SMAQMD BACT CLEARINGHOUSE

CATEGORY: **Coating Adhesives**

BACT Size: Minor Source BACT **Adhesive Application**

BACT Determination Number: 226	**BACT Determination Date:** 5/24/2019

Equipment Information

Permit Number: 26136

Equipment Description: Adhesive Application

Unit Size/Rating/Capacity: <1,170 lbsVOC/month and <=4,019 lbs VOC/year

Equipment Location: SUNERGY CALIFORNIA LLC
4741 URBANI AVE
MCCLELLAN, CA

EXPIRED

BACT Determination Information

ROCs	**Standard:**	
	Technology Description:	See BACT determination Evaluation
	Basis:	Achieved in Practice
NOx	**Standard:**	
	Technology Description:	
	Basis:	
SOx	**Standard:**	
	Technology Description:	
	Basis:	
PM10	**Standard:**	
	Technology Description:	Spray booth with dry filters or waterwash
	Basis:	Achieved in Practice
PM2.5	**Standard:**	
	Technology Description:	Spray booth with dry filters or waterwash
	Basis:	
CO	**Standard:**	
	Technology Description:	
	Basis:	
LEAD	**Standard:**	
	Technology Description:	
	Basis:	

Comments: VOC BACT determination consists of 9 tables that are included in the BACT determination evaluation

District Contact: Brian Krebs Phone No.: 916-874-4856 email: bkrebs@airquality.org

Printed: 6/10/2019

SMAQMD BACT CLEARINGHOUSE

CATEGORY: **Coating - Adhesives**

BACT Size: **Adhesive Application Operation**

BACT Determination Number: 227	**BACT Determination Date:** 5/24/2019

Equipment Information

Permit Number: 26136
Equipment Description: Adhesive Application Operation
Unit Size/Rating/Capacity: >=1,170 lb/month or >4,019 lb/yr
Equipment Location: SUNERGY CALIFORNIA LLC
4741 URBANI AVE
MCCLELLAN, CA

EXPIRED

BACT Determination Information

ROCs	**Standard:**	
	Technology Description:	Compliance with adhesive BACT VOC limits (see comment)
	Basis:	Achieved in Practice
NOx	**Standard:**	
	Technology Description:	
	Basis:	
SOx	**Standard:**	
	Technology Description:	
	Basis:	
PM10	**Standard:**	
	Technology Description:	Spray booth with dry filters or waterwash
	Basis:	Achieved in Practice
PM2.5	**Standard:**	
	Technology Description:	Spray booth with dry filters or waterwash
	Basis:	Achieved in Practice
CO	**Standard:**	
	Technology Description:	
	Basis:	
LEAD	**Standard:**	
	Technology Description:	
	Basis:	

Comments: Compliance with adhesive BACT VOC limits (see Tables 1-9 in BACT determination evaluation) and VOC control system with ≥90% collection efficiency and ≥ 95% destruction efficiency.

District Contact: Brian Krebs Phone No.: (916) 874 - 4856 email: bkrebs@airquality.org

777 12th Street, Third Floor

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Sacramento, CA 95814

BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

EXPIRED

DETERMINATION NO.: 226 & 227

DATE: April 3, 2019

ENGINEER: Brian Krebs

Category/General Equip Description: Adhesive Application Operations

Equipment Specific Description: Solar Panel Manufacturing

Equipment Size/Rating: <1,170 lbs VOC/month and ≤ 4,019 lbs VOC/year (BACT #226)
≥1,170 lbs VOC/month or > 4,019 lbs VOC/year (BACT #227); Minor Source

Previous BACT Det. No.: 134 & 139

These BACT determinations will update determinations #134 and #139 for an adhesive application operation.

BACT ANALYSIS

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

The following control technologies are currently employed as BACT for adhesive application operations by the following air pollution control districts:

<table>
<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>US EPA</td><td>
BACT
Source: EPA RACT/BACT/LAER Clearinghouse
<table>
<tr><th colspan="2">Adhesives Application Operation</th></tr>
<tr><td>VOC</td><td>No standard</td></tr>
<tr><td>NOx</td><td>No standard</td></tr>
<tr><td>SOx</td><td>No standard</td></tr>
<tr><td>PM10</td><td>No standard</td></tr>
<tr><td>PM2.5</td><td>No standard</td></tr>
<tr><td>CO</td><td>No standard</td></tr>
</table>
RULE REQUIREMENTS:
40 CFR 63 Subpart JJ – National Emission Standards for Wood Furniture Manufacturing Operations
This regulation applies for facilities that are engaged, either in part or in whole, in the manufacture of wood furniture or wood furniture components and that are located at a plant site that is a major source as defined in 40 CFR subpart A, §63.2 Since this BACT determination is only for minor sources, this
</td></tr>
</table>

NESHAP is not applicable.

Subpart JJ limits volatile hazardous air pollutants (VHAP) of finishing operations and contact adhesives and also limits the VOC strippable spray booth material. Only the limits that are applicable to adhesives will be shown. The limits can be seen in the table below.

Table 3 to Subpart JJ of Part 63—Summary of Emission Limits

Emission point	Existing source	New source
Contact Adhesives:		
(a) Use compliant contact adhesives (maximum kg VHAP/kg solids [lb VHAP/lb solids], as applied) based on following criteria:		
i. For aerosol adhesives, and for contact adhesives applied to nonporous substrates	[a]NA	[a]NA
ii. For foam adhesives used in products that meet flammability requirements	1.8	0.2
iii. For all other contact adhesives (including foam adhesives used in products that do not meet flammability requirements); or	1.0	0.2
(b) Use a control device	[b]1.0	[b]0.2
All Contact Adhesives:		
(a) Achieve total free formaldehyde emissions across all finishing operations and contact adhesives, lb per rolling 12 month period, as applied	400	400
(b) Use coatings and contact adhesives only if they are low-formaldehyde coatings and contact adhesives	[c]1.0	[c]1.0

[a]There is no limit on the VHAP content of these adhesives.
[b]The control device must operate at an efficiency that is equivalent to no greater than 1.0 kilogram (or 0.2 kilogram) of VHAP being emitted from the affected emission source per kilogram of solids used.
[c]The limits refer to the formaldehyde content by weight of the coating or contact adhesive, as specified on certified product data sheets.

NOTE - No new BACT determinations nor any revisions or additions to rules were identified as of 4/3/19.

ARB

BACT
Source: ARB BACT Clearinghouse

Adhesive Application Operation	
VOC	No standard
NOx	No standard
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	No standard

RULE REQUIREMENTS:
None

NOTE - No new BACT determinations nor any revisions or additions to rules were identified as of 4/3/19.

