure in which air flow is directed downward onto or across the part or assembly being coated and exhausted through one or more outlets.
2. For new sources, control the air stream from this operation as follows:
   a) Before exhausting it to the atmosphere, pass the air stream through an air pollution control system that meets or exceeds the efficiency data points in the tables below:

THREE-STAGE ARRESTOR; LIQUID PHASE CHALLENGE FOR NEW SOURCES

Filtration Efficiency Requirement, %	Aerodynamic Particle Size Range, µm
>95	>2.0
>80	>1.0
>65	>0.42

THREE-STAGE ARRESTOR; SOLID PHASE CHALLENGE FOR NEW SOURCES

Filtration Efficiency Requirement, %	Aerodynamic Particle Size Range, µm
>95	>2.5
>85	>1.1
>75	>0.70

40 CFR 63 Subpart HHHHHH – National Emission Standards for Hazardous Air Pollutants for Paint Stripping and Miscellaneous Surface Coating Operations at Area Sources

This subpart applies to autobody refinishing operations, among other area sources, that include motor vehicles and mobile equipment spray-applied surface coating operations; and apply coatings that may potentially contain the target HAP compounds of chromium, lead, manganese, nickel, or cadmium. This subpart also applies to operations using MeCl for the removal of dried paint.

General Requirements

For paint stripping operations using MeCl:

A. Implement management practice to minimize the evaporative emissions of MeCl. The management practices must address practices in paragraphs 1 through 5, as applicable.
   1. Evaluate each application to ensure there is a need for paint stripping.
   2. Evaluate each application where a paint stripper containing MeCl is used to ensure that there is no alternative paint stripping technology that can be used.
   3. Reduce exposure of all paint strippers containing MeCl to the air.
   4. Optimize application conditions when using paint strippers containing MeCl to reduce MeCl evaporation.
   5. Practice proper storage and disposal of paint strippers containing MeCl.

For coatings that may potentially contain the target HAP compounds of chromium, lead, manganese, nickel, or cadmium:

1. All spray-applied coatings must be performed in a spray booth, preparation station, or

mobile enclosures that are fully enclosed with a full roof with four walls or complete side curtains. The enclosure must be ventilated at a negative pressure and equipped with a filter system that can achieve at least 98% capture efficiency.
2. Coatings must be applied with HVLP spray equipment, electrostatic application, airless spray gun, air-assisted airless spray gun, or an equivalent technology for which written approval has been obtained from the U.S. EPA.
3. Spray gun cleaning must be conducted such that an atomized mist or spray of gun cleaning solvent and paint residue is not created outside of a container that collects used cleaning solvent.
4. All new and existing personnel who spray-apply surface coatings must be trained in the proper application of surface coatings.
5. For new affected sources, submit an initial notification to EPA no later than 180 days after initial startup or July 7, 2008, whichever is later. For an existing affected source, submit the initial notification no later than January 11, 2010.

California Air Resource Board (CARB)

BACT
Source: CARB BACT Clearinghouse
CARB BACT Guidelines Search

The ARB BACT Clearinghouse did not contain any BACT determinations.

The CARB BACT Guidelines Search listed aerospace coating BACTs from BAAQMD and SJVAPCD which are covered in their respective BACT determination sections below.

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

RULE REQUIREMENTS
No Rules.

Sacramento Metropolitan AQMD

BACT
Source: SMAQMD BACT Clearinghouse (BACT #182 & #183)

BACT #182: Paint Spray Booths for Aerospace Coatings ≤ 4,785 lbs VOC/year	
VOC	1. Compliance with SMAQMD Rule 456 and aerospace coatings BACT VOC limits (see Tables 1-3 below) 2. Use of an enclosed gun cleaner
NOx	For heaters ≥ 325,000 Btu/hr, low NOx burner, 30 ppmvd @ 3% O2 or 0.036 lb/MMBtu/hr
SOx	No Standard
PM10	Enclosed paint booth with use of dry filters and use of HVLP, properly maintained
PM2.5	No Standard
CO	No Standard

BACT #183: Paint Spray Booths for Aerospace Coatings > 4,785 lbs VOC/year	
VOC	1. Compliance with SMAQMD Rule 456 and aerospace coatings BACT VOC limits (see Tables 1-3 below), and VOC control system with overall capture efficiency ≥ 90% by weight 2. Use of an enclosed gun cleaner
NOx	For heaters ≥ 325,000 Btu/hr, low NOx burner, 30 ppmvd @ 3% O2 or 0.036 lb/MMBtu/hr
SOx	No Standard
PM10	Enclosed paint booth with use of dry filters and use of HVLP, properly maintained
PM2.5	No Standard
CO	No Standard

T-BACT

T-BACT #182: Paint Spray Booths for Aerospace Coatings ≤ 4,785 lbs VOC/year	
HAP/ NPOC	1. Compliance with SMAQMD Rule 456 and aerospace coatings BACT VOC limits (see Tables 1-3 below), and VOC control system with overall capture efficiency ≥ 90% by weight 2. Compliance with 40 CFR Subpart 63 GG limits for volatile HAPs 3. Compliance with 40 CFR 63 Subpart HHHHHH for metals 4. For major sources of HAPs, compliance with 40 CFR 63, Subpart GG

T-BACT #183: Paint Spray Booths for Aerospace Coatings > 4,785 lbs VOC/year	
HAP/ NPOC	1. Compliance with SMAQMD Rule 456 and aerospace coatings BACT VOC limits (see Tables 1-3 below), and VOC control system with overall capture efficiency ≥ 90% by weight 2. Compliance with 40 CFR Subpart 63 GG limits for volatile HAPs 3. Compliance with 40 CFR 63 Subpart HHHHHH for metals 4. For major sources of HAPs, compliance with 40 CFR 63, Subpart GG

Table 1
Maximum VOC Content Excluding Water and Exempt Compounds
grams/liter

Coating Type	VOC Limits g/l	Source
Ablative	**420**	SDAPCD Rule 67.9 (A)
Adhesion Promoter	**250**	SCAQMD Rule 1124
Sealant Adhesion Promoter	**420**	SDAPCD Rule 67.9 (A)

Table 1 Maximum VOC Content Excluding Water and Exempt Compounds grams/liter		
Coating Type	**VOC Limits g/l**	**Source**
Adhesives		
A. Non-Structural	**250**	SJVAPCD Rule 4605, SCAQMD Rule 1124
B. Structural		
i. Autoclavable	**50**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
ii. Nonautoclavable	**250**	SDAPCD Rule 67.9
iii. Epoxy	**50**	SDAPCD Rule 67.9
C. Elastomeric	**600**	SMAQMD Rule 456
D. Fuel Tank Adhesives	**600**	SMAQMD Rule 456
E. All Other Adhesives	**250**	SDAPCD Rule 67.9
Adhesive Bonding Primers		
A. New Commercial Aircraft	**250**	SJVAPCD Rule 4605, SCAQMD Rule 1124
B. All Military Aircraft	**805 (B)**	SJVAPCD Rule 4605, SCAQMD Rule 1124
C. Remanufactured Commercial Aircraft Parts	**805 (B)**	SJVAPCD Rule 4605, SCAQMD Rule 1124
D. Sonic and Acoustic Applications	**805 (B)**	SJVAPCD Rule 4605, SCAQMD Rule 1124
E. Long Term	**250**	SJVAPCD Rule 4605, SCAQMD Rule 1124
F. Short Term	**250**	SJVAPCD Rule 4605, SCAQMD Rule 1124
Antichafe Coatings	**420**	SCAQMD Rule 1124
Bearing Coating	**620**	SJVAPCD Rule 4605, SCAQMD Rule 1124
Caulking And Smoothing Compounds	**850**	SJVAPCD Rule 4605, SDAPCD Rule 67.9,
Chemical Agent Resistant Coating	**420**	SDAPCD Rule 67.9 (A)
Conformal Coating	**600**	SMAQMD Rule 456
Electric/Radiation Effect Coatings	**600**	SMAQMD Rule 456
Fire Resistant Coatings		
A. Civilian (Interior)	**420**	SDAPCD Rule 67.9 (A)

Table 1 Maximum VOC Content Excluding Water and Exempt Compounds grams/liter		
Coating Type	**VOC Limits g/l**	**Source**
B. Commercial	**420**	SDAPCD Rule 67.9 (A)
C. Military	**420**	SDAPCD Rule 67.9 (A)
Flight Test Coatings Used On		
A. Missiles or Single-Use Target Craft	**420**	SJVAPCD Rule 4605, SMAQMD Rule 456, SDAPCD Rule 67.9
B. All Other Coatings	**420**	SMAQMD Rule 456
Fuel Tank Coatings		
A. General	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124
B. Epoxy	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124
High Temperature Coating	**420**	SMAQMD Rule 456
Impact Resistant Coating	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
Intermediate Release Coating	**420**	SDAPCD Rule 67.9 (A)
Lacquer	**420**	SDAPCD Rule 67.9 (A)
Maskants for bonding	**600**	SDAPCD Rule 67.9
Maskants – Chemical Processing	**250**	SCAQMD Rule 1124, SDAPCD Rule 67.9
Maskants – Chemical Milling		
A. Type I	**250**	SJVAPCD Rule 4605
B. Type II	**160**	SCAQMD Rule 1124, SDAPCD Rule 67.9
C. Photolithographic	**250**	SJVAPCD Rule 4605
D. Touch-up, Line Sealer Maskants	**250**	SJVAPCD Rule 4605
E. All Others	**250**	SJVAPCD Rule 4605
Metalized Epoxy Coating	**420**	SDAPCD Rule 67.9 (A)
Mold/Form Release	**762**	SMAQMD Rule 456
Optical Anti-Reflective Coating	**700**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
Part Marking Coating	**420**	SDAPCD Rule 67.9 (A)

Table 1 Maximum VOC Content Excluding Water and Exempt Compounds grams/liter		
Coating Type	**VOC Limits g/l**	**Source**
Pretreatment Coating	**780**	SJVAPCD Rule 4605, SMAQMD Rule 456, SDAPCD Rule 67.9
Primers		
A. General	**350**	SJVAPCD Rule 4605, SMAQMD Rule 456, SCAQMD Rule 1124, SDAPCD Rule 67.9, BAAQMD Rule 29
B. Commercial Exterior Aerodynamic Structure	**350**	SJVAPCD Rule 4605, SMAQMD Rule 456
C. Low-Solids Corrosion Resistant Primer	**350**	SCAQMD Rule 1124
D. Pretreatment Primer	**350**	SJVAPCD Rule 4605, SMAQMD Rule 456, SCAQMD Rule 1124, SDAPCD Rule 67.9
E. Pretreatment Wash Primer	**350**	SJVAPCD Rule 4605, SMAQMD Rule 456, SCAQMD Rule 1124, SDAPCD Rule 67.9
F. Sealant Bonding Primer	**350**	SJVAPCD Rule 4605, SMAQMD Rule 456, SCAQMD Rule 1124, SDAPCD Rule 67.9
G. Rain Erosion-Resistant Coating Compatible Primer	**350**	SJVAPCD Rule 4605, SMAQMD Rule 456, BAAQMD Rule 29
Rain Erosion Resistant Coating		
A. Fluoroelastomer	**690**	SDAPCD Rule 67.9
B. All Other	**600**	SMAQMD Rule 456
Rocket Motor Nozzle Coating	**420**	SDAPCD Rule 67.9 (A)
Scale Inhibitor	**880**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
Screen Print Ink	**420**	SDAPCD Rule 67.9 (A)
Sealant		
A. Fastener Sealant	**420**	SDAPCD Rule 67.9 (A)
B. Extrudable, Rollable or Brushable	**280**	SJVAPCD Rule 4605, SCAQMD Rule 1124
C. Hot Melt Sealant	**100**	SDAPCD Rule 67.9
D. Other	**600**	SMAQMD Rule 456, SCAQMD Rule 1124, SDAPCD Rule 67.9, BAAQMD Rule 29
Silicone Insulation Material	**420**	SDAPCD Rule 67.9 (A)