SMAQMD

BACT
Source: SMAQMD BACT Clearinghouse

Adhesive Application Operation	
VOC	VOC BACT Requirements as contained in BACT #134 and #139 evaluation
NOx	No standard
SOx	No standard
PM10	Spray booth with dry filters or waterwash
PM2.5	Spray booth with dry filters or waterwash
CO	No standard

RULE REQUIREMENTS:

Rule 460 Adhesives and Sealants (11/30/00)

Table 1	
Adhesive	VOC Limits g/l(lbs/gal)
ABS Welding Adhesive	400 (3.3)
Ceramic Tile Installation Adhesive	130 (1.1)
Computer Diskette Jacket Manufacturing Adhesive	850 (6.9)
Cove Base Installation Adhesive	150 (1.2)
CPVC Welding Adhesive	490 (4.0)
Indoor Floor Covering Installation Adhesive	150 (1.2)

Metal to Urethane/Rubber Molding or Casting Adhesive	250 (2.0)
Multipurpose Construction Adhesive	200 (1.6)
Non-Membrane Roof Installation/Repair Adhesive	300 (2.5)
Outdoor Floor Covering Installation Adhesive	250 (2.0)
PVC Welding Adhesive	510 (4.2)
Single-Ply Roof Membrane Installation/Repair Adhesive	250 (2.0)
Structural Glazing Adhesive	100 (0.8)
Thin Metal Laminating Adhesive	780 (6.4)
Tire Retread Adhesive	100 (0.8)
Perimeter Bonded Sheet Vinyl Flooring Installation Adhesive	660 (5.4)
Waterproof Resorcinol Glue	170 (1.4)
Other Plastic Cement Welding Adhesive	450 (3.7)

Table 2
VOC Content For Adhesive Primers

Type of Adhesive Primer	VOC Limits g/l(lbs/gal)
Automotive Glass	700 (5.7)
Plastic Cement Welding	400 (3.3)
Single-Ply Roof Membrane	250 (2.0)
Traffic Marking Tape	150 (1.2)
Other	250 (2.0)

Table 3
VOC Content For Contact Adhesives

Type of Contact Adhesive	VOC Limits g/l(lbs/gal)
Contact Adhesive	250 (2.0)
Contact Adhesive – Specialty Substrate	250 (2.0)

Table 4
VOC Content For Sealants

Type of Sealant	VOC Limits g/l(lbs/gal)
Architectural	250 (2.0)
Marine Deck	760 (6.2)
Nonmembrane Roof Installation/Repair	300 (2.5)
Roadway Sealant	250 (2.0)
Single-Ply Roof Membrane Sealant	450 (3.7)
Other	420 (3.4)

Table 5 VOC Content For Sealant Primers	
Type of Sealant Primer	VOC g/l(lbs/gal)
Architectural Nonporous Porous	 250 (2.0) 775 (6.3)
Marine Deck	760 (6.2)
Other	750 (6.1)

Table 6 VOC Content For Adhesives Applications Onto Substrates	
Adhesive Applications Onto Substrates	VOC Limits g/l(lbs/gal)
Flexible Vinyl	250 (2.0)
Fiberglass	200 (1.6)
Metal	30 (0.2)
Porous Material	120 (1.0)
Rubber	250 (2.0)
Other Substrates	250 (2.0)

Table 8 VOC Content of Solvents for Surface Preparation, Cleanup, and Stripping		
Adhesive Applications Onto Substrates	VOC Limits g/l(lbs/gal) Including water and exempt compounds	VOC Composite Partial Pressure Millimeters of Mercury at 20 °C (68 °F)
SUBSTRATE PREPARATION: Single-Ply Roof Membrane Installation/Repair	--	≤45
SUBSTRATE PREPARATION: Electronic Components	≤900 (≤7.3)	≤33
SUBSTRATE PREPARATION: Medical Devices	≤900 (≤7.3)	≤33
SUBSTRATE PREPARATION: Other Substrates	≤70 (≤0.6)	--
CLEANUP: Cleaning a Spray Gun in an Enclosed Gun Cleaner	--	<45
CLEANUP: Soaking of Application Equipment in a Closed Container	--	≤9.5
CLEANUP: Cleaning of Application Equipment —No Closed Container, No	≤70 (≤0.6)	––

	Enclosed Gun Cleaner		
	CLEANUP: Cleaning of Equipment Other Than Adhesive or Sealant Product Application Equipment	--	<45
	STRIPPING: Adhesive or Sealant Products on Wood	<350	≤2
	STRIPPING: Adhesive or Sealant Products on Substrates	--	≤9.5

NOTE - No new BACT determinations nor any revisions or additions to rules were identified as of 4/3/19.

South Coast AQMD

BACT

Source: SCAQMD BACT Guidelines for Non-Major Polluting Facilities, page 121 (Last Revised 2/1/19)

Adhesive Application Operation Spray Booth	
VOC	For non-automotive booths with <1170 lbs/month VOC Emissions 1. Compliance with applicable AQMD Regulation XI Rules For non-automotive 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 Clean Materials (<5% VOC by weight); OR Use of low-VOC materials resulting in an equivalent emission reduction
NOx	No standard
SOx	No standard
PM10	Dry filters or waterwash
PM2.5	No standard
CO	No standard

RULE REQUIREMENTS:

Rule 1168 Adhesive and Sealant Applications (10/6/17)

The use of cleaning solvents are addressed under Rule 1171 Solvent Cleaning Operations.

Architectural Applications	VOC Limits g/l
Building Envelope Membrane Adhesive	250
Structural Wood Member Adhesive	140
Indoor Carpet Adhesives	50
Carpet Pad Adhesives	50
All Other Indoor or Outdoor Floor Covering Adhesives	50
Wood Flooring Adhesive	100
Rubber Floor Adhesives	60
Subfloor Adhesives	50
Ceramic Tile Adhesives	65
VCT and Asphalt Tile Adhesives	50
Dry Wall and Panel Adhesives	50
Cove Base Adhesives	50
Multipurpose Construction Adhesives	70
Structural Glazing Adhesives	100
Roof Adhesives	250

Specialty Applications	VOC Limits g/l
Computer Diskette Manufacturing Contact Adhesive	350
Contact Adhesive	80
Edge Glue Adhesive	250
Plastic Welding Cement	
ABS Welding	325
ABS to PVC Transition Cement	510
CPVC Welding	490
PVC Welding	510
All Other Plastic Cement Welding	100
Rubber Vulcanization Adhesive	850
Special Purpose Contact Adhesive	250
Thin Metal Laminating Adhesive	780
Tire Tread Adhesive	100
Top and Trim Adhesive	540
Waterproof Resorcinol Glue	170
All Other Adhesives	250

Substrate Specific Applications	VOC Limits g/l
Metal to Metal	30
Plastic Foams	50
Porous Material (except wood)	50
Wood	30
Fiberglass	80
Reinforced Plastic Composite	200

** These limits apply to any adhesive, bonding primer or any other primer not Regulated by the previous table.

Sealants	VOC Limits g/l
Architectural	
Clear, Paintable, and Immediately Water-Resistant Sealant	380
Foam Insulation	250
Foam Sealant	250
Grout	65
Roadway Sealant	250
Non-Staining Plumbing Putty	150
Roofing	
Single-Ply Roof Membrane	450
All Other Roof Sealants	300
All Other Architectural Sealants	50
Marine Deck	760
All Other Sealants	420

Adhesive Primers	VOC Limits g/l
Plastic	550
Pressure Sensitive	785
Traffic Marking Tape	150
Vehicle glass	700
All Other Adhesive Primers	250

Sealant Primers	VOC Limits g/l
Architectural Nonporous Porous	 250 775
Modified Bituminous	500
Marine Deck	760
Other	750

<table>
<tr><td></td><td>NOTE - No new BACT determinations were identified, however Rule 1168 was revised since the last BACT analysis.</td></tr>
<tr><td>San Diego County APCD</td><td>
<u>BACT</u>
Source: NSR Requirements for BACT Guidance Document (6/11), page 3-2.

<table>
<tr><td colspan="2">Adhesive Application Operations (< 10 gal/day)</td></tr>
<tr><td>VOC</td><td>Compliance with Rule 67.21, Adhesive Material Application Operations</td></tr>
<tr><td>NOx</td><td>No standard</td></tr>
<tr><td>SOx</td><td>No standard</td></tr>
<tr><td>PM10</td><td rowspan="2">Spray booth if used, shall be equipped with over spray filters.</td></tr>
<tr><td>PM2.5</td></tr>
<tr><td>CO</td><td>No standard</td></tr>
</table>
** The applicant has the option to limit the potential to emit (PE) to less than 10 lb/day for each pollutant in lieu of meeting the BACT requirements.