Table 1 Maximum VOC Content Excluding Water and Exempt Compounds grams/liter		
Coating Type	**VOC Limits g/l**	**Source**
Solid Film/Dry Lubricants		
A. Fastener Manufacturing		
i. Solid-Film Lubricant	**250**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
ii. Dry Lubricative Materials	**120**	SJVAPCD Rule 4605, SCAQMD Rule 1124
iii. Barrier Coating	**420**	SCAQMD Rule 1124
B. Fastener Installation		
i. Solid-Film Lubricant	**420**	SDAPCD Rule 67.9 (A)
ii. Dry Lubricative Materials	**420**	SDAPCD Rule 67.9 (A)
C. Nonfastener Manufacturing		
i. Solid-Film Lubricant	**880**	SJVAPCD Rule 4605, SMAQMD Rule 456, SCAQMD Rule 1124, SDAPCD Rule 67.9
ii. Dry Lubricative Materials	**675**	SJVAPCD Rule 4605, SCAQMD Rule 1124
Space Vehicle Coatings		
A. Electrostatic Discharge Protection	**800**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
B. Adhesives	**800**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
C. Other Space Vehicle Coatings	**1000**	SJVAPCD Rule 4605, SMAQMD Rule 456, SCAQMD Rule 1124, SDAPCD Rule 67.9
Specialized Function Coatings	**420**	SDAPCD Rule 67.9 (A)
Temporary Protective Coatings	**250**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9, BAAQMD Rule 29
Thermal Control Coating	**600**	SMAQMD Rule 456, SDAPCD Rule 67.9
Topcoats		
A. Acrylic lacquer for F-111	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
B. Barrier Topcoat	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124
C. Clear Topcoat	**420**	SMAQMD Rule 456

Table 1 Maximum VOC Content Excluding Water and Exempt Compounds grams/liter		
Coating Type	**VOC Limits g/l**	**Source**
D. Interior Topcoat	**340**	BAAQMD Rule 29
E. All Other	**420**	SJVAPCD Rule 4605, SMAQMD Rule 456, SCAQMD Rule 1124, SDAPCD Rule 67.9
Epoxy Polyamide	**420**	SDAPCD Rule 67.9 (A)
Unicoats	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
Wet Fastener Installation Coating	**620**	SMAQMD Rule 456
Wing Coating	**420**	SDAPCD Rule 67.9 (A)
Wire Coatings		
A. Electronic	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124
B. Anti-Wicking	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124
C. Pre-Bonding Etching	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124
D. Phosphate Ester Resistant Ink	**420**	SDAPCD Rule 67.9 (A)
E. Other	**420**	SCAQMD Rule 1124
All Other Coatings	**420**	SDAPCD Rule 67.9

(A) VOC limit is based on SDAPCD Rule 67.9's All Other Coatings Category.
(B) These coating categories would fall under SMAQMD's Rule 456 adhesive bonding agent (primer) category. However, SMAQMD's VOC content limit of 780 g/l has not been shown to be achieved in practice for adhesive bonding primers for military aircrafts, remanufactured commercial aircraft parts, and sonic and acoustic applications. Therefore, SJVAPCD's Rule 4605 and SCAQMD's Rule 1124 VOC content of 805 g/l will be used instead.

Table 2 Solvent Cleaning VOC Limits		
Type of Solvent Cleaning Operation	**VOC Content Limit grams of VOC/liter of material**	**Source**
Cleaning or surface preparation	200 g/l Or 45 mm Hg VOC Composite Partial Pressure	SMAQMD Rule 456, SJVAPCD Rule 4605, SCAQMD Rule 1124
Cleaning of application equipment	25 g/l	SMAQMD Rule 456

Table 3 Stripper VOC Limits		
	VOC Limit	**Source**
Strippers	300 g/l Or 9.5 mm Hg VOC Composite Partial Pressure	SMAQMD Rule 456, SJVAPCD Rule 4605, SCAQMD Rule 1124

RULE REQUIREMENTS:

Rule 456 Aerospace Assembly and Component Coating Operations (Last amended 10/23/2008)

VOC content of coatings for aerospace components: Except as provided in sections 110, 111, and 305 a person shall not apply to any aerospace component any coating that exceeds the following VOC contents limits as applied. The VOC content per volume of coating shall be determined pursuant to Section 502.1:

Coating Category (SMAQMD Rule 456 Definition)	**VOC Content Limit as Applied** g/l (lbs/gal)
Ablative	600 (5.0)
Adhesive	600 (5.0)
Adhesive Bonding Agent	780 (6.5)
Conformal	600 (5.0)
Electrostatic Discharge	612 (5.1)
Extreme Performance	750 (6.3)
Fire Resistant/Retardant	600 (5.0)
Flight Test	420 (3.5)
Fuel Tank	650 (5.4)
High Temperature	420 (3.5)
Maskants: Type I Type II All Others	 622 (5.2) 460 (1.3) 850 (7.1)
Mold Release	762 (6.4)
Part Marking	850 (7.1)
Pretreatment Wash Primer	780 (6.5)
Primer	350 (2.9)
Radiation Effect	600 (5.0)
Rain Erosion Resistant: Fluoroelastomer All Other	 800 (6.7) 600 (5.0)

Coating Category (SMAQMD Rule 456 Definition)	**VOC Content Limit as Applied** g/l (lbs/gal)
Sealant	600 (5.0)
Sealant Adhesion Promoter	760 (6.3)
Self-Priming Topcoat	420 (3.5)
Solid Film Lubricant	880 (7.3)
Space Vehicle: Electro Static Discharge All Other	 880 (7.3) 1000 (8.3)
Temporary Protective	250 (2.1)
Thermal Expansion Release	762 (6.4)
Thermocontrol	600 (5.0)
Topcoat: Acrylic Lacquer For F-111 All Other	 780 (6.5) 420 (3.5)
Wet Fastener Installation	620 (5.2)

VOC Content for coating removers (strippers): A person shall not use a coating remover (stripper) in aerospace coating operations which contains more than 300 grams of VOC per liter of material (2.5 pounds per gallon) or has a VOC composite partial vapor pressure of greater than 9.5 mmHg (0.18 psia) at 68°F (20°C). The VOC content shall be determined pursuant to Section 502.1. The VOC composite partial vapor pressure shall be determined pursuant to Section 502.6.

Application Equipment Requirement: A person shall or stationary source shall not apply any coating unless one of the following application methods is used:

a. Hand application equipment, such as a brush or roller
b. Dip coat
c. Flow coat
d. Roll coater
e. Electrodeposition
f. Electrostatic spray
g. High-volume low-pressure (HVLP) spray
h. Low-volume low-pressure (LVLP) spray
i. Any other equivalent method which has been approved in writing by the Air Pollution Control Officer and the U.S. Environmental Protection Agency

Surface Preparation and Cleaning, Application Equipment Cleanup, and Storage Requirements:

Any person subject to this rule shall comply with the following requirements:

a. Closed containers shall be used for the disposal of cloth, sponges, or paper used for surface preparation, cleanup, and coating removal.
b. A person shall not use VOC- containing materials for the cleaning of application equipment used in coating operations unless the VOC content of the material used does not exceed

25 grams/liter (0.21 pounds per gallon). The VOC content shall be determined pursuant to Section 502.1.

c. A person shall not perform cleaning or surface preparation unless the VOC content of the material used does not exceed 200 grams per liter (1.67 pounds/gallon) or the material has a VOC composite partial vapor pressure of 45 mmHg or less at 68°F (20°C), as determined by Sections 502.1 and 502.6.

Emission Control System Requirements: As an alternative to Section 301, 302 and 304 a person may use air pollution control equipment that has been permitted by the Air Pollution Control Officer, pursuant to Rule 201, General Permitting Requirements, that provides an overall system efficiency, as determined by Section 408, of not less than 85%.

Rule 419 – NOx from Miscellaneous Combustion Units (10/25/18)
This Rule applies to any miscellaneous combustion unit or cooking unit with a total rated heat input capacity of 2 MMBtu/hr or greater that is located at a major stationary source of NOx and to any miscellaneous combustion unit or cooking unit with a total rated heat input capacity of 5 MMBtu/hr or greater that is not located at a major stationary source of NOx.

The requirements of this rule do not apply to combustion equipment where its primary function is to operate as an air pollution control device including, but not limited to, afterburners, catalytic oxidizers, flares, thermal oxidizers, or vapor incinerators.

TABLE 1: Miscellaneous Combustion Units
Emission Limits Expressed As PPMV, corrected to 3% O_2

Equipment Category	**NOx Limit ppmv, corrected to 3% O_2 (lb/MMBtu)**		**CO Limit ppmv, corrected to 3% O_2 (lb/MMBtu)**
Gaseous Fuel-Fired Equipment	**Process Temperature**		**All Temperatures**
	< 1200°F	≥ 1200 °F	
Oven, Dehydrator, Dryer, Heater, or Kiln	30 (0.036)	60 (0.073)	400 (0.30)

South Coast AQMD

BACT

Source: SCAQMD BACT Guidelines for Non-Major Polluting Facilities, page 117 (2/5/2021)

Spray Booths – Other Types	
VOC	For booths with < 1170 lbs/month VOC Emissions 1. Compliance with applicable AQMD Regulation XI Rules For booths with ≥ 1170 lbs/month VOC Emissions 1. Compliance with applicable AQMD Regulation XI Rules, and VOC control system with ≥ 90% collection efficiency and ≥ 95% destruction efficiency; OR 2. Use of Super Compliant Materials (< 50 grams of VOC per liter of material); OR 3. Use of low-VOC materials resulting in an equivalent emission reduction For fully-enclosed down-draft type booths, with < 667 lbs/month VOC Emissions 1. Compliance with applicable AQMD Regulation XI Rules For fully-enclosed down-draft type booths, with ≥ 22 lbs/day VOC Emissions 1. Compliance with applicable AQMD Regulation XI Rules, and VOC control system with ≥ 90% collection efficiency and ≥ 95% destruction efficiency; OR 2. Use of Super Compliant Materials (< 50 grams of VOC per liter of material); OR 3. Use of low-VOC materials resulting in an equivalent emission reduction
NOx	For booths with make-up air unit or a heater 1. Compliance with Rule 1147
SOx	No standard
PM10	Dry filters or waterwash
PM2.5	No standard
CO	No standard

T-BACT

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

RULE REQUIREMENTS

Reg XI, Rule 1124 – Aerospace Assembly and Component Manufacturing Operations (Last amended 9/21/2001)

A person shall not apply to aerospace components any materials, including any VOC-containing materials added to the original material supplied by the manufacturer, which contain VOC in excess of the limits specified below:

Primers (SCAQMD Rule 1124 Definition)	**VOC Content Limit as Applied** g/l
General Primer	350
Low-Solids Corrosion Resistant Primer	350
Pretreatment Primer	780
Rain Erosion-Resistant Coating Compatible Primer	850
Adhesion Promoter	250
Adhesive Bonding Primer	
New Commercial Aircraft	250
All Military Aircraft	805
Remanufactured Commercial Aircraft Parts	805
Sonic And Acoustic Applications	805
Adhesive Bonding Primer	
Long Term	250
Short Term	250

Coatings (SCAQMD Rule 1124 Definition)	**VOC Content Limit as Applied** g/l
Topcoat	420
Clear Topcoat	520
Unicoat	420
Wing Coating	750
Impact Resistant Coating	420
High-Temperature Coating	850
Antichafe Coating	420
Rain Erosion-Resistant Coating	800
Conformal Coating	750
Optical Anti-Reflective Coating	700
Scale Inhibitor	880
Metallized Epoxy Coating	700
Electric Or Radiation Effect Coating	800
Temporary Protective Coating	250
Fuel Tank Coatings	420
Mold Release Coatings	780

Coatings (SCAQMD Rule 1124 Definition)	**VOC Content Limit as Applied** g/l
Topcoat	420
Flight Resistant Coatings	
Used On Missiles or Single Use Target Craft	650
All Other	840
Fire Resistant Coatings	
Commercial	650
Military	800
Wire Coatings	
Phosphate Ester Resistant Ink	925
Other	420
Space Vehicle Coatings	
Electrostatic Discharge Protection Coating	800
Other	1000

Adhesives (SCAQMD Rule 1124 Definition)	**VOC Content Limit as Applied** g/l
Non-structural adhesive	250
Structural Adhesive	
Autoclavable	50
Non-Autoclavable	850
Space Vehicle Adhesive	800
Fuel Tank Adhesive	620

Sealants (SCAQMD Rule 1124 Definition)	**VOC Content Limit as Applied** g/l
Fastener Sealant	675
Extrudable, Rollable or Brushable Sealant	280
Other	600

Maskants (SCAQMD Rule 1124 Definition)	**VOC Content Limit as Applied** g/l
For Chemical Processing	250
For Chemical Milling	
Type I	250
Type II	160
Photolithographic	850
Touch-Up, Line Sealer Maskants	750

Lubricants (SCAQMD Rule 1124 Definition)	**VOC Content Limit as Applied** g/l
Fastener Installation	
Solid-Film Lubricant	880
Dry Lubricative Materials	675
Fastener-Lubricative Coatings, Fastener Manufacturing	
Solid Film Lubricant	250
Dry Lubricative Materials	120
Barrier Coating	420
Non-Fastener Lubricative Coatings, Fastener Manufacturing	
Solid Film Lubricant	880
Dry Lubricative Materials	675

Cleaning Solvents and Strippers (SCAQMD Rule 1124 Definition)	**VOC Limit**
Cleaning Solvents	200 g/l or 45 mmHg VOC Composite Partial Pressure
Strippers	300 g/l or 9.5 mmHg VOC Composite Partial Pressure

Documents shall be provided to the Executive Officer or his designee demonstrating that unicoat is being used in lieu of the application of a primer and topcoat, and the applicant must receive written approval for the use of unicoat specifying the conditions of application form the Executive Officer or his designee.