<u>RULE REQUIREMENTS</u>:

<u>Regulation 4, Rule 67.21 Adhesive Material Application Operations (11/14/08)</u>

<table>
<tr><th>Architectural Products</th><th>VOC Limits (grams/liter)</th></tr>
<tr><td>Architectural sealant</td><td>250</td></tr>
<tr><td>Architectural sealant primer for:
- Non-porous materials
- Porous materials</td><td>
250
775</td></tr>
<tr><td>Ceramic tile installation adhesive</td><td>65</td></tr>
<tr><td>Cove base installation adhesive</td><td>50</td></tr>
<tr><td>Flooring adhesives:
Indoor carpet or carpet pad adhesive
Rubber flooring adhesive
Subfloor adhesive
VCT and asphalt tile adhesive
Wood flooring adhesive
Other floor covering adhesive</td><td>
50
60
50
50
100
150</td></tr>
</table>
</td></tr>
</table>

Multipurpose construction installation/repair adhesive	70
Non-membrane roof installation/repair adhesive/sealant	300
Perimeter bonding adhesive	660
Roadway sealant	250
Single-ply roof membrane installation/repair adhesive/primer	250
Single-ply roof membrane sealant	450
Structural glazing adhesive	100
Structural wood member adhesive	140
Traffic marking tape adhesive primer	150

Plastic Welding Products	VOC Limits (grams/liter)
ABS welding adhesive	400
CPVC welding adhesive	490
PVC welding adhesive	510
Plastic cement welding adhesive primer	650
Other plastic cement welding adhesives	510

Specialty Adhesive Materials	VOC Limits (grams/liter)
Automotive glass adhesive primer	700
Adhesive primers Computer diskette jacket manufacturing adhesive	850
Contact adhesive General Special	 80 250
Elastomeric adhesive	750
Marine deck sealant/primer	760
Metal to elastomer molding or casting adhesive	850
Natural gas pipeline tape adhesive primer	600
Sheet rubber lining installation adhesive	850
Thin metal laminating adhesive	780
Tire retread adhesive	100
Top and Trim adhesive	540
Waterproof resorcinol glue	170

Substrate Specific Adhesives	VOC Limits (grams/liter)
Adhesives applied onto:	
Fiberglass	80
Metal	30
Porous material (except wood)	50
Wood	30
Other substrates	250

All Other Adhesive Materials	VOC Limits (grams/liter)
Adhesive primer	250
Sealants	420
Sealant primers	750

Surface preparation, stripping and cleanup materials are subject to the following:

(i) The material contains 70 grams or less of VOC per liter of material; or
(ii) The material has an initial boiling point of 190°C (374°F) or greater; or
(iii) The material has a total VOC vapor pressure of 45 mm Hg or less, at 20°C (68°F).

Cleaning of application equipment is subject to the following:

(i) The material contains 70 grams or less of VOC per liter of material; or
(ii) The material has an initial boiling point of 190°C (374°F) or greater; or
(iii) The material has a total VOC vapor pressure of 45 mm Hg or less, at 20°C (68°F); or
(iv) The cleaning material is flushed or rinsed through the application equipment in a contained manner that will minimize evaporation into the atmosphere; or
(v) 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
(vi) A system is used that totally encloses the component parts being cleaned during the washing, rinsing, and draining processes; or
(vii) Other application equipment cleaning methods are used that are demonstrated to be as effective as any of the equipment described above in minimizing the VOC emissions to the atmosphere, provided that the method has been tested and approved in writing by the Air Pollution Control Officer prior to use.

NOTE - No new BACT determinations nor any revisions or additions to rules were identified as of 4/3/19

Bay Area AQMD

BACT
Source: BAAQMD BACT Guideline

Adhesive Application Operation	
VOC	No standard
NOx	No standard
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	No standard

RULE REQUIREMENTS:

Reg 8, Rule 51 Adhesive and Sealant Products (7/17/02)

This rule does not include VOC limits for cleaning solvent usage.

Architectural	VOC Limits (grams/liter)
Indoor Floor Covering Installation	150
Multipurpose Construction	200
Nonmembrane Roof Installation/Repair	300
Outdoor Floor Covering Installation	250
Single-Ply Roof Material Installation/Repair	250
Structural Glazing	100
Ceramic Tile Installation	130
Cove Base Installation	150
Perimeter Bonded Sheet Vinyl Flooring Installation	660

Specialty	VOC Limits (grams/liter)
Computer Diskette Jacket Manufacturing	850
ABS Welding	400
CPVC Welding	490
PVC Welding	510
Other Plastic Welding	500
Thin Metal Laminating	780
Tire Retread	100
Rubber Vulcanization Bonding	850
Waterproof Resorcinol Glue	170
Immersible Product Manufacturing	650
Top and Trim Installation	540

Adhesive Primers	VOC Limits (grams/liter)
Automotive Glass Primer	700
Pavement Marking Tape Primer	150
Plastic Welding Primer	650
Other	250

Contact Bond Adhesives	VOC Limits (grams/liter)
Contact Bond Adhesive	250
Contact Bond Adhesive – Special Substrates	400

Adhesive Product, Substrate Limits	VOC Limits (grams/liter)
Metal	30
Porous Materials	120
Other Substrates	250

Sealant	VOC Limits (grams/liter)
Architectural	250
Marine Deck	760
Roadways	250
Single Ply Roof Material Installation/Repair	450
Nonmembrane Roof Installation/Repair	300
Other	420

Sealant Primer	VOC Limits (grams/liter)
Architectural - Nonporous	250
Architectural - Porous	775
Other	750

NOTE - No new BACT determinations nor any revisions or additions to rules were identified as of 4/3/19.

San Joaquin Valley APCD

BACT

SJVAPCD BACT Guidelines

Source: SJVAPCD BACT Guideline 4.9.1 (7/10/96)

Adhesive Application Operation – Tire Retreading	
VOC	Use of adhesives with a VOC content of 5.2 lb/gal (less water and exempt compounds) or less
NOx	No standard
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	No standard

Note: Current Rule 4653 limit is more restrictive.

Source: SJVAPCD BACT Guideline 4.9.2 (9/11/97)

Adhesive Application Operation – Rubber Parts and Products, Brush Applied	
VOC	Using adhesives with a VOC content of 7.0 lb/gal or less (less water and exempt compounds)
NOx	No standard
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	No standard

Note: Current Rule 4653 limit is more restrictive.

Source: SJVAPCD BACT Guideline 4.9.3 (5/27/97)

Adhesive Application Process – Foam Products	
VOC	Adhesives with a VOC content of ≤ 1.0 lb/gal (less water and exempt compounds)
NOx	No standard
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	No standard

Note: Current Rule 4653 limit is more restrictive.

Source: SJVAPCD BACT Guideline 4.9.4 (4/3/00)

Adhesive Application Process – Non-Porous Materials, Specialty Contact Adhesives, Spray Application	
VOC	Using adhesives with a VOC content of 540 g/l or less (less water and exempt compounds) until July 1, 2000. Using adhesives with a VOC content of 400 g/l or less (less water and exempt compounds) after July 1, 2000.
NOx	No standard
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	No standard

Note: Current Rule 4653 limit is more restrictive.