Solvent Cleaning Operations; Storage and Disposal of VOC-Containing Materials

a. Cleaning of material application equipment and storage of solvent laden cloth shall comply with provisions of Rule 1171.
b. A person shall not atomize any solvent into open air.

Transfer efficiency
A person or facility shall not apply aerospace materials unless they are applied with properly operating equipment or controlled, according to operating procedure specified by the equipment manufacturer or the Executive officer or his designee, and by the use of one of the following methods:

a. Electrostatic application
b. Flow coater
c. Roll coater
d. Dip coater
e. High-volume, low-pressure (HVLP)
f. Hand application methods
g. Such other alternative application methods are demonstrated to the Executive Officer, using District-approved procedures, to be capable of achieving at least equivalent transfer efficiency to method (c)(3)(E) and for which written approval of the Executive Officer has been obtained
h. Approved air pollution control equipment under paragraph (c)(4)

Control Equipment
Owners and/or operators may comply with provisions of paragraphs (c)(1) and (c)(3) by using approved air pollution control equipment provided that the VOC emissions from such operations and/or materials are reduced in accordance with provisions (A) and (B)

(A) The control device shall reduce emissions from an emission collection system by at least 95%, by weight, or the output of the air pollution control device is less than 50 ppm calculated as carbon with no dilution.
(B) The owner/operator demonstrates that the system collects at least 90 percent, by weight, of the emissions generated by the sources of emissions.

Air Toxics
In lieu of complying with subdivisions (e), (f), (h), and (i) of Rule 1402 - Control of Toxic Air Contaminants from Existing Sources, a facility may submit a compliance plan to the District for the Executive Officer's approval within 180 days from the date of Health Risk Assessment approval that demonstrates how a toxicity-weighted emissions reduction efficiency of at least 90.0 percent for toxic organic solvents and at least 99.0 percent for toxic particulate matter emissions has been achieved and will be maintained in the future.

Reg XI, Rule 1171 – Solvent Cleaning Operations (Last amended 5/1/2009)
This rule applies to all persons who use solvent materials in solvent cleaning operations during the production, repair, maintenance, or servicing of parts, products, tools, machinery, equipment, or general work areas; all persons who store and dispose of these materials used in solvent cleaning operations; and all solvent suppliers who supply, sell, or offer for sale solvent cleaning materials for use in solvent cleaning operations.

Solvent Cleaning Activity	VOC limits g/l (lb/gal)
(A) Product cleaning during manufacturing process or surface preparation for coating, adhesive, or ink application	
(i) General	25 (0.21)
(ii) Electrical apparatus components & electronic components	100 (0.83)
(B) Repair and Maintenance Cleaning	
(i) General	25 (0.21)

Solvent Cleaning Activity	VOC limits g/l (lb/gal)
(ii) Electrical apparatus components & electronic components	100 (0.83)
(C) Cleaning of coatings or adhesives application equipment	25 (0.1)
(D) Cleaning of polyester resin application equipment	25 (0.21)

Reg XI, Rule 1147 – NOx Reductions from Miscellaneous Sources
(Last amended 5/6/2022)
This rule applies to ovens, dryers, dehydrators, heaters, kilns, calciners, furnaces, crematories, incinerators, heated pots, cookers, roasters, fryers, closed and open heated tanks and evaporators, distillation units, afterburners, degassing units, vapor incinerators, catalytic or thermal oxidizers, soil and water remediation units and other combustion equipment with nitrogen oxide emissions that require a District permit and are not specifically required to comply with a nitrogen oxide emission limit by other District Regulation XI rules.

However, Reg II, Rule 219 exempts combustion equipment firing natural gas, for which the maximum heat input is 2,000,000 Btu/hr or less. Therefore, in practice, the below standards only apply to booth heaters with a heat input greater than 2,000,000 Btu/hr.

Equipment Category	NOx Emission Limit PPM @ 3% O2, dry or pound/MMBtu heat input	
	Process Temperature	
	< 1200° F	≥ 1200 ° F
Oven, Dehydrator, Dryer, Heater, Kiln, Calciner, Cooker, Roaster, Furnace, or Heated Storage Tank	20 ppm or 0.024 lb/MMBtu	30 ppm or 0.036 lb/MMBtu

CO limit for all units is 1,000 ppmv at 3% O2.

San Joaquin Valley Unified APCD

BACT
Source: SJVUAPCD BACT Guideline
Guideline 4.2.6 Aerospace Parts Coating Operation (9/27/2021)

Aerospace Parts Coating Operation	
VOC	1. The use of coatings, cleaning materials, and solvents compliant with District Rule 4605 and use of HVLP application equipment (Achieved in Practice) 2. Thermal oxidation (Technologically feasible) 3. Catalytic Oxidation (Technologically feasible) 4. Carbon Adsorption (Technologically feasible)

Aerospace Parts Coating Operation	
NOx	No standard
SOx	No standard
PM10	Enclosed paint booth with dry filters and use of HVLP gun
PM2.5	No standard
CO	No standard

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

RULE REQUIREMENTS:

Rule 4605 – Aerospace Assembly and Component Coating Operations
(Amended 6/16/2011)

Coating Limits
An operator shall not apply any aerospace component any coating, aerosol or adhesive with a VOC content, less water and exempt compounds, as applied, in excess of the following limits:

Coating Category (SJVAPCD Rule 4605 Definition)	**VOC Regulatory Limit as Applied** g/l
Ablative	600
Adhesion Promoter	850
Adhesives	
A. Non-Structural	250
B. Structural	
I. Autoclavable	50
ii. Nonautoclavable	850
Adhesive Bonding Primers	
A. New Commercial Aircraft	250
B. All Military Aircraft	805
C. Remanufactured Commercial Aircraft Parts	805
D. Sonic And Acoustic Applications	805
E. Long Term	250
F. Short Term	250
Antichafe Coatings	600

Coating Category (SJVAPCD Rule 4605 Definition)	**VOC Regulatory Limit as Applied** g/l
Barrier Topcoat	420
Bearing Coating	620[(A)]
Caulking And Smoothing Compounds	850[(A)]
Chemical Agent Resistant Coating	550[(A)]
Clear Topcoat	520
Conformal Coating	750
Dry Lubricative Materials	
A. Fastener Manufacturing	120
B. Nonfastener Manufacturing	675
Electric/Radiation Effect Coatings	800
Electromagnetic Interference Coating	800[(A)]
Fastener Sealants	600[(B)]
Fire Resistant Coatings	
A. Civilian (Interior)	650
Flight Test Coatings Used On	
A. Missiles Or Single-Use Target Craft	420
B. All Others	600
Fuel Tank Coatings	
A. General	420
B. Epoxy	420
Fuel Tank Adhesives	620
High Temperature Coating	850
Impact Resistant Coating	420
Intermediate Release Coating	750[(A)]
Lacquer	830[(A)]
Maskants – Chemical Milling	250
Metalized Epoxy Coating	740[(A)]
Mold Release	780[(A)]

Coating Category (SJVAPCD Rule 4605 Definition)	**VOC Regulatory Limit as Applied** g/l
Optical Anti-Reflective Coating	700
Part Marking Coating	850[(A)]
Pretreatment Coating	780
Primers	
A. General	350
B. Commercial Exterior Aerodynamic Structure	350
Rain Erosion Resistant Coating	800
Rocket Motor Nozzle Coating	660[(A)]
Scale Inhibitor	880
Screen Print Ink	840
Sealant (Extrudable/Rollable/Brushable)	280[(C)]
Silicone Insulation Material	850[(A)]
Solid Film Lubricants	
A. Fastener Manufacturing	250
B. Fastener Installation	880
C. Nonfastener Manufacturing	880
Space Vehicle Coatings	
A. Electrostatic Discharge Protection	800
B. Other Space Vehicle Coatings	1,000
C. Adhesives	800
Specialized Function Coatings	890[(A)]
Temporary Protective Coatings	250
Thermal Control Coating	800[(A)]
Topcoats	420
Epoxy Polyamide	660[(A)]
Unicoats (Self Priming Topcoats)	420
Wet Fastener Installation Coating	675[(A)]

Coating Category (SJVAPCD Rule 4605 Definition)	**VOC Regulatory Limit as Applied** g/l
Wing Coating	750
Wire Coatings	
A. Electronic	420
B. Anti-Wicking	420
C. Pre-Bonding Etching	420
D. Phosphate Ester Resistant Ink	925

(A) Coatings that have been designated as “classified” by the Department of Defense or coatings that are used on space vehicles are exempt from these coating limits.
(B) Coatings that have been designated as “classified” by the Department of Defense or coatings that are used on space vehicles are exempt from the 600 g/l limit, but must comply with a 675 g/l limit.
(C) Coatings that have been designated as “classified” by the Department of Defense or coatings that are used on space vehicles are exempt from the 280 g/l limit, but must comply with a 600 g/l limit.

Surface Cleaning
No operator shall use a solvent for surface cleaning, clean-up, or jet engine or rocket engine gas path cleaning or flushing, not exempt under Section 4.0 of this rule, excluding stripping coatings or cleaning coating application equipment, unless:
1. The solvent contains less than 200 grams of VOC per liter (1.67 lb/gal) of material, as applied; or
2. The VOC composite vapor pressure of the solvent is less than or equal to 45 mm Hg (0.87 psia) at a temperature of 68°F.

Coating Application Equipment Cleaning
An operator shall not use VOC-containing materials to clean spray equipment used for the application of coatings, adhesives, or ink, unless an enclosed system or equipment that is proven to be equally effective at controlling emissions is used for cleaning. If an enclosed system is used, it must totally enclose spray guns, cups, nozzles, bowls, and other parts during washing, rinsing and draining procedures, and it must be used according to the manufacturer’s recommendations and must be closed when not in use.

Coating Strippers
No operator shall use or specify for use within the District a coating stripper unless it contains less than 300 grams of VOC per liter (2.5 lb/gal), as applied, or unless it has a VOC composite vapor pressure of 9.5 mm Hg (0.18 psia) or less at 68°F.

Storage and Disposal of VOC Containing Materials
An operator shall store or dispose of fresh or spent solvents, waste solvent cleaning materials such as cloth, paper, etc., coatings, adhesives, catalysts, and thinners in closed, nonabsorbent and non-leaking containers. The containers shall remain closed at all times except when depositing or removing the contents of the containers or when the container is empty.

Application Equipment Requirements
No operator shall apply coatings subject to the provisions of this rule unless one of the following methods is used:
1. Electrostatic application;
2. Electrodeposition;
3. High-Volume, Low-Pressure (HVLP) spray,
4. Flow coating;
5. Roll coating;
6. Dip Coating;
7. Brush Coating

VOC Emission Control System
As an alternative to meeting the requirements of Sections 5.1, 5.2, 5.3, or 5.5, an operator may install a VOC emission control system provided that the VOC emission control system meets all of the following requirements:
1. The VOC emission control system shall be approved by the APCO.
2. The VOC emission control system shall comply with the requirements of Section 5.6.3 through 5.6.5 during periods of emission-producing activities.
3. The VOC control system's VOC control device shall have a control efficiency of at least 95%, by weight.
4. The VOC emission control system's VOC collection device shall have a capture efficiency of at least 90%, by weight.
5. In no case shall compliance through the use of a VOC emission control system result in VOC emissions in excess of the VOC emissions which would result from the compliance with applicable provisions of Sections 5.1, 5.2, 5.3, or 5.5.

San Diego County APCD

BACT
Source: NSR Requirements for BACT (June 2011)

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

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

RULE REQUIREMENTS
Regulation 4, Rule 67.9 – Aerospace Coating Operations (Effective 4/30/97)
This rule is applicable to the coating, masking, bonding, and paint stripping of aerospace components in operations where aerospace coatings are used, to surface cleaning related to these aerospace coating operations, and to the cleanup of application equipment associated with these operations.