Source: SJVAPCD BACT Guideline 4.9.5 (11/5/98)

Adhesive Application Process – Wooden Case Manufacturing	
VOC	Use of adhesives with a VOC content compliant with Rule 4653 (Adhesives).
NOx	No standard
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	No standard

Source: SJVAPCD BACT Guideline 4.9.6 (11/28/00)

Paper Carton Manufacturing – Printing and Adhesive Application	
VOC	Adhesive with a VOC content of = or < 5.7 lb/gal (excluding water and exempt compounds) and inks with a VOC content of = or < 2.55 lb/gal (excluding water and exempt compounds)
NOx	No standard
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	No standard

Note: This BACT is not applicable, since the adhesive's limit is addressed under the District Graphic Arts Rule (Rule 4607).

Source: SJVAPCD BACT Guideline 4.9.7 (8/3/01)

Corrugated PVC Sheet Products – Special Contact Adhesive, Roller Applied	
VOC	PVC welding adhesive compliant with District Rule 4653
NOx	No standard
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	No standard

Source: SJVAPCD BACT Guideline 4.9.8 (11/20/01)

Adhesive Application Process – Wooden Door Assembly, Roller Applied	
VOC	Use of an adhesive with a VOC content of 5.0 grams/liter (less water and exempt compounds), or less
NOx	No standard
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	No standard

Note: This limit is more restrictive than Rule 4653.

Source: SJVAPCD BACT Guideline 4.9.9 (9/26/03)

Adhesive Application Process – Vinyl Door and Window Assembly, Non-Spray Applied	
VOC	1) Use of adhesive with a VOC content of 3.0 g/l (less water and exempt compounds), or less for automated adhesive application and assembly processes 2) Use of adhesive with VOC content of 76.5 g/l (less water and exempt compounds), or less for manually applied adhesive operation when assembling
NOx	No standard
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	No standard

Note: These limits are more restrictive than Rule 4653.

Source: SJVAPCD BACT Guideline 4.9.10 (11/18/04)

Adhesive Application for Multi-Wall Packaging Manufacturing	
VOC	Adhesives with a VOC content of ≤ 0.2 lb/gal (excluding water and exempt compounds) for the adhesion of plastic film to porous material Adhesives with a VOC content of ≤ 0.13 lb/gal (excluding water and exempt compounds) for the adhesion of porous materials
NOx	No standard
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	No standard

Note: These limits are more restrictive than Rule 4653.

Source: SJVAPCD BACT Guideline 4.9.11 (11/3/05)

Adhesive Application Operation – Bonding of Fiberglass Boat Hulls and Decks, Non-Atomizing Application	
VOC	Use of adhesives with VOC content of 80 grams/liter or less (less water and exempt compounds)
NOx	No standard
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	No standard

Note: This limit is equivalent to the current Rule 4653 limit.

Source: SJVAPCD BACT Guideline 4.9.12 (9/22/06)

Corrugated Box Gluer	
VOC	Use of adhesives with a VOC content (less water and exempt compounds) not exceeding 0.044 lb/gal
NOx	No standard
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	No standard

Note: This limit is more restrictive than Rule 4653.

Source: SJVAPCD BACT Guideline 4.9.13 (1/30/15)

Corrugated Cardboard Manufacturing (Corrugator)	
VOC	Adhesives – 0.015 lb/VOC/gal (less water and exempt compounds)
NOx	No standard
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	No standard

Note: This limit is more restrictive than Rule 4653.

RULE REQUIREMENTS:

Rule 4653 Adhesives and Sealants (9/16/10)

Table 2 - VOC Content Limits for Adhesive Products (Effective on and after January 1, 2012)	
Applications	VOC limit (Grams Per Liter)
	Architectural Adhesive Products:
Multipurpose Construction	70
Ceramic Tile Adhesive	65
Cove Base Installation	50
Dry Wall and/or Panel Adhesive	50
Flooring Adhesives:	
Floor Covering Installation	150
Ceramic Floor Tile Installation	65
Indoor Carpet Adhesive	50
Carpet Pad Adhesive	50
Outdoor Carpet Adhesive	150
Rubber Flooring Adhesive	60
Perimeter Bonded Sheet Flooring Installation	660
Subfloor Adhesive	50
VCT and Asphalt Tile Adhesive	50
Wood Flooring Adhesive	100
Roofing Adhesives:	
Single-Ply Roof Material Installation	250
Non-Membrane Roof Adhesive	300
Structural Glazing	100
Structural Wood Member Adhesive	140
Miscellaneous Adhesives:	
Contact Adhesive	80
Contact Adhesive – Specialty	250
Rubber Vulcanization Adhesive/Primer	850
Tire Retread	100
Motor Vehicle Adhesive	250
Motor Vehicle Weather-strip Adhesive	750
Traffic Marking Tape Adhesive/ Primer	150
Top and Trim Adhesive	540
Waterproof Resorcinol Glue	170

Staple and Nail Manufacturing	640
Thin Metal Laminating Adhesive	780
Elastomeric Adhesive	750
Flexible Vinyl Adhesive	250

Table 2 - VOC Content Limits for Adhesive Products continued
(Effective on and after January 1, 2012)

Applications	VOC Limit (Grams per Liter)
Plastic Welding Products	
ABS Welding Adhesive	325
Cellulosic Plastic Welding Adhesive	100
CPVC Welding Adhesive	490
PVC Welding Adhesive	510
Styrene-Acrylonitrile Welding Adhesive	100
Plastic Cement Welding Adhesive Primer	400
Other Plastic Cement Welding Adhesive	250
Adhesive Primers:	
Automotive Glass Primer	700
Adhesive Primer	250

Table 3 - VOC Content Limits for Adhesive Products
(Effective on and after January 1, 2012)

Materials Bonded	VOC Limit (Grams per Liter)
Metal to Metal	30
Porous Materials	50
Plastic Foam	50
Wood	30
Pre-formed Rubber Products	250
Reinforced Plastic Composite	200
Fiberglass	80
All other Substrates	250

Table 4 - VOC Content Limits for Sealants

Sealant	VOC Limit Effective on and after January 1, 2012. (Grams Per Liter)
Architectural	250
Marine Deck	760
Non-membrane Roof	300
Roadway	250
Single-Ply Roof Membrane	450
Other Sealants	420

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Table 5 - VOC Content Limits for Sealant Primers	
Sealant Primer	VOC Limit Effective on and after January 1, 2012. (Grams Per Liter)
Architectural Non Porous	250
Architectural Porous	775
Modified Bituminous	500
Marine Deck	760
Other Sealant Primers	750

Table 6 – VOC Limits for Organic Solvents Used in Cleaning Operations	
Type of Solvent Cleaning Operation	VOC Content Limit Grams of VOC/liter of material (lb/gal)
A. Products Cleaning During Manufacturing Process or Surface Preparation for Adhesive Application	
1. General	25 (0.21)
2. Surface Preparation Prior to Rubber Vulcanization Process	850 (7.1)
B. Repair and Maintenance Cleaning	25 (0.21)
C. Cleaning of Adhesive Application Equipment	25 (0.21)

NOTE - No new BACT determinations nor any revisions or additions to rules were identified as of 4/3/19.

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

SUMMARY OF ACHIEVED IN PRACTICE CONTROL TECHNOLOGIES	
VOC	1. See adhesives, sealants, solvents and strippers limit tables from each district and BACT guidelines from the SCAQMD, SDCAPCD and SJVAPCD listed above – [SMAQMD, SCAQMD, SJVAPCD, BAAQMD, SDCAPCD]
NOx	1. No standard – [SMAQMD, SCAQMD, SJVAPCD, BAAQMD, SDCAPCD]
SOx	1. No standard – [SMAQMD, SCAQMD, SJVAPCD, BAAQMD, SDCAPCD]
PM10	1. Dry filters or waterwash – [SMAQMD, SCAQMD] 2. Spray booth if used, shall be equipped with over spray filters – [SDCAPCD] (A) 3. No standard – [SJVAPCD, BAAQMD]
PM2.5	1. Dry filters or waterwash – [SMAQMD]
CO	1. No standard – [SMAQMD, SCAQMD, SJVAPCD, BAAQMD, SDCAPCD]

(A) SDCAPCD allows the facility the option of limiting the PE to emit to less than 10 lb/day in lieu of meeting the BACT requirements. Achieved in Practice BACT is the use of over spray filters.

On 2/2/16, the District sent the SJVAPCD, SDCAPCD and SCAQMD an email and asked them if the limits established in their adhesives rules were being enforced in order to determine if the limits were considered to be achieved in practice.

Angela Ortega (SDCAPCD, Supervisor – Rule Development, (858)586-2753) called the District on 2/4/16 and stated they are enforcing their rule limits. She stated their inspectors have been to hardware stores to ensure the adhesives that are being sold are compliant. They also have a point of sale in their rule.

Bradley McClung (SCAQMD, AQ Inspector III, (909)396-2446) called the District on 2/17/16 and stated they are enforcing their rule limits.

Chay Thao (SJVAPCD, Program Manager – Strategies and Incentives Department, (559)230-5895) emailed the District with a response on 4/4/16. He stated they are enforcing their adhesives rule limits.

Therefore, the limits established in the SJVAPCD, SDCAPCD and SCAQMD adhesives rules are considered to be achieved in practice.

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

BEST CONTROL TECHNOLOGIES ACHIEVED		
Pollutant	**Standard**	**Source**
VOC	<u>For booths with <1,170 lbs/month VOC Emissions</u> Compliance with adhesives, sealants, solvents and strippers Tables 1 – 9 under Section C of this document.	SMAQMD, SCAQMD, SJVAPCD, BAAQMD, SDCAPCD
	<u>For booths with ≥1,170 lbs/month VOC Emissions</u> 1. Compliance with adhesives, sealants, solvents and strippers Tables 1 – 9 under Section C of this document and VOC control system with ≥90% collection efficiency and ≥ 95%	SMAQMD, SCAQMD

BEST CONTROL TECHNOLOGIES ACHIEVED		
Pollutant	**Standard**	**Source**
	destruction efficiency; OR 2. Use of Super Clean Materials (<5% VOC by weight); OR 3. Use of low-VOC materials resulting in an equivalent emission reduction	
NOx	No standard	
SOx	No standard	
PM10	1. Dry filters or waterwash – [SMAQMD, SCAQMD] 2. Spray booth if used, shall be equipped with over spray filters – [SDCAPCD] (A)	SMAQMD (BACT) SCAQMD (BACT) SDCAPCD (BACT)
PM2.5	Dry filters or waterwash – [SMAQMD]	
CO	No standard	

(A) SDCAPCD allows the facility the option of limiting the PE to emit to less than 10 lb/day in lieu of meeting the BACT requirements. Achieved in Practice is the use of over spray filters as the use of the booth is an option.

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.

VOC

1. Carbon Adsorber
2. Thermal Oxidizer
3. SCAQMD Rule 1168 future limits (January 1, 2023)

Architectural Applications	VOC Limits g/l
Wood Flooring Adhesive	20
Roof Adhesives	
Single Ply Roof Membrane Adhesive	200
All other Roof Adhesive	200

Specialty Applications	VOC Limits g/l
Plastic Welding Cement	
PVC Welding	425
Top and Trim Adhesive	250

	Sealants — VOC Limits g/l
	Architectural
	Roofing
	Single-Ply Roof Membrane: 250
	All Other Roof Sealants: 250
	All Other Sealants: 250
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:

The SCAQMD maintains a list of products (https://www.aqmd.gov/home/rules-compliance/compliance/vocs/adhesive-and-sealants/rule-1168-compliant-products#Compliant) that are compliant with the future January 2023 compliance date in Rule 1168. For the categories listed above, products are currently available to meet these future VOC limits. Since these products are currently available it is assumed that they are both technologically feasible and cost effective and no other cost effectiveness evaluation will be performed.

For the equipment based technologically feasible options, the following cost analysis was perfomed. The cost recovery factor (CRF) used in determining cost effectiveness in the previous BACT #134 assumed an annual interest rate of 4%. Per the October 2015, "Procedures for Making Best Available Control Technology (BACT) and Best Available Control Technology for Toxics (T-BACT) Determinations for new and Modified Emission Units" the interest rate used to calculate the CRF is the 6 month average of the ten year treasury + 2% rounded up. As of April 2019, the the 10 year treasure rate (as found on http://www.multpl.com/10-year-treasury-rate/table/by-month) for the last 6 months beginning in October 2018 and ending in April 2019 is 3.15%, 3.12%, 2.83%, 2.71%, 2.68, and 2.52%. The average is 2.84%. Therefore the resultant annual interest rate to be used is 2.84% + 2% = 4.84 % or 5%. Since the the intersest rate is higher then what was previously used in the cost effectiveness calculations, redoing the calculations with today's higher interest rate would only drive the cost effectiveness higher thus establishing a higher threshold of emissions before technologically feasible BACT would be considered cost effective. Therefore, in accordance with district policy, a higher cost threshold of emissions will not be considerd based on only a change in the assumed interest rate. With this said, the cost effectiveness calculations that were presented for BACT# 134 are still applicable and are shown below.

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

Maximum Cost per Ton of Air Pollutants Controlled

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

Pollutant	Maximum Cost ($/ton)
ROG	17,500
NO_X	24,500
PM_{10}	11,400
SO_X	18,300
CO	TBD if BACT triggered

Cost Effectiveness Analysis Summary

The cost analysis was processed in accordance with the EPA OAQPS Air Pollution Control Cost Manual (Third Edition). The sales tax rate was based on the District's standard rate of 8.5% as approved on 10/17/16. The electricity (11.24 cents/kWh) and natural gas (6.41 dollars/1,000 cubic feet) rates were based on an industrial application as approved by the District on 10/17/16. 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 Treasurey 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 51-9191: Adhesive bonding machine operators and tenders) and maintenance (Occupation Code 49-9099: Installation, maintenance, and repair workers, all other) rates were based on data from the Bureau of Labor Statistics.

Carbon Adsorption System

Equipment Life = 10 years

Total Capital Investment = $10,210.98

Annualized Total Capital Investment = $1,481.46 per year

Direct Annual Cost = $4,209.43 per year

Indirect Annual Cost = $4,257.98 per year

Cost of Carbon per year = $21,702.60

Total Annual Cost = $31,651.47 per year

VOC Removed = 1.8 tons per year

Cost of VOC Removal = $17,501.02 per ton reduced

A detailed calculation of the cost effectiveness for VOC removal with a carbon absorber is shown in Appendix B. Uncontrolled VOC emissions of 4,019 lb/year or greater is the cost-effective threshold for control equipment using carbon absorption control technology

Thermal Oxidizer:

Equipment Life = 10 years

Total Capital Investment = $218,719

Annualized Total Capital Investment = $18,943.24 per year

Direct Annual Cost = $90,774.16 per year

Indirect Annual Cost = $17,018.07 per year

Total Annual Cost = $126,735.47per year

VOC Removed = 7.24 tons per year

Cost of VOC Removal = $17,504.90 per ton reduced

A detailed calculation of the cost effectiveness for VOC removal with a thermal oxidizer is shown in Appendix B. Uncontrolled VOC emissions of 14,480 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 4,019 lb per year or greater must be reached in order for the carbon absorption control option to be cost effective. Uncontrolled VOC emission level of 14,480 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 ROC of $17,500 per ton controlled.