VOC Content Limits

Adhesives (SDAPCD Rule 67.9 Definition)	**VOC Content Limit as Applied** g/l
Adhesive Bonding Primers	
Structural	850
For Elastomers and Elastomeric	850
All Other Adhesive Bonding Primers	850
Adhesives	
Structural Autoclavable	50
Structural Epoxy	50
Structural Non-Autoclavable	250
Elastomeric	850
Fuel Tank Adhesives	620
All Other Adhesives	250

Coatings (SDAPCD Rule 67.9 Definition)	**VOC Content Limit as Applied** g/l
Antichafe Coatings	600
Bearing Coatings	620
Caulking And Smoothing Compounds	850
Conformal Coating	750
Dry Lubricative Materials	
Fasteners Lubrication	250
Non-Fasteners Lubrication	880
Electromagnetic Radiation Effect Coatings	800
Flight Test Coatings	
Use On Missiles, Targets	420
All Others	840
Form Release Agents	800
Fuel Tank Coatings	720

Coatings (SDAPCD Rule 67.9 Definition)	**VOC Content Limit as Applied** g/l
Heat Treatment Scale Inhibitors	880
High Temperature Coatings	850
High Temperature Resistant, Thermal Flash Resistant, Rain Erosion Resistant Coatings	800
Impact Resistant Coatings	420
Line Seal Maskants	650
Maskants For Bonding	600
Maskants For Chemical Milling:	
Type I Including Multi-Stage Maskants	250
Type II	160
All Other Chemical Milling	250
Maskants For Chemical Processing Including Multi-Stage Maskants	250
Optical Anti-Reflective Coatings	700
Pretreatment Coatings	780
Primers	350
Primers Compatible With Rain Erosion Coatings	850
Rain Erosion Resistant Coatings	690
Sealants	600
Hot Melt Sealants	100
Solid Film Lubricants	
Fasteners Lubrication	250
Non-Fasteners Lubrication	880
Space Vehicle Coatings	
Electrostatic Discharge Protection	800
Other Space Vehicle Coatings	1000
Adhesives	800
Temporary Protective Coatings	250
Thermoscontrol Coatings	600

Coatings (SDAPCD Rule 67.9 Definition)	**VOC Content Limit as Applied** g/l
Topcoats	420
Unicoats	420
Wet Fastener Installation Coatings	675
All Other Coatings	420

Application Methods
Except as provided in Subsections (b)(1), (b)(2), and (b)(5), a person shall not apply aerospace coatings in aerospace coating operations subject to this rule except by means of the following application methods:
1. Electrostatic spray application
2. Flow coat application
3. Dip coat application
4. Hand application methods
5. Airless spray application for use with maskants and temporary protective coatings only
6. High-volume low-pressure (HVLP) spray application
7. Other coating application methods that are demonstrated to have transfer efficiency at least equal to one of the above application methods, and which are used in such a manner that parameters under which they were tested are permanent features of the method. Such coating application methods shall be approved in writing by the Air Pollution Control Officer prior to use.

Stripping Operations
Except as provided in Subsection (b)(1), a person shall not use a stripper in aerospace coating operations unless the stripper:
1. Contains 400 grams VOC per liter of material or less as applied, or
2. Has a total vapor pressure of VOC of 9.5 mmHg or less at 68°F (20°C)

Surface Cleaning Operations
Except as provided in Subsections (b)(1) and (b)(8), a person shall not use a material for surface cleaning or surface preparation of an aerospace component unless:
1. The material contains 200 grams of VOC per liter of material or less as applied, or
2. The material has a total vapor pressure of VOC of 45 mmHg or less at 68°F (20°C), or
3. The material has an initial boiling point of 374°F (190°C) or greater at 760 mmHg total pressure, or
4. The aerospace component is cleaned in an enclosed cleaning material container which is only opened when assessing parts or adding surface cleaning materials.

Cleaning of Application Equipment
Except as provided in Subsection (b)(1), a person shall not clean aerospace coating application equipment unless the cleaning material:
1. Contains 200 grams or less of VOC per liter of material; or
2. Has a total vapor pressure of VOC of 20 mm Hg or less at 68°F (20°C); or
3. Has an initial boiling point of 190°C (374°F) or greater at 760 mm Hg total pressure; or
4. The cleaning material is flushed or rinsed through the application equipment in a contained manner that will minimize evaporation into the atmosphere; or

5. The application equipment or equipment parts are cleaned in a container which is open only when being accessed for adding, cleaning, or removing application equipment or when cleaning material is being added, provided the cleaned equipment or equipment parts are drained to the container until dripping ceases; or
6. A system is used that totally encloses the component parts being cleaned during washing, rinsing and draining; or
7. Other application equipment cleaning methods are used that are demonstrated to be as effective as any of the equipment described above in minimizing the emissions of VOC to the atmosphere, provided that the method has been tested and approved by the Air Pollution Control Officer prior to use.

Maskant Dip Coating Application Equipment

Except as provided in Subsections (b)(1), (b)(6), and (b)(7), a person shall not use a dip tank to apply Type I chemical milling maskants or maskants for chemical processing or component coatings of a multi-stage maskants to aerospace parts unless:

1. The dip tank is covered except when being accessed to add or remove materials; take samples; visually inspect the maskant level; clean, maintain or repair the tank; or apply maskant; and
2. The dip tank has a readily visible, permanent mark or line indicating the maximum allowable maskant level; and Regulation IV -13- Rule 67.9
3. The dip tank has a freeboard ratio greater than or equal to 0.5; and
4. Maskant agitation is achieved by means other than gas agitation; and
5. Material is added to the dip tank by means of submerged filling; and
6. Any dip tank lip exhaust ventilation system with an inlet located below the cover of the maskant application dip tank is turned off and the ventilation duct closed when the maskant application dip tank is covered.

Disposal of Waste Materials into the Air

A person shall not use spray application equipment or any other means to dispose of waste coatings, coating components, surface preparation materials, or cleaning materials into the air, except when momentarily purging coating material from a spray applicator cap immediately before or after applying the coating material.

Control Equipment

Any person subject to this rule may comply with the provisions of Subsections (d)(1) through (d)(6) by using air pollution control equipment which has been approved in writing by the Air Pollution Control Officer provided that the air pollution control equipment:
Has been installed in accordance with an Authority to Construct; and

1. Includes an emission collection system which captures organic gaseous emissions. Including emissions associated with applicable coating, equipment cleaning, and surface preparation operations, and transports the captured emissions to an air pollution control device; and
2. Has a combined emissions capture and control device efficiency of at least 85% by weight.

Bay Area AQMD

BACT

Source: BAAQMD BACT Guideline 161.1.1 (9/6/91)
BAAQMD BACT Guideline 161.1.2 (9/6/91)

Spray Booths – Coating of Aerospace Components	
POC (A)	For < 25 lb VOC/day emissions 1. Coatings with VOC content and transfer efficiency complying with Reg. 8, Rule 29, and emissions controlled to overall capture/destruction efficiency ≥ 90% by weight (Technologically Feasible); or 2. Compliance with Reg. 8, Rule 29 (Achieved in Practice) For ≥ 25 lb VOC/day emissions 1. Coatings with VOC content less than and transfer efficiency greater than that required by Reg. 8, Rule 29, and emissions controlled to overall capture/destruction efficiency ≥ 90% by weight (Technologically Feasible); or 2. Coatings with VOC content and transfer efficiency complying with Reg. 8, Rule 29, and emission controlled to overall capture/destruction efficiency ≥ 90% by weight (Achieved in Practice)
NOx	No standard
SOx	No standard
PM10	Dry filters or waterwash, properly maintained
PM2.5	No standard
CO	No standard

(A) POC = Precursor Organic Compounds. POC is considered equivalent to SMAQMD definition of VOC (under Rule 101).

T-BACT

Source: BAAQMD BACT Guideline 161.1.1 (9/6/91)
BAAQMD BACT Guideline 161.1.2 (9/6/91)

Spray Booths – Coating of Aerospace Components	
NPOC (A)	For < 25 lb VOC/day emissions 1. Coatings with VOC content and transfer efficiency complying with Reg. 8, Rule 29, and emissions controlled to overall capture/destruction efficiency ≥ 90% by weight (Technologically Feasible. Generally considered cost effective if ≥ 25 lb/VOC/day); or 2. Compliance with Reg. 8, Rule 29 (Achieved in Practice) For ≥ 25 lb VOC/day emissions 1. Coatings with VOC content less than and transfer efficiency greater than that required by Reg. 8, Rule 29, and emissions controlled to overall capture/destruction efficiency ≥ 90% by weight (Technologically Feasible. Generally considered cost effective if ≥ 25 lb/VOC/day); or 2. Coatings with VOC content and transfer efficiency complying with Reg. 8, Rule 29, and emission controlled to overall capture/destruction efficiency ≥ 90% by weight (Achieved in Practice)

(A) NPOC = Non-Precursor Organic Compounds. NPOC are select exempt compounds that are not considered VOC in SMAQMD rules (under Rule 101).

RULE REQUIREMENTS:

Reg 8, Rule 29 – Aerospace Assembly and Component Coating Operations (12/20/1995)

Coating Limits
A person shall not apply to aerospace components any coating with a VOC content in excess of the following limits, expressed as grams VOC per liter (lbs/gal) of coating as applied, excluding water, unless emissions to the atmosphere are controlled to an equivalent level by air pollution abatement equipment with an abatement device efficiency of at least 85% that meets the requirements of Regulation 2, Rule 1:

Coating Category (BAAQMD Rule 29 Definition)	**VOC Content Limit as Applied** g/l (lbs/gal)
Primer	350 (2.9)
Adhesive Bonding Primer	850 (7.1)
Interior Topcoat	340 (2.8)
Electric Or Radiation Effect Coating	800 (6.7)
Extreme Performance Interior Topcoat	420 (3.5)
Fire Insulation Coating	600 (5.0)
Fuel Tank Coating	720 (6.0)
High-Temperature Coating	720 (6.0)
Sealant	600 (5.0)
Self-Priming Topcoat	420 (3.5)
Topcoat	420 (3.5)
Pretreatment Wash Primer	420 (3.5)
Sealant Bonding Primer	720 (6.0)
Temporary Protective Coating	250 (2.1)

Solvent Evaporative Loss Minimization
Any person using organic solvent for surface preparation and cleanup or mixing, using or disposing of coating or stripper containing organic solvent:

1. Shall use closed containers for the storage or disposal of cloth or paper used for solvent surface preparation and cleanup
2. Shall not use organic compounds for the cleanup of spray equipment including paint lines unless equipment for collecting the cleaning compounds and minimizing their evaporation to the atmosphere is used.
3. Shall close containers of stripper subject to this Rule, coating, catalyst, thinner, or

solvent when in use.

Stripper limitations
A person shall not use a stripper unless it complies with one or both of the following:
1. The stripper contains less than 400 g/l (3.3 lbs/gal) of precursor organic compounds.
2. The stripper has a true vapor pressure of less than 10 mmHg (0.19 psia) at actual usage temperature.

Maskant for chemical processing limitations
A person shall not apply any maskant for chemical processing to aerospace components unless:
1. The VOC emissions from coating operations are reduced by 85%, or
2. The coating contains less than 600 grams of VOC per liter of coating excluding water, as applied.

Spray application equipment limitations:
A person who uses spray application equipment to apply coatings to aerospace components within the District shall use one or more of the following high transfer efficiency application methods, unless emissions to the atmosphere are controlled by an approved emission control system with an overall abatement efficiency of at least 85%.
1. High-volume, Low-pressure (HVLP) spray, operated in accordance with manufacturer's recommendations, or
2. Electrostatic spray, operate in accordance with manufacturer's recommendations, or
3. Detailing gun, or

Any other coating spray application which has been demonstrated to the satisfaction of the APCO to achieve an equivalent transfer efficiency compared to the spray application methods listed in Subsections 310.1 through 310.3. Prior written approval from the APCO shall be obtained for each alternative method used.