C. SELECTION OF BACT:

BACT FOR ADHESIVES APPLICATION OPERATIONS (#226) < 1,170 lbs/month and ≤ 4,019 lbs VOC/year		
Pollutant	**Standard**	**Source**
VOC	1. Compliance with adhesive BACT VOC limits (see Tables 1-9 below)	SMAQMD, SCAQMD, SJVAPCD, BAAQMD, SDCAPCD
NOx	No standard	
SOx	No standard	
PM10	1. Spray booth with dry filters or waterwash.	SCAQMD SDCAPCD
PM2.5	1. Spray booth with dry filters or waterwash.	SCAQMD SDCAPCD
CO	No Standard	

BACT FOR ADHESIVES APPLICATION OPERATIONS (#227) >1,170 lbs /month or > 4,019 lb VOC/year		
Pollutant	**Standard**	**Source**
VOC	1. Compliance with adhesive BACT VOC limits (see Tables 1-9 below) and VOC control system with ≥90% collection efficiency and ≥ 95% destruction efficiency.	SMAQMD, SCAQMD
NOx	No standard	
SOx	No standard	
PM10	1. Spray booth with dry filters or waterwash.	SCAQMD SDCAPCD
PM2.5	1. Spray booth with dry filters or waterwash.	SCAQMD

BACT FOR ADHESIVES APPLICATION OPERATIONS (#227) >1,170 lbs /month or > 4,019 lb VOC/year		
Pollutant	**Standard**	**Source**
		SDCAPCD
CO	No Standard	

Table 1 Adhesives		
Adhesive	**VOC Limits g/l (lbs/gal)**	**Source**
Architectural Adhesive Applications:		
Multipurpose Construction Adhesive	70 (0.6)	SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21
Structural Wood Member Adhesive	140 (1.2)	SCAQMD Rule 1168, SJVAPCD Rule 4653, SDCAPCD Rule 67.21
Ceramic Tile Installation Adhesive	65 (0.5)	SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21
Cove Base Installation Adhesive	50 (0.4)	SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21
Dry Wall and/or Panel Adhesive	50 (0.4)	SJVAPCD Rule 4653, SCAQMD Rule 1168
Flooring Adhesives:		
All Other Indoor or Outdoor Floor Covering Adhesive	50 (0.4)	SCAQMD Rule 1168
Ceramic Floor Tile Installation	65 (0.5)	SCAQMD Rule 1168, SJVAPCD Rule 4653
Indoor Carpet Adhesive	50 (0.4)	SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21
Carpet Pad Adhesive	50 (0.4)	SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21
Rubber Flooring Adhesive	60 (0.5)	SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21
Wood Flooring Adhesive	20 (0.2)	SCAQMD Rule 1168,
Subfloor Adhesive	50 (0.4)	SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21
VCT and Asphalt Tile Adhesive	50 (0.4)	SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21
Roofing Adhesives:		
Single-Ply Roof Membrane Installation/Repair Adhesive (A)	200 (1.7)	SCAQMD Rule 1168

Table 1 Adhesives		
Adhesive	**VOC Limits g/l (lbs/gal)**	**Source**
All Other Roof Adhesives	200 (1.7)	SCAQMD Rule 1168
Structural Glazing Adhesive (A)	100 (0.8)	SMAQMD Rule 460, SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21, BAAQMD Rule 51
Plastic Welding Products:		
ABS Welding Adhesive	325 (2.7)	SJVAPCD Rule 4653, SCAQMD Rule 1168
Cellulosic Plastic Welding Adhesive	100 (0.8)	SDCAPCD Rule 67.21
CPVC Welding Adhesive	490 (4.1)	SMAQMD Rule 460, SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21, BAAQMD Rule 51
PVC Welding Adhesive	425 (3.5)	SCAQMD Rule 1168
ABS to PVC Transition Cement	510 (4.3)	SCAQMD Rule 1168
All Other Plastic Cement Welding Adhesive	100 (0.8)	SCAQMD Rule 1168
Miscellaneous Adhesives:		
Metal to Urethane/Rubber Molding or Casting Adhesive	250 (2.1)	SMAQMD Rule 460
Thin Metal Laminating Adhesive (A)	780 (6.5)	SCAQMD Rule 1168, SMAQMD Rule 460, SJVAPCD Rule 4653, SDCAPCD Rule 67.21, BAAQMD Rule 51
Tire Tread Adhesive (A)	100 (0.8)	SMAQMD Rule 460, SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21, BAAQMD Rule 51
Top and Trim Adhesive	250 (2.1)	SCAQMD Rule 1168
Waterproof Resorcinol Glue (A)	170 (1.4)	SCAQMD Rule 1168, SMAQMD Rule 460, SJVAPCD Rule 4653, SDCAPCD Rule 67.21, BAAQMD Rule 51
Computer Diskette Jacket	350 (2.9)	SCAQMD Rule 1168

Table 1 Adhesives		
Adhesive	**VOC Limits g/l (lbs/gal)**	**Source**
Manufacturing Adhesive		
All Other Specialty Adhesives	250 (2.1)	SCAQMD Rule 1168
Adhesive Application Process – Wooden Door Assembly, Roller Applied	Use of an adhesive with a VOC content of 5.0 grams/liter (0.04 lb/gal) (less water and exempt compounds), or less	SJVAPCD BACT Guideline 4.9.8 (11/20/01)
Adhesive Application Process – Vinyl Door and Window Assembly, Non-Spray Applied	1) Use of adhesive with a VOC content of 3.0 g/l (0.03 lb/gal)(less water and exempt compounds), or less for automated adhesive application and assembly processes Use of adhesive with VOC content of 76.5 g/l (0.6 lb/gal) (less water and exempt compounds), or less for manually applied adhesive operation when assembling	SJVAPCD BACT Guideline 4.9.9 (9/26/03)
Adhesive Application for Multi-Wall Packaging Manufacturing	1. Adhesives with a VOC content of <= 0.2 lb/gal (24.0 g/l) (excluding water and exempt compounds) for the adhesion of plastic film to porous material Adhesives with a VOC content of <= 0.13 lb/gal (15.6 g/l) (excluding water and exempt compounds) for the adhesion of porous materials	SJVAPCD BACT Guideline 4.9.10 (11/18/04)
Corrugated Box Gluer	Use of adhesives with a VOC content (less water and exempt compounds) not exceeding 0.044 lb/gal (5.3 g/l)	SJVAPCD BACT Guideline 4.9.12 (9/22/06)
Corrugated Cardboard Manufacturing (Corrugator)	Adhesives – 0.015 lb/VOC/gal (1.8 g/l) (less water and exempt compounds)	SJVAPCD BACT Guideline 4.9.13 (1/30/15)

(A) Also listed in EPA's s Control Techniques Guidelines for Miscellaneous Industrial Adhesives (EPA-453/R-08-005 (9/08)).