Summary of Achieved in Practice Control Technologies

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

SUMMARY OF ACHIEVED IN PRACTICE CONTROL TECHNOLOGIES	
VOC	<u>For booths with no add-on control[(A)]</u> 1. Compliance with SMAQMD Rule 456 and aerospace BACT #182 & #183 VOC limits and use of enclosed gun cleaner [SMAQMD] 2. Compliance with SCAQMD Regulation XI Rules 1124, 1147, & 1171 [SCAQMD] 3. The use of coatings, cleaning materials, and solvents compliant with SJVAPCD District Rule 4605 and use of HVLP application equipment [SJVAPCD] 4. Compliance with SDAPCD Rule 67.9 [SDAPCD] 5. Compliance with Reg. 8, Rule 29 [BAAQMD] 6. 40.8 tons/year, compliance with 40 CFR Part 63, Subpart GG and low VOC vapor pressure cleaning solvents and strippers with low pressure applicators or manual application for depainting [US EPA, RBLC ID: WWA-0344] <u>For booths with add-on control[(A)]</u> 1. Compliance with SMAQMD Rule 456 and aerospace coatings BACT #182 & #183 VOC limits, use of enclosed gun cleaner, and VOC control system with overall capture efficiency ≥ 90% by weight [SMAQMD] 2. Coatings with VOC content and transfer efficiency complying with Reg. 8, Rule 29, and emission controlled to overall capture efficiency ≥ 90% by weight [BAAQMD] 3a. Compliance with applicable AQMD Regulation XI Rules 1124, 1147, & 1171, and VOC control system with ≥ 90% collection efficiency and ≥ 95% destruction efficiency; OR [SCAQMD] 3b. Use of Super Compliant Materials (< 50 grams of VOC per liter of material); OR [SCAQMD] 3c. Use of low-VOC materials resulting in an equivalent emission reduction [SCAQMD] 4. The use of coatings, cleaning materials, and solvents compliant with SJVAPCD District Rule 4605 and use of HVLP application equipment [SJVAPCD] 5. Compliance with SDAPCD Rule 67.9 [SDAPCD] 6. 40.8 tons VOCs/year, compliance with VOC limits of 40 CFR Part 63, Subpart GG and low VOC vapor pressure cleaning solvents and strippers with low pressure applicators or manual application for depainting [US EPA, RBLC ID: WWA-0344]
NOx	1. For heaters < 1200° F: 20 ppm or 0.024 lb/MMBtu, for heaters ≥ 1200 ° F: 30 ppm or 0.036 lb/MMBtu. [SCAQMD] 2. For heaters ≥ 325,000 Btu/hr, low NOx burner, 30 ppmvd @ 3% O2 or 0.036 lb/MMBtu/hr [SMAQMD] 3. No Standard – [SDCAPCD, BAAQMD, SJVAPCD, US EPA]
SOx	1. No Standard – [SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD]

SUMMARY OF ACHIEVED IN PRACTICE CONTROL TECHNOLOGIES	
PM10	1. Enclosed paint booth with use of dry filters and use of HVLP, properly maintained [SMAQMD, SJVAPCD] 2. Dry filters or waterwash, properly maintained [BAAQMD] 3. Dry filters or waterwash [SCAQMD] 4. No Standard [SMAQMD, SDAPCD]
PM2.5	1. No Standard – [SMAQMD, SCAQMD, SDAPCD, BAAQMD, SJVAPCD]
CO	1. For heaters: 400 ppm corrected to 3% O_2 – [SMAQMD] 2. For heaters: 1,000 ppm corrected to 3% O_2 – [SCAQMD]
HAP/VHAP (T-BACT)	1a. Compliance with SMAQMD Rule 456 and aerospace coatings BACT VOC limits (see Tables 1-3 below), and VOC control system with overall capture efficiency ≥ 90% by weight 1b. Compliance with 40 CFR Subpart 63 GG limits for volatile HAPs 1c. For major sources of HAPs, compliance with 40 CFR 63, Subpart GG [SMAQMD] 2. Coatings with VOC content and transfer efficiency complying with Reg. 8, Rule 29, and emission controlled to overall capture/destruction efficiency ≥ 90% by weight [BAAQMD] 3. Compliance with volatile HAP limits of 40 CFR 63 Subpart GG [US EPA] and metal HAP standards of 40 CFR 63 Subpart HHHHHH [US EPA]. For major sources, full compliance with GG.
Inorganic HAP (T-BACT)	1. Compliance with 40 CFR 63 Subpart HHHHHH for metals – Spray booth filter system with 98% capture efficiency of paint overspray, HVLP spray equipment or equivalent technology [US EPA] 2. For major sources of HAPs, compliance with 40 CFR 63, Subpart GG [US EPA]

(A) The BACT thresholds for add-on control of 22 lbs/day, 25 lbs/day, and 1,170 lbs/month from BAAQMD and SCAQMD, have been converted to annual thresholds (9,125 lb/yr for BAAQMD and 8,030 lbs/year and 14,040 lb/yr for SCAQMD) since cost effectiveness calculations are based on annual cost and not daily or monthly. These thresholds are higher than SMAQMD's current add-on control threshold of 4,785 lbs/year.

SMAQMD has found that coating processes exempted in SMAQMD's Rule 456 can't be achieved in practice using the previously determined BACT VOC limits that combined other air district rule VOC limits. The combined BACT VOC limits also did not take into account the exemptions listed in the respective air district rules. Therefore, SMAQMD's BACT will be updated to include compliance with Rule 456 which will allow the use of exemptions to apply to BACT limits.

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.

Pollutant	Technologically Feasible Alternatives
VOC	1. Carbon Adsorber 2. Thermal Oxidizer
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

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:

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

Cost Effectiveness Analysis Summary

A previous cost effectiveness analysis determined that 4,785 lb VOC/year was the highest allowable uncontrolled emission rate that did not require any add-on control devices. The EPA has updated the cost manual for incinerators/oxidizers in 11/2017 and carbon adsorbers in 10/2018. Therefore, this BACT determination will revisit this limit in accordance with the updated EPA OAQPS Air Pollution Control Cost Manual. The electricity (13.80 cents/kWh) and natural gas (8.04 dollars/1,000 cubic feet) rates were based on a commercial application

as approved by the District. The life of the equipment was based on the EPA cost manual recommendation. The interest rate was based on the previous 6-month average interest rate on United States Treasury Securities (based on the life of the equipment) and addition of two percentage points and rounding up to the next higher integer rate. The labor (Occupation Code 51-8099: Plant and System Operators - Other) and maintenance (Occupation Code 49-2094: electrical and electronics commercial and industrial equipment repairers) rates were based on data from the Bureau of Labor Statistics.

Carbon Adsorber:
As shown in Attachment C, the cost effectiveness for the add on carbon adsorber system to control VOC was calculated to be **$17,503.69/ton** (see attached Paint Spray Booth for Plastic Coating Cost Effectiveness Analysis). The following basic parameters were used in the analysis.

Equipment Life = 15 years

Total Capital Investment = $307,618

Direct Annual Cost = $13,549 per year

Indirect Annual Cost = $46,994 per year

Total Annual Cost = $58,344 per year

VOC Removed = 3 tons per year

Cost of VOC Removal = $17,509.23 per ton reduced

A detailed calculation of the cost effectiveness for VOC removal with a carbon absorber is shown in Attachment C. Uncontrolled VOC emissions of 7,404 lb/year or greater is the cost-effective threshold for control equipment using carbon absorption control technology

Thermal Oxidizer:

Equipment Life = 20 years

Direct Cost = $193,478

Direct Annual Cost = $73,514 per year

Indirect Annual Cost = $134,493 per year

Total Annual Cost = $208,007 per year

VOC Removed = 12.1 tons per year

Cost of VOC Removal = $17,657 per ton reduced

A detailed calculation of the cost effectiveness for VOC removal with a thermal oxidizer is shown in Attachment C. Uncontrolled VOC emissions of 23,799 lb/year or greater is the cost-effective threshold for control equipment using thermal oxidation control technology.

Conclusion: In this analysis, different emission operating levels are presented with the corresponding total cost per ton of VOC controlled using either a carbon adsorption control or

a thermal oxidizer. Uncontrolled VOC emission level of 7,404 lb per year or greater must be reached in order for the carbon adsorption control option to be cost effective. Uncontrolled VOC emission level of 24,799 lb per year or greater must be reached in order for a thermal oxidizer to be cost effective. The emissions levels for the cost effectiveness of controls is based on the District cost effective limit for VOC of $17,500 per ton controlled.

With EPA's new cost data, the highest allowable uncontrolled emission rate to not require add-on control devices will be updated to 7,404 lb/year based on the cost of carbon adsorption.

C. SELECTION OF BACT:

Based on the review of SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD, ARB, and EPA BACT Clearinghouses and cost effectiveness determinations, BACT for VOC, PM10, and PM2.5 will be the following:

BACT #318 for Paint Spray Booths for Aerospace Coatings ≤ 7,404 pounds VOC per year		
Pollutant	**Standard**	**Source**
VOC	1. Compliance with SMAQMD Rule 456(A) and aerospace coatings BACT VOC limits (see Tables 1-3 below) 2. Use of an enclosed gun cleaner	SMAQMD
NOx	For heaters < 1200° F: 20 ppm or 0.024 lb/MMBtu, for heaters ≥ 1200 ° F: 30 ppm or 0.036 lb/MMBtu	SCAQMD
SOx	No standard	SMAQMD, SCAQMD, SDAPCD, BAAQMD, SJVAPCD
PM10	1. Enclosed paint booth with use of dry filters and use of HVLP, properly maintained	SMAQMD, SJVAPCD
PM2.5	No standard	SMAQMD, SCAQMD, SDAPCD, BAAQMD, SJVAPCD
CO	For heaters: 400 ppm corrected to 3% O_2	SMAQMD

(A) Compliance with SMAQMD Rule 456 includes use of exemptions of this rule. If the operation qualifies for exemption of VOC content limits the BACT VOC content limits are exempt as well.

T-BACT #318 for Paint Spray Booths for Aerospace Coatings ≤ 7,404 pounds VOC per year		
Pollutant	**Standard**	**Source**
Organic HAP/VHAP	1. Compliance with SMAQMD Rule 456(A) and aerospace coatings BACT VOC limits (see Tables 1-3 below), and VOC control system with overall capture efficiency ≥ 90% by weight 2. Compliance with 40 CFR Subpart 63 GG limits for volatile HAPs 3. For major sources of HAPs, compliance with 40 CFR 63, Subpart GG	SMAQMD, USEPA
Inorganic HAP	1. Compliance with 40 CFR 63 Subpart HHHHHH for metals – Spray booth filter system with 98% capture efficiency of paint overspray, HVLP spray equipment or equivalent technology 2. For major sources of HAPs, compliance with 40 CFR 63, Subpart GG	USEPA

(A) Compliance with SMAQMD Rule 456 includes use of exemptions of this rule. If the operation qualifies for exemption of VOC content limits the BACT VOC content limits are exempt as well.

BACT #319 for Paint Spray Booths for Aerospace Coatings > 7,404 pounds VOC per year		
Pollutant	**Standard**	**Source**
VOC	1. Compliance with SMAQMD Rule 456(A) and aerospace coatings BACT VOC limits (see Tables 1-3 below) 2. Use of enclosed gun cleaner 3. VOC control system with overall capture efficiency ≥ 90% by weight	SMAQMD
NOx	For heaters < 1200° F: 20 ppm or 0.024 lb/MMBtu, for heaters ≥ 1200 ° F: 30 ppm or 0.036 lb/MMBtu	SCAQMD
SOx	No standard	SMAQMD, SCAQMD, SDAPCD, BAAQMD, SJVAPCD
PM10	Enclosed paint booth with use of dry filters and use of HVLP, properly maintained	SJVAPCD, SCAMQD, SMAQMD, SDAPCD
PM2.5	No standard	SMAQMD, SCAQMD, SDAPCD, BAAQMD, SJVAPCD
CO	For heaters: 400 ppm corrected to 3% O_2	SMAQMD

(A) Compliance with SMAQMD Rule 456 includes use of exemptions of this rule. If the operation qualifies for exemption of VOC content limits the BACT VOC content limits are exempt as well.

T-BACT #319 for Paint Spray Booths for Aerospace Coatings > 7,404 pounds VOC per year		
Pollutant	**Standard**	**Source**
Organic HAP/VHAP	1. Compliance with SMAQMD Rule 456(A) and aerospace coatings BACT VOC limits (see Tables 1-3 below), and VOC control system with overall capture efficiency ≥ 90% by weight 2. Compliance with 40 CFR Subpart 63 GG limits for volatile HAPs 3. For major sources of HAPs, compliance with 40 CFR 63, Subpart GG	SMAQMD, USEPA
Inorganic HAP	1. Compliance with 40 CFR 63 Subpart HHHHHH for metals – Spray booth filter system with 98% capture efficiency of paint overspray, HVLP spray equipment or equivalent technology 2. For major sources of HAPs, compliance with 40 CFR 63, Subpart GG	USEPA

(A) Compliance with SMAQMD Rule 456 includes use of exemptions of this rule. If the operation qualifies for exemption of VOC content limits the BACT VOC content limits are exempt as well.

Table 1 Maximum VOC Content Excluding Water and Exempt Compounds grams/liter		
Coating Type	**VOC Limits g/l**	**Source**
Ablative	**420**	SDAPCD Rule 67.9 (A)
Adhesion Promoter	**250**	SCAQMD Rule 1124
Sealant Adhesion Promoter	**420**	SDAPCD Rule 67.9 (A)
Adhesives		
A. Non-Structural	**250**	SJVAPCD Rule 4605, SCAQMD Rule 1124
B. Structural		
i. Autoclavable	**50**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
ii. Nonautoclavable	**250**	SDAPCD Rule 67.9
iii. Epoxy	**50**	SDAPCD Rule 67.9
C. Elastomeric	**600**	SMAQMD Rule 456
D. Fuel Tank Adhesives	**600**	SMAQMD Rule 456
E. All Other Adhesives	**250**	SDAPCD Rule 67.9

Table 1 Maximum VOC Content Excluding Water and Exempt Compounds grams/liter		
Coating Type	**VOC Limits g/l**	**Source**
Adhesive Bonding Primers		
A. New Commercial Aircraft	**250**	SJVAPCD Rule 4605, SCAQMD Rule 1124
B. All Military Aircraft	**805 (B)**	SJVAPCD Rule 4605, SCAQMD Rule 1124
C. Remanufactured Commercial Aircraft Parts	**805 (B)**	SJVAPCD Rule 4605, SCAQMD Rule 1124
D. Sonic and Acoustic Applications	**805 (B)**	SJVAPCD Rule 4605, SCAQMD Rule 1124
E. Long Term	**250**	SJVAPCD Rule 4605, SCAQMD Rule 1124
F. Short Term	**250**	SJVAPCD Rule 4605, SCAQMD Rule 1124
Antichafe Coatings	**420**	SCAQMD Rule 1124
Bearing Coating	**620**	SJVAPCD Rule 4605, SCAQMD Rule 1124
Caulking And Smoothing Compounds	**850**	SJVAPCD Rule 4605, SDAPCD Rule 67.9,
Chemical Agent Resistant Coating	**420**	SDAPCD Rule 67.9 (A)
Conformal Coating	**600**	SMAQMD Rule 456
Electric/Radiation Effect Coatings	**600**	SMAQMD Rule 456
Fire Resistant Coatings		
A. Civilian (Interior)	**420**	SDAPCD Rule 67.9 (A)
B. Commercial	**420**	SDAPCD Rule 67.9 (A)
C. Military	**420**	SDAPCD Rule 67.9 (A)
Flight Test Coatings Used On		
A. Missiles or Single-Use Target Craft	**420**	SJVAPCD Rule 4605, SMAQMD Rule 456, SDAPCD Rule 67.9
B. All Other Coatings	**420**	SMAQMD Rule 456
Fuel Tank Coatings		
A. General	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124
B. Epoxy	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124
High Temperature Coating	**420**	SMAQMD Rule 456

Table 1 **Maximum VOC Content Excluding Water and Exempt Compounds** **grams/liter**		
Coating Type	**VOC Limits g/l**	**Source**
Impact Resistant Coating	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
Intermediate Release Coating	**420**	SDAPCD Rule 67.9 (A)
Lacquer	**420**	SDAPCD Rule 67.9 (A)
Maskants for bonding	**600**	SDAPCD Rule 67.9
Maskants – Chemical Processing	**250**	SCAQMD Rule 1124, SDAPCD Rule 67.9
Maskants – Chemical Milling		
A. Type I	**250**	SJVAPCD Rule 4605
B. Type II	**160**	SCAQMD Rule 1124, SDAPCD Rule 67.9
C. Photolithographic	**250**	SJVAPCD Rule 4605
D. Touch-up, Line Sealer Maskants	**250**	SJVAPCD Rule 4605
E. All Others	**250**	SJVAPCD Rule 4605
Metalized Epoxy Coating	**420**	SDAPCD Rule 67.9 (A)
Mold/Form Release	**762**	SMAQMD Rule 456
Optical Anti-Reflective Coating	**700**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
Part Marking Coating	**420**	SDAPCD Rule 67.9 (A)
Pretreatment Coating	**780**	SJVAPCD Rule 4605, SMAQMD Rule 456, SDAPCD Rule 67.9
Primers		
A. General	**350**	SJVAPCD Rule 4605, SMAQMD Rule 456, SCAQMD Rule 1124, SDAPCD Rule 67.9, BAAQMD Rule 29
B. Commercial Exterior Aerodynamic Structure	**350**	SJVAPCD Rule 4605, SMAQMD Rule 456
C. Low-Solids Corrosion Resistant Primer	**350**	SCAQMD Rule 1124
D. Pretreatment Primer	**350**	SJVAPCD Rule 4605, SMAQMD Rule 456, SCAQMD Rule 1124, SDAPCD Rule 67.9

Table 1 Maximum VOC Content Excluding Water and Exempt Compounds grams/liter		
Coating Type	**VOC Limits g/l**	**Source**
E. Pretreatment Wash Primer	**350**	SJVAPCD Rule 4605, SMAQMD Rule 456, SCAQMD Rule 1124, SDAPCD Rule 67.9
F. Sealant Bonding Primer	**350**	SJVAPCD Rule 4605, SMAQMD Rule 456, SCAQMD Rule 1124, SDAPCD Rule 67.9
G. Rain Erosion-Resistant Coating Compatible Primer	**350**	SJVAPCD Rule 4605, SMAQMD Rule 456, BAAQMD Rule 29
Rain Erosion Resistant Coating		
A. Fluoroelastomer	**690**	SDAPCD Rule 67.9
B. All Other	**600**	SMAQMD Rule 456
Rocket Motor Nozzle Coating	**420**	SDAPCD Rule 67.9 (A)
Scale Inhibitor	**880**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
Screen Print Ink	**420**	SDAPCD Rule 67.9 (A)
Sealant		
A. Fastener Sealant	**420**	SDAPCD Rule 67.9 (A)
B. Extrudable, Rollable or Brushable	**280**	SJVAPCD Rule 4605, SCAQMD Rule 1124
C. Hot Melt Sealant	**100**	SDAPCD Rule 67.9
D. Other	**600**	SMAQMD Rule 456, SCAQMD Rule 1124, SDAPCD Rule 67.9, BAAQMD Rule 29
Silicone Insulation Material	**420**	SDAPCD Rule 67.9 (A)
Solid Film/Dry Lubricants		
A. Fastener Manufacturing		
i. Solid-Film Lubricant	**250**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
ii. Dry Lubricative Materials	**120**	SJVAPCD Rule 4605, SCAQMD Rule 1124
iii. Barrier Coating	**420**	SCAQMD Rule 1124
B. Fastener Installation		
i. Solid-Film Lubricant	**420**	SDAPCD Rule 67.9 (A)
ii. Dry Lubricative Materials	**420**	SDAPCD Rule 67.9 (A)

Table 1 Maximum VOC Content Excluding Water and Exempt Compounds grams/liter		
Coating Type	**VOC Limits g/l**	**Source**
C. Nonfastener Manufacturing		
i. Solid-Film Lubricant	**880**	SJVAPCD Rule 4605, SMAQMD Rule 456, SCAQMD Rule 1124, SDAPCD Rule 67.9
ii. Dry Lubricative Materials	**675**	SJVAPCD Rule 4605, SCAQMD Rule 1124
Space Vehicle Coatings		
D. Electrostatic Discharge Protection	**800**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
E. Adhesives	**800**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
F. Other Space Vehicle Coatings	**1000**	SJVAPCD Rule 4605, SMAQMD Rule 456, SCAQMD Rule 1124, SDAPCD Rule 67.9
Specialized Function Coatings	**420**	SDAPCD Rule 67.9 (A)
Temporary Protective Coatings	**250**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9, BAAQMD Rule 29
Thermal Control Coating	**600**	SMAQMD Rule 456, SDAPCD Rule 67.9
Topcoats		
A. Acrylic lacquer for F-111	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
B. Barrier Topcoat	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124
C. Clear Topcoat	**420**	SMAQMD Rule 456
D. Interior Topcoat	**340**	BAAQMD Rule 29
E. All Other	**420**	SJVAPCD Rule 4605, SMAQMD Rule 456, SCAQMD Rule 1124, SDAPCD Rule 67.9
Epoxy Polyamide	**420**	SDAPCD Rule 67.9 (A)
Unicoats	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124, SDAPCD Rule 67.9
Wet Fastener Installation Coating	**620**	SMAQMD Rule 456
Wing Coating	**420**	SDAPCD Rule 67.9 (A)
Wire Coatings		
A. Electronic	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124

Table 1 Maximum VOC Content Excluding Water and Exempt Compounds grams/liter		
Coating Type	**VOC Limits g/l**	**Source**
B. Anti-Wicking	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124
C. Pre-Bonding Etching	**420**	SJVAPCD Rule 4605, SCAQMD Rule 1124
D. Phosphate Ester Resistant Ink	**420**	SDAPCD Rule 67.9 (A)
E. Other	**420**	SCAQMD Rule 1124
All Other Coatings	**420**	SDAPCD Rule 67.9

(A) VOC limit is based on SDAPCD Rule 67.9's All Other Coatings Category.
(B) These coating categories would fall under SMAQMD's Rule 456 adhesive bonding agent (primer) category. However, SMAQMD's VOC content limit of 780 g/l has not been shown to be achieved in practice for adhesive bonding primers for military aircrafts, remanufactured commercial aircraft parts, and sonic and acoustic applications. Therefore, SJVAPCD's Rule 4605 and SCAQMD's Rule 1124 VOC content of 805 g/l will be used instead.

Table 2 Solvent Cleaning VOC Limits		
Type of Solvent Cleaning Operation	**VOC Content Limit grams of VOC/liter of material**	**Source**
Cleaning or surface preparation	200 g/l Or 45 mm Hg VOC Composite Partial Pressure	SMAQMD Rule 456, SJVAPCD Rule 4605, SCAQMD Rule 1124
Cleaning of application equipment	25 g/l	SMAQMD Rule 456

Table 3 Stripper VOC Limits		
	VOC Limit	**Source**
Strippers	300 g/l Or 9.5 mm Hg VOC Composite Partial Pressure	SMAQMD Rule 456, SJVAPCD Rule 4605, SCAQMD Rule 1124

APPROVED BY: *Brian F Krebs* **DATE:** 09-07-2022

Attachment A

Review of BACT Determinations published by EPA

List of BACT determinations published in EPA's RACT/BACT/LAER Clearinghouse (RBLC) for Aerospace Surface Coating:

RBLC	Permit Date	Process Code (A)	Process/Equipment	Pollutant	Standard	Control Technology	Case-By-Case Basis
OK-0172	11/19/15	41.001	Chemical Depainting/Aircraft Paint Stripping/Aircraft parts paint stripping	VOC	333.38 tons/year	1. Low VOC vapor pressure cleaning solvents and strippers (<45 mmHg @ 20°C or as specified per NESHAP GG/ 2. Low pressure or hand application 3. Good work practices per Subpart GG	BACT-PSD
OK-0171	11/18/15	41.001	Chemical Depainting/Aircraft Paint Stripping/Aircraft parts paint stripping	VOC	1605.56 tons/year	1. Low VOC vapor pressure cleaning solvents and strippers (<45 mmHg @ 20°C or as specified per NESHAP GG/ 2. Low pressure or hand application 3. Good work practices per Subpart GG	BACT-PSD
IN-0126	9/21/11	41.001	Refinish Operation	VOC	4.5 lb/gal monthly volume-weighted average	Management and work practices	Other Case-by-Case
WA-0344	10/7/08	41.001	Paint Booth/Hangar	VOC	40.8 tons/year	Compliance with 40 CFR Part 63, Subpart GG and Low VOC vapor pressure cleaning solvents and strippers with low pressure applicators or manual application for depainting	BACT-PSD
WA-0340	7/27/07	41.001	Paint Hangar/Final Exterior Coating	VOC	412 tons any 12 consecutive months		Other Case-by-Case

(A) Process Code 41.001 includes aerospace surface coating.