Table 2 VOC Content For Adhesive Primers		
Type of Adhesive Primer	**VOC Limits g/l (lbs/gal) (A)**	**Source**
Automotive Glass	700 (5.8)	SMAQMD Rule 460, SCAQMD Rule 1168, SJVAPCD Rule 4653, SDCAPCD Rule 67.21, BAAQMD Rule 51
Plastic Cement Welding	400 (3.3)	SMAQMD Rule 460, SJVAPCD Rule 4653,
Single-Ply Roof Membrane	250 (2.1)	SMAQMD Rule 460, SJVAPCD Rule 4653, SDCAPCD Rule 67.21
Traffic Marking Tape	150 (1.3)	SMAQMD Rule 460, SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21, BAAQMD Rule 51
Other	250 (2.1) (A)	SMAQMD Rule 460, SDCAPCD Rule 67.21, BAAQMD Rule 51

(A) Also listed in EPA's s Control Techniques Guidelines for Miscellaneous Industrial Adhesives (EPA-453/R-08-005 (9/08)).

Table 3 VOC Content For Contact Adhesives		
Type of Contact Adhesive	**VOC Limits g/l (lbs/gal)**	**Source**
Contact Adhesive	80 (0.7)	SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21
Contact Adhesive – Specialty Substrate	250 (2.1)	SMAQMD Rule 460, SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21

Table 4 VOC Content For Sealants		
Type of Sealant	**VOC Limits g/l (lbs/gal)**	**Source**
Architectural		
Clear, Paintable, and Immeduately Water-Resistant Sealant	380 (3.2)	SCAQMD Rule 1168
Grout	65 (0.5)	SCAQMD Rule 1168
Foam Sealant	250 (2.1)	SCAQMD Rule 1168
Roadway Sealant	250 (2.1)	SMAQMD Rule 460, SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21, BAAQMD

Table 4 VOC Content For Sealants		
Type of Sealant	**VOC Limits g/l (lbs/gal)**	**Source**
		Rule 51
Non-Staining Plumbing Putty	150 (1.6)	SCAQMD Rule 1168
Roof Sealant	250 (2.1)	SCAQMD Rule 1168
All Other Architectural Sealants	50 (0.4)	SCAQMD Rule 1168
Marine Deck	760 (6.3)	SMAQMD Rule 460, SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21, BAAQMD Rule 51
All Other Sealants	250 (2.1)	SCAQMD Rule 1168

Table 5 VOC Content For Sealant Primers		
Type of Sealant Primer	**VOC g/l (lbs/gal)**	**Source**
Architectural Nonporous Porous	 250 (2.1) 775 (6.5)	SMAQMD Rule 460, SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21, BAAQMD Rule 51
Marine Deck	760 (6.3)	SMAQMD Rule 460, SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21
Modified Bituminous	500 (4.2)	SJVAPCD Rule 4653, SCAQMD Rule 1168
Other	750 (6.3)	SMAQMD Rule 460, SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21, BAAQMD Rule 51

Table 6 VOC Content For Adhesives Applications Onto Substrates		
Adhesive Applications Onto Substrates	**VOC Limits g/l (lbs/gal)**	**Source**
Flexible Vinyl (A)	250 (2.1)	SMAQMD Rule 460
Fiberglass	80 (0.7)	SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21
Metal (A)	30 (0.3)	SMAQMD Rule 460, SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21, BAAQMD Rule 51
Porous Material	50 (0.4)	SMAQMD Rule 460, SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21, BAAQMD Rule 51

Table 6 VOC Content For Adhesives Applications Onto Substrates		
Adhesive Applications Onto Substrates	**VOC Limits g/l (lbs/gal)**	**Source**
Rubber (A)	250 (2.1)	SMAQMD Rule 460
Wood (A)	30 (0.3)	SJVAPCD Rule 4653, SCAQMD Rule 1168, SDCAPCD Rule 67.21
Plastic Foam	50 (0.4)	SJVAPCD Rule 4653, SCAQMD Rule 1168
Reinforced Plastic Composite	200 (1.7)	SCAQMD Rule 1168, SJVAPCD Rule 4653
Other Substrates (A)	250 (2.1)	SMAQMD Rule 460, SJVAPCD Rule 4653, SDCAPCD Rule 67.21, BAAQMD Rule 51

(A) All of the listed substrates and limits, except fiberglass, are listed in EPA/s Control Techniques Guidelines for Miscellaneous Industrial Adhesives (EPA-453/R-08-005 (9/08)).

Table 7 Maximum VOC Content Percentages for Aerosol Adhesives (Percent by VOC by Weight)		
Type of Solvent Cleaning Operation	**VOC Content Limit grams of VOC/liter of material (lb/gal)**	**Source**
Adhesives – Aerosol Mist Spray Adhesives Web Spray Adhesives	 65% 55%	SMAQMD Rule 460
Special Purpose Spray Adhesives Mounting, Automotive Engine Compartment, and Flexible Vinyl Adhesives Polystyrene Foam and Automobile Headliner Adhesives Polyolefin and Laminate Repair/Edge banding Adhesives	 70% 65% 60%	SMAQMD Rule 460

Table 8 Solvent Cleaning VOC Limits		
Type of Solvent Cleaning Operation	**VOC Content Limit grams of VOC/liter of material (lb/gal)**	**Source**
Product cleaning during manufacturing process or surface preparation for adhesive application		
1. General	25 (0.2)	SJVAPCD Rule 4653
Repair and maintenance cleaning	25 (0.2)	SJVAPCD Rule 4653
Cleaning of adhesive application equipment	25 (0.2)	SJVAPCD Rule 4653

Table 9 Stripper VOC Limits		
	VOC Content g/l (lbs/gal) including water and exempt compounds	**VOC Composite Partial Pressure Millimeters of Mercury at 20 °C (68 °F)**
Adhesive or Sealant Products on Wood	≤ 70 (≤ 0.6) (A)	≤ 2 (B)
Adhesive or Sealant Products on Substrates	--	≤ 9.5 (B)

(A) VOC limit is based on SDCAPCD Regulation IV, Rule 67.21.
(B) VOC vapor pressure limit is based on SMAQMD Regulation IV, Rule 460.

D: SELECTION OF T-BACT:

Toxics are in the form of VOCs and may also be exempt compounds. T-BACT for adhesives application was determined to be the following:

T-BACT FOR ADHESIVES APPLICATION OPERATIONS (#134) < 1,170 lbs/month and ≤ 4,019 lbs VOC/year		
Pollutant	**Standard**	**Source**
Organic HAP/VHAP (T-BACT)	1. Compliance with adhesives, sealants, solvents, and strippers BACT VOC limits (see Tables 1-9 above) and emission limits of Table 3 to Subpart JJ of Part 63.	SCAQMD NESHAP 40 CFR 63 Subpart JJ

T-BACT FOR ADHESIVES APPLICATION OPERATIONS (#139) ≥ 1,170 lbs VOC/month or > 4,019 lb VOC/year		
Pollutant	**Standard**	**Source**
Organic HAP/VHAP (T-BACT)	1. Compliance with adhesives, sealants, solvents and strippers BACT VOC limits (see Tables 1-9 above), emission limits of Table 3 to Subpart JJ of Part 63 and VOC control system with ≥90% collection efficiency and ≥ 95% destruction efficiency.	SCAQMD NESHAP 40 CFR 63 Subpart JJ