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

Attachment B

BACT Determinations from Air District

ACTIVE SMAQMD BACT CLEARINGHOUSE

CATEGORY: **COATING - AEROSPACE**

BACT Size: Minor Source BACT **PAINT SPRAY BOOTH**

BACT Determination Number: 182	**BACT Determination Date:** 9/18/2018

Equipment Information

Permit Number: 25528
Equipment Description: PAINT SPRAY BOOTH
Unit Size/Rating/Capacity: ≤ 4,785 lbs VOC/year Per Project
Equipment Location: COMPOSITE ENGINEERING INC, A KRATOS CO
5301 RALEY BLVD
SACRAMENTO, CA

EXPIRED

BACT Determination Information

ROCs	**Standard:**	
	Technology Description:	1.Compliance with SMAQMD Rule 456 and aerospace coatings BACT VOC limits (see Tables 1-3 in BACT Determination Evaluation) 2.Use of an enclosed gun cleaner
	Basis:	Achieved in Practice
NOx	**Standard:**	30 ppmvd @ 3% O2 or 0.036 lb/MMBtu/hr
	Technology Description:	1.For heaters ≥ 325,000 Btu/hr, low NOx burner, 30 ppmvd @ 3% O2 or 0.036 lb/MMBtu/hr
	Basis:	Achieved in Practice
SOx	**Standard:**	No Standard
	Technology Description:	
	Basis:	Achieved in Practice
PM10	**Standard:**	
	Technology Description:	1.Enclosed paint booth with use of dry filters and use of HVLP, properly maintained
	Basis:	Achieved in Practice
PM2.5	**Standard:**	No Standard
	Technology Description:	
	Basis:	Achieved in Practice
CO	**Standard:**	No Standard
	Technology Description:	
	Basis:	Achieved in Practice
LEAD	**Standard:**	
	Technology Description:	
	Basis:	

Comments: For T-BACT:
1.Compliance with SMAQMD Rule 456 and aerospace coatings BACT VOC limits (see Tables 1-3 in BACT Determination Evaluation), and VOC control system with overall capture efficiency ≥90% by weight
2.Compliance with 40 CFR Subpart 63 GG limits for volatile HAPs 3.Compliance with 40 CFR 63 Subpart HHHHHH for metals 4. For major sources of HAPs, compliance with 40 CFR 63, Subpart GG

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

Printed: 9/18/2018

ACTIVE SMAQMD BACT CLEARINGHOUSE

CATEGORY: **COATING - AEROSPACE**

BACT Size: Minor Source BACT **PAINT SPRAY BOOTH**

BACT Determination Number:	183	**BACT Determination Date:**	**9/18/2018**

Equipment Information

Permit Number: N/A -- Generic BACT Determination
Equipment Description: PAINT SPRAY BOOTH
Unit Size/Rating/Capacity: > 4,785 lb VOC/year Per Project
Equipment Location:

EXPIRED

BACT Determination Information

ROCs	**Standard:**	
	Technology Description:	1.Compliance with SMAQMD Rule 456 and aerospace coatings BACT VOC limits (see Tables 1-3 in BACT Determination Evaluation), and VOC control system with overall capture efficiency ≥90% by weight 2.Use of an enclosed gun cleaner
	Basis:	Achieved in Practice
NOx	**Standard:**	30 ppmvd @ 3% O2 or 0.036 lb/MMBtu/hr
	Technology Description:	1.For heaters ≥ 325,000 Btu/hr, low NOx burner, 30 ppmvd @ 3% O2 or 0.036 lb/MMBtu/hr
	Basis:	Achieved in Practice
SOx	**Standard:**	No Standard
	Technology Description:	
	Basis:	Achieved in Practice
PM10	**Standard:**	
	Technology Description:	1.Enclosed paint booth with use of dry filters and use of HVLP, properly maintained
	Basis:	Achieved in Practice
PM2.5	**Standard:**	No Standard
	Technology Description:	
	Basis:	Achieved in Practice
CO	**Standard:**	No Standard
	Technology Description:	
	Basis:	Achieved in Practice
LEAD	**Standard:**	
	Technology Description:	
	Basis:	

Comments: For T-BACT:
1.Compliance with SMAQMD Rule 456 and aerospace coatings BACT VOC limits (see Tables 1-3 of BACT Determination Evaluation), and VOC control system with overall capture efficiency ≥90% by weight
2.Compliance with 40 CFR Subpart 63 GG limits for volatile HAPs 3.Compliance with 40 CFR 63 Subpart HHHHHH for metals 4.For major souorces of HAPs, compliance with 40 CFR 63, Subpart GG

District Contact:

Printed: 9/18/2018

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

10-20-2000 Rev. 0
2-1-2019 Rev 1
2-5-2021 Rev. 2

Equipment or Process: Spray Booth

	Criteria Pollutants					
Subcategory/ Rating/Size	**VOC**	**NOx**	**SOx**	**CO**	**PM_{10}**	**Inorganic**
Fully-enclosed, Down-Draft Type, < 667 Lbs/Month of VOC Emissions (2-5-2021)	Compliance with Applicable Regulation XI Rules (10-20-2000)	If booth has a Make-up Air Unit or a Heater; Compliance with Rule 1147 (2-5-2021)			Dry Filters or Waterwash (1990)	
Other Types, < 1170 Lbs/Month of VOC Emissions	Compliance with Applicable Regulation XI Rules (10-20-2000)	If booth has a Make-up Air Unit or a Heater; Compliance with Rule 1147 (2-5-2021)			Same as Above (1990)	
Fully-enclosed, Down-Draft Type, ≥ 22 Lbs/Day of VOC Emissions (2-5-2021)	- Compliance with Applicable Regulation XI Rules, and VOC Control System with ≥ 90% Collection Efficiency and ≥ 95% Destruction Efficiency, or - Use of Super Compliant Materials (<50 grams of VOC per liter of material): or - Use of Low-VOC Materials Resulting in an Equivalent Emission Reduction (10-20-2000)	If booth has a Make-up Air Unit or a Heater; Compliance with Rule 1147 (2-5-2021)			Same as Above (1990)	

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

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Best Available Control Technology (BACT) Guidelines for Non-Major Polluting Facilities*

Other Types, ≥ 1170 Lbs/Month of VOC Emissions	- Compliance with Applicable Regulation XI Rules, and VOC Control System with ≥ 90% Collection Efficiency and ≥ 95% Destruction Efficiency, or - Use of Super Compliant Materials (<50 grams of VOC per liter of material): or - Use of Low-VOC Materials Resulting in an Equivalent Emission Reduction (10-20-2000)	If booth has a Make-up Air Unit or a Heater; Compliance with Rule 1147 (2-5-2021)			Same as Above (1990)	
Enclosed with automated spray nozzles for wood cabinets, < 1170 Lbs/Month of VOC Emissions (2-5-2021)	Compliance with Rule 1136 or use of Rule 1136 compliant UV/EB or water-based coatings.	If booth has a Make-up Air Unit or a Heater; Compliance with Rule 1147				

Note: The sum of all VOC emissions from all spray booths within the same subcategory applied for in the previous two years at the same facility are considered toward the emission threshold.

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

San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 4.2.6*

Last Update: 9/27/2021

Aerospace Parts Coating Operation

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	The use of coatings, cleaning materials, and solvents compliant with District Rule 4605 and use of HVLP application equipment	1) Thermal Oxidation 2) Catalytic Oxidation 3) Carbon Adsorption	
PM10	Enclosed paint booth with dry filters and use of HVLP application equipment		

BACT is the most stringent control technique for the emissions unit and class of source. Control techniques that are not achieved in practice or contained in a State Implementation Plan must be cost effective as well as feasible. Economic analysis to demonstrate cost effectiveness is required for all determinations that are not achieved in practice or contained in an EPA approved State Implementation Plan.

***This is a Summary Page for this Class of Source**

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

Source Category

Source:	*Spray Booth - Coating of Aerospace Components*	Revision:	*1*
		Document #:	*161.1.1*
Class:	*<25 lb/day Emissions (Uncontrolled)*	Date:	*09/06/91*

Determination

POLLUTANT	BACT 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice	TYPICAL TECHNOLOGY
POC	1. *Coating w/ VOC content and transfer efficiency complying w/ Reg. 8, Rule 29, and emissions controlled to overall capture/ destruction efficiency ≥90%*[a,c] 2. *Compliance w/ Reg. 8, Rule 29*[a]	1. *Collection System Vented to Carbon Adsorber or Afterburner*[a,c] 2. *Low VOC Coating*[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/d* 2. *n/s*	1. *n/d* 2. *Dry Filters or Waterwash, Properly Maintained*[a,b]
NPOC	1. *Coating w/ solvent content and transfer efficiency complying w/ Reg. 8, Rule 29, and emissions controlled to overall capture/ destruction efficiency≥90%*[a,c] 2. *Compliance w /Reg 8, Rule 29*[a]	1. *Collection system Vented to Carbon Adsorber*[a,c] 2. *Low Solvent Coatings*[a]

References

a. BAAQMD
c. Generally considered to be cost-effective if uncontrolled emissions ≥25 lb/day

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

Source Category

Source:	*Spray Booth - Coating of Aerospace Components*	Revision:	*1*
		Document #:	*161.1.2*
Class:	*≥25 lb/day emissions (Uncontrolled)*	Date:	*09/06/91*

Determination

POLLUTANT	BACT 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice	TYPICAL TECHNOLOGY
POC	1. *Coating w/ VOC content less than and transfer efficiency greater than that required by Reg. 8, Rule 29, and emissions controlled to overall capture/destruction efficiency ≥90%*[a] 2. *Coating w/ VOC Content and transfer efficiency complying w/ Reg. 8, Rule 29, and emissions controlled to overall capture/ destruction efficiency ≥90%*	1. *Collection system Vented to Carbon Adsorber or Afterburner*[a] 2. *Collection system Vented to Carbon Adsorber or Afterburner*[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/d* 2. *n/s*	1. *n/d* 2. *Dry Filters or Waterwash, Properly Maintained*[a]
NPOC	1. *Coating w/ VOC content less than and transfer efficiency greater than that required by Reg. 8, Rule 29, and emissions controlled to overall capture/destruction efficiency ≥90%*[a] 2. *Coating w/ VOC solvent content and transfer efficiency complying w/ Reg. 8, Rule 29, and emissions controlled to overall capture/ destruction efficiency ≥90%*[a]	1. *Collection system Vented to Carbon Adsorber or Afterburner*[a] 2. *Collection system Vented to Carbon Adsorber or Afterburner*[a]

Attachment C

Cost Effectiveness Determination for Carbon Adsorption and Thermal Oxidizers

COST EFFECTIVENESS ANALYSIS FOR CARBON ADSORPTION

Data Inputs

Select the type of carbon adsorber system:	Fixed-Bed Carbon Adsorber with Steam Regeneration
For fixed-bed carbon adsorbers, provide the following information:	
Select the type of operation:	Continuous Operation
Select the type of material used to fabricate the carbon adsorber vessels:	Stainless Steel, 304
Select the orientation for the adsorber vessels:	Horizontal

RESET

Enter the design data for the proposed Fixed-Bed Carbon Adsorber with Steam Regeneration

Number of operating hours per year (Θ_s)	2,080	hours/year	
Waste Gas Flow Rate (Q)	10,000	acfm (at atmospheric pressure and 77°F)	
VOC Emission Rate (m_{voc})	3.560	lbs/hour	
Required VOC removal efficiency (E)	90	percent	
Superficial Bed Velocity (v_b)	75.00	ft/min	
Estimated equipment life of adsorber vessels and auxiliary Equipment (n)	15	Years*	* 15 years is a default equipment life. User should enter actual value, if known.
Estimated Carbon life (n)	5	Years	
Total Number of carbon beds (N_{total})	3	Beds*	* 3 beds is the default. User should enter actual number of beds, if known.
Number of carbon beds adsorbing VOC when system is operating (N_A)	2	Beds*	* 2 beds is the default. User should enter actual number of beds, if known.
Total time for adsorption (Θ_A)	12	hours*	* 12 hours is a default value. User should enter actual value, if known.
Total time for desorption (Θ_D)	5	hours*	* 5 hours is a default value. User should enter actual value, if known.
Estimated Carbon Replacement Rate (CRR)	379	lbs/hour*	* 379 lbs./hour is a default value. User should enter actual value, if known.

Enter the Characteristics of the VOC/HAP:

Name of VOC/HAP	Toluene	
Partial Pressure of Toluene in waste gas stream	0.0104	psia
Parameter "k" for Toluene	0.551	**Note:** Typical values of "k" and "m" for some common VOCs are shown in Table A.
Parameter "m" for Toluene	0.110	

Enter the cost data for the carbon adsorber:

Desired dollar-year	2022			
CEPCI* for 2022	567.5	CEPCI value for 2022	390.6	1999
Annual Interest Rate (i)	4	percent (Current bank prime rate)		

* CEPCI is the Chemical Engineering Plant Cost Index. The use of CEPCI in this spreadsheet is not an endorsement of the index for purpose of cost escalation or de-escalation, but is there merely to allow for availability of a well-known cost index to spreadsheet users. Use of other well-known cost indexes (e.g., M&S) is acceptable.

Electricity (P_{elec})	$0.1380	per kWh	
Steam (P_s)	$5.00	per 1,000 lbs*	* $5.00/1,000 lbs is a default value. User should enter actual value, if known.
Cooling Water (P_{cw})	$3.55	per 1,000 gallons of water*	* $3.55/1,000 gallons is a default value. User should enter actual value, if known.
Operator Labor Rate	$27.48	per hour*	* $27.48/hour is a default value. User should enter actual value, if known.
Maintenance Labor Rate	$30.23	per hour*	* $30.23/hour is a default value. User should enter actual value, if known. If the rate is not known, use 1.10 x operator labor rate.
Carbon Cost (CC)	$4.20	per lb	* $4.20/lb is a default value based on 2018 market price. User should enter actual value, if known.
Re-Sale Value of Recovered VOC (P_{voc})	$0.33	per lb*	* $0.33/lb is a default value for recovered toluene based on 2018 data. User should enter actual value of
Disposal/Treatment Cost for Recovered VOC (D_{voc})	$0.00	per lb*	* $0/lb is a default value for disposal and/or treatment of recovered VOC/HAP. User should enter actual value,

If known, enter any additional costs for site preparation and building construction/modification:

Site Preparation (SP) =	$0	* Default value. User should enter actual value, if known.
Buildings (Bldg) =	$0	* Default value. User should enter actual value, if known.
Equipment Costs for auxiliary equipment (e.g., ductwork, dampers, and stack) (EC_{aux}) =	$32,000	* Default value. User should enter actual value, if known.
Contingency Factor (CF)	10.0 percent*	* 10 percent is a default value. The contingency factor should be between 5 and 15 percent.

Cost Estimate

Capital Costs

Estimated capital costs for a Fixed-Bed Carbon Adsorber with Steam Regeneration with the following characteristics:

VOC Controlled/Recovered = Toluene
Adsorber Vessel Orientation = Horizontal
Operating Schedule = Continuous Operation

Total Capital Investment (TCI) (in 2020 dollars)

Parameter	Equation	Cost
Costs for Each Carbon Adsorber Vessel (C_v) =	$271 \times F_m \times S^{0.778}$ =	$25,175
Total Cost for All Carbon Adsorber Vessels and Carbon(EC_{Adsorb}) =	$5.82 \times Q^{-0.133} \times [C_c + (N_A + N_D) \times C_v]$ =	$131,885
Auxiliary Equipment (EC_{aux}) =	(Based on design costs or estimated using methods provided in Section 2)	$32,000
Total Purchased Equipment Costs for Carbon Adsorber (A) =	= $EC_{Adsorb} + EC_{aux}$ =	$163,885
Instrumentation =	0.10 × A =	Included in A
Sales taxes =	0.03 × A =	$4,917
Freight =	0.05 × A =	$8,194
	Total Purchased Equipment Costs (B) =	$176,995

Direct Installation Costs (in 2020 dollars)

Parameter	Equation	Cost
Foundations and Supports =	0.08 × B =	$14,160
Handling and Erection =	0.14 × B =	$24,779
Electrical =	0.04 × B =	$7,080
Piping =	0.02 × B =	$3,540
Insulation =	0.01 × B =	$1,770
Painting =	0.01 × B =	$1,770
Site Preparation (SP) =		$0
Buildings (Bldg) =		$0
	Total Direct Costs (DC) = B + (0.3 × B) + SP + Bldg =	$230,094

Total Indirect Installation Costs (in 2020 dollars)			
Parameter	**Equation**		**Cost**
Engineering =	0.10 × B =		$17,700
Construction and field expenses =	0.05 × B =		$8,850
Contractor fees =	0.10 × B =		$17,700
Start-up =	0.02 × B =		$3,540
Performance test =	0.01 × B =		$1,770
		Total Indirect Costs (IC) =	$49,559
Contingency Cost (C) =	CF(IC+DC)=		$27,965
Total Capital Investment (TCI) =	**DC + IC + C = (1.28 × B) + SP + Bldg. + C =**		**$307,618** **in 2020 dollars**

Annual Costs

Direct Annual Costs		
Parameter	**Equation**	**Cost**
Annual Electricity Cost =	$Q_{Elec} \times P_{elec}$ =	$738
Annual Steam Cost (C_s) =	3.50 x m_{voc} x Θ_s x P_s =	$130
Annual Cooling Water Cost (C_{cs}) =	3.43 x C_s/P_s x P_{wc} =	$316
Operating Labor Costs:	Operator = 0.5 hours/shift × Labor Rate × (Operating hours/8 hours/shift)	$3,572
	Supervisor = 15% of Operator	$536
Maintenance Costs:	Labor = 0.5 hours/shift × Labor Rate × (Operating Hours/8 hours/shift)	$3,930
	Materials = 100% of maintenance labor	$3,930
Carbon Replacement Costs:	Labor = CRF_{carbon} x (Labor Rate × M_c)/CRR =	$7
	Carbon = CRF_{carbon} x CC x M_c x 1.08 =	$392
Direct Annual Costs (DAC) =		**$13,549** **in 2020 dollars**

Indirect Annual Costs			
Parameter	**Equation**	**Cost**	
Overhead	= 60% of sum of operator, supervisor, maintenance labor Plus maintenance materials	$7,181	
Administrative Charges	= 2% of TCI	$6,152	
Property Taxes	= 1% of TCI	$3,076	
Insurance	= 1% of TCI	$3,076	
Capital Recovery	= $CRF_{Adsorber}$ x (TCI - [(1.08 x CC x M_c) + (LR x M_c/CRR)] =	$27,508	
Indirect Annual Costs (IAC) =		**$46,994**	**in 2020 dollars**

Recovered Solvent Credit/Disposal Costs			
Disposal Cost			
Parameter	**Equation**	**Cost**	
VOC Disposal/Treatment Costs ($Disposal_{cost}$)	= m_{voc} x Θ_s x D_{voc} x E =	$0	
VOC Recovery Credit			
Parameter	**Equation**	**Cost**	
Annual Recovery Credit for Condensate (RC)	= m_{voc} x Θ_s x P_{voc} x E =	$2,199	
Total Annual Cost (TAC) =	**DAC + IAC + C + $Disposal_{Cost}$ - RC =**	**$58,344**	**in 2020 dollars**

Cost Effectiveness

Cost Effectiveness			
Parameter	**Equation**	**Cost**	
Total Annual Cost =	TAC =	$58,344	per year in 2020 dollars
Annual Quantity of VOC Removed/Recovered =	W_{voc} = m_{voc} x Θ_s x E =	3	tons/year
Cost Effectiveness =	Total Annual Cost (TAC) / Annual Quantity of VOC Removed/Recovered =	$17,509.23	per ton of pollutants removed/recovered in 2020 dollars

COST EFFECTIVENESS ANALYSIS FOR THERMAL INCINERATION

Data Inputs

Select the type of oxidizer: Regenerative Thermal Oxidizer

RESET

Enter the following information for your emission source:

Composition of Inlet Gas Stream

Pollutant Name	Concentration (ppmv)	Lower Explosive Limit (LEL) (ppmv)*	Heat of Combustion (Btu/scf)	Molecular Weight
Toluene	40	11,000	4,274	92.13

Note: The lower explosion limit (LEL), heat of combustion and molecular weight for some commonly used VOC/HAP are provided in the table below.

Enter the design data for the proposed oxidizer:

Number of operating hours/year	2,080	hours/year	
Inlet volumetric flow rate(Q_{sd}) at 77°F and 1 atm.	20,000	scfm*	* 20,000 scfm is a default volumetric flow rate. User should enter actual value, if known.
Inlet volumetric flow rate(Q_{sd}) (actual conditions)	20,900	acfm*	* 20,900 acfm is a default volumetric flow rate. User should enter actual value, if known.
Pressure drop (ΔP)	19	inches of water	* 23 inches of water is the default pressure drop for thermal oxidizers; 19 inches of water is the default pressure drop for catalytic oxidizers. Enter actual value, if known.
Motor/Fan Efficiency (ε)	60	percent*	* 60% is a default fan efficiency. User should enter actual value, if known.
Inlet Waste Gas Temperature (T_{wi})	77	°F	
Operating Temperature (T_{fi})	1,900	°F	* Note: Default value for Tfi is 2000°F for thermal regenerative oxidizers. Use actual value if known. Tfi for regenerative oxidizers typically between 1800 and 2000°F.
Destruction and Removal Efficiency (DRE)	99	percent*	* 99 percent is a default control efficiency. User should enter actual value, if known.
Estimated Equipment Life	20	Years*	* 20 years is the typical equipment life. User should enter actual value, if known.
Heat Loss (η)	1	percent*	* 1 percent is a default value for the heat loss. User should enter actual value, if known. Heat loss is typically between 0.2 and 1.5%.

Percent Energy Recovery (HR) = 70 percent

Enter the cost data:

Desired dollar-year	2022			
CEPCI* for 2022	541.7	Enter the CEPCI value for 2022	541.7	2016 CEPCI
Annual Interest Rate (i)	4	Percent		
Electricity ($Cost_{elect}$)	0.138	$/kWh		
Natural Gas Fuel Cost ($Cost_{fuel}$)	0.00804	$/scf		
Operator Labor Rate	$27.48	per hour		
Maintenance Labor rate	$30.23	per hour		
Contingency Factor (CF)	10.0	Percent		

* 10 percent is a default value for construction contingencies. User may enter values between 5 and 15 percent.

* CEPCI is the Chemical Engineering Plant Cost Escalation/De-escalation Index. The use of CEPCI in this spreadsheet is not an endorsement of the index for purposes of cost escalation or de-escalation, but is there merely to allow for availability of a well-known cost index to spreadsheet users. Use of other well-known cost indexes (e.g., M&S) is acceptable.

Cost Estimate

Direct Costs			
Total Purchased equipment costs (in 2020 dollars)			
Incinerator + auxiliary equipment[a] (A) =			
Equipment Costs (EC) for Regenerative Oxidizer	=[2.664 x 100,000 + (13.98 x Qtot)] x (2020 CEPI/2016 CEPCI) =	$546,548	in 2020 dollars
Instrumentation[b] =	0.10 × A =	$54,655	
Sales taxes =	0.03 × A =	$16,396	
Freight =	0.05 × A =	$27,327	
	Total Purchased equipment costs (B) =	$644,926	in 2020 dollars
Footnotes			
a - Auxiliary equipment includes equipment (e.g., duct work) normally not included with unit furnished by incinerator vendor.			
b - Includes the instrumentation and controls furnished by the incinerator vendor.			
Direct Installation Costs (in 2020 dollars)			
Foundations and Supports =	0.08 × B =	$51,594	
Handlong and Errection =	0.14 × B =	$90,290	
Electrical =	0.04 × B =	$25,797	
Piping =	0.02 × B =	$12,899	
Insulation for Ductwork =	0.01 × B =	$6,449	
Painting =	0.01 × B =	$6,449	
Site Preparation (SP) =		$0	
Buildings (Bldg) =		$0	
	Total Direct Installaton Costs =	$193,478	
Total Direct Costs (DC) =	Total Purchase Equipment Costs (B) + Total Direct Installation Costs =	$838,404	in 2020 dollars
Total Indirect Installation Costs (in 2020 dollars)			
Engineering =	0.10 × B =	$64,493	
Construction and field expenses =	0.05 × B =	$32,246	
Contractor fees =	0.10 × B =	$64,493	
Start-up =	0.02 × B =	$12,899	
Performance test =	0.01 × B =	$6,449	
	Total Indirect Costs (IC) =	$180,579	
Continency Cost (C) =	CF(IC+DC)=	$101,898	
Total Capital Investment =	**DC + IC +C =**	**$1,120,882**	**in 2020 dollars**

Direct Annual Costs		
Annual Electricity Cost	= Fan Power Consumption × Operating Hours/year × Electricity Price =	$22,227
Annual Fuel Costs for Natural Gas	= $Cost_{fuel}$ × Fuel Usage Rate × 60 min/hr × Operating hours/year	$39,319
Operating Labor	Operator = 0.5hours/shift × Labor Rate × (Operating hours/8 hours/shift)	$3,572
	Supervisor = 15% of Operator	$536
Maintenance Costs	Labor = 0.5 hours/shift × Labor Rate × (Operating Hours/8 hours/shift)	$3,930
	Materials = 100% of maintenance labor	$3,930
Direct Annual Costs (DC) =		**$73,514 in 2020 dollars**

Indirect Annual Costs		
Overhead	= 60% of sum of operating, supervisor, maintenance labor and maintenance materials	$7,181
Administrative Charges	= 2% of TCI	$22,418
Property Taxes	= 1% of TCI	$11,209
Insurance	= 1% of TCI	$11,209
Capital Recovery	= CRF[TCI-1.08(cat. Cost)]	$82,476
Indirect Annual Costs (IC) =		**$134,493 in 2020 dollars**

Total Annual Cost =	**DC + IC =**	**$208,007 in 2020 dollars**

Cost Effectiveness

Cost Effectiveness = (Total Annual Cost)/(Annual Quantity of VOC/HAP Pollutants Destroyed)

Total Annual Cost (TAC) =	$208,007	per year in 2020 dollars
VOC/HAP Pollutants Destroyed =	11.8	tons/year
Cost Effectiveness =	$17,657	per ton of pollutants removed in 2020 dollars