REVIEWED BY: _____ **DATE:** _____

APPROVED BY: Jorge A. Leyva **DATE:** 5/29/19

Appendix A

Review of BACT Determinations Published by Other Air Districts

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

10-20-2000 Rev. 0

Equipment or Process: Spray Booth

	Criteria Pollutants					
Subcategory/ Rating/Size	**VOC**	**NOx**	**SOx**	**CO**	**PM_{10}**	**Inorganic**
Automotive, Down-Draft Type, < 660 Lbs/Month of VOC Emissions	Compliance with Applicable AQMD Regulation XI Rules (10-20-2000)				Dry Filters or Waterwash (1990)	
Other Types, < 1170 Lbs/Month of VOC Emissions	Compliance with Applicable AQMD Regulation XI Rules (10-20-2000)				Same as Above (1990)	
Automotive, Down-Draft Type, ≥ 22 Lbs/Day of VOC Emissions	- Compliance with Applicable AQMD Regulation XI Rules, and VOC Control System with ≥ 90% Collection Efficiency and ≥ 95% Destruction Efficiency, or - Use of Super Clean Materials (< 5% VOC by weight): or - Use of Low-VOC Materials Resulting in an Equivalent Emission Reduction (10-20-2000)				Same as Above (1990)	
Other Types, ≥ 1170 Lbs/Month of VOC Emissions	Same as Above (10-20-2000)				Same as Above (1990)	

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

ADHESIVE MATERIAL APPLICATION OPERATIONS (<10 gal/day)
Fee Schedules 27 U, V, & W

Review the BACT Control Option listed below. The applicant must propose the Control Option listed or perform a Top-down BACT Analysis as described in Section 4 to justify the selection of another Control Option. The applicant will be required to provide documentation that the Control Option selected meets the requirements listed in the table.

	VOC	NOx	SOx	PM
BACT Emission Rate Limit	Not Determined	(N/A)	(N/A)	Not Determined
BACT Control Option	Compliance with Rule 67.21, Adhesive Material Application Operations (A/P)	(N/A)	(N/A)	Spray booth if used, shall be equipped with over spray filters. (A/P)

The applicant may choose to limit the Potential to Emit (PTE) from the equipment to less than 10 pounds per day for each pollutant in lieu of meeting the stated BACT requirement

(This table does not apply to operations applying, on average, 10 or more gallons of adhesive application materials per day.)

San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 4.9.1*

Last Update: 7/10/1996

Adhesives Application Operation - Tire Retreading

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	Use of adhesives with a VOC content of 5.2 lb/gal (less water and exempt compounds) or less	1. VOC capture and control with thermal/catalytic incineration utilizing adhesives with a VOC content of 5.2 lb/gal (less water and exempt compounds) or less 2. VOC capture and control with thermal/catalytic incineration utilizing adhesives with a VOC content of 7.1 lb/gal (less water and exempt compounds) or less 3. VOC capture and control with carbon adsorption utilizing adhesives with a VOC content of 5.2 lb/gal (less water and exempt compounds) or less 4. VOC capture and control with carbon adsorption utilizing adhesives with a VOC content of 7.1 lb/gal (less water and exempt compounds) or less	

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 s 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.

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San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 4.9.2*

Last Update: 9/11/1997

Adhesive Application Operation - Rubber Parts and Products, Brush Applied

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	Using adhesives with a VOC content of 7.0 lb/gal or less (less water and exempt compounds)	1. VOC capture and control with thermal incineration 2. VOC capture and control with catalytic incineration 3. VOC capture and control with carbon adsorption	

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 s 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.

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San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 4.9.3*

Last Update: 5/27/1997

Adhesive Application Process - Foam Products

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	Adhesives with a VOC content of ≤ 1.0 lb/gallon (less water and exempt compounds)	1. Capture and control with a thermal incineration device 2. Capture and control with a catalytic incineration device 3. Capture and control with a carbon adsorption device 4. Adhesives with a VOC content of ≤ 0.49 lb/gallon (less water and exempt compounds)	

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 s 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.

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San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 4.9.4*

Last Update: 4/3/2000

Adhesive Application Process - Non-Porous Materials, Specialty Contact Adhesives, Spray Application

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	Using adhesives with a VOC content of 540 grams/liter or less (less water and exempt compounds) until July 1, 2000. Using adhesives with a VOC content of 400 grams/liter or less (less water and exempt compounds) after July 1, 2000.	1. VOC capture and control with thermal or catalytic incineration 2. VOC capture and control with carbon adsorption	

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 s 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.

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San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 4.9.5*

Last Update: 11/5/1998

Adhesive Application Process - Wooden case manufacturing

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	Use of adhesives with a VOC content compliant with Rule 4653 (Adhesives) [This is achieved in practice only for those facilities subject to District Rule 4653.]	1. VOC capture and incineration using adhesives with a VOC content compliant with Rule 4653 (Adhesives). 2. VOC capture and carbon adsorption using adhesives with a VOC content compliant with Rule 4653 (Adhesives).	

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 s 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.

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San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 4.9.6*

Last Update: 11/28/2000

Paper Carton Manufacturing - Printing and Adhesive Application

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	1. Adhesive with a VOC content of = or < 5.7 lb/gal (excluding water and exempt compounds) and Inks with a VOC content of = or < 2.5 lb/gal (excluding water and exempt compounds)	1. Capture and thermal incineration. 2. Capture and carbon adsorption. 3. Adhesive with a VOC content of = or < 4.04 lb/gal (excluding water and exempt compounds) and Inks with a VOC content of = or < 2.4 lb/gal (excluding water and exempt compounds)	

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 s 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.

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San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 4.9.7*

Last Update: 8/3/2001

Corrugated PVC Sheet Products - Special Contact Adhesive, Roller Applied

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	PVC welding adhesive compliant with District Rule 4653	1. Thermal / catalytic incinerator. 2. Carbon adsorption system. 3. Low VOC adhesive (= or < 0.3 lb/gal, less water and exempt compounds).	

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 s 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.

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San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 4.9.8*

Last Update: 11/20/2001

Adhesive Application Process – Wooden Door Assembly, Roller applied

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	Use of an adhesive with a VOC content of 5.0 grams/liter (less water and exempt compounds), or less.	1. Thermal incineration 2. Carbon Adsorption or Use of an adhesive with a VOC content of 1.0 grams/liter (less water or exempt compounds), or less.	

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 s 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.

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Best Available Control Technology (BACT) Guideline 4.9.8 A

Emissions Unit:	Wooden Door Assembly, roller-applied adhesive.	**Equipment Rating:**	All
Facility:	American Door Manufacturing	**References:**	ATC #: N-1084-6-0 Project #: N-1010318
Location:	Stockton	**Date of Determination:**	11/20/2001

Pollutant	BACT
CO	BACT NOT TRIGGERED
NOx	BACT NOT TRIGGERED
PM10	BACT NOT TRIGGERED
SOx	BACT NOT TRIGGERED
VOC	Use of an adhesive with 1.0 gram/liter (less water and exempt compounds).

BACT Status	Comment
Technologically Feasible BACT	
The following technologically feasible options were not cost effective	1. Thermal or catalytic oxidation.

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Best Available Control Technology (BACT) Guideline 4.9.9 A

Emissions Unit:	Adhesive Application	**Equipment Rating:**	All
Facility:	Jeld-Wen, Inc.	**References:**	ATC # N-4943-4-0 and -5-0; Project # 1030691
Location:	Stockton	**Date of Determination:**	9/26/2003

Pollutant	BACT
CO	BACT NOT TRIGGERED
NOx	BACT NOT TRIGGERED
PM10	BACT NOT TRIGGERED
SOx	BACT NOT TRIGGERED
VOC	1) Use of adhesive with VOC content of 3.0 g/l (less water and exempt compounds), or less for automated adhesive application and assembly processes 2) Use of adhesive with VOC content of 76.5 g/l (less water and exempt compounds), or less for manually applied adhesive operations when assembling custom window assemblies

BACT Status	Comment
Achieved in Practice	
The following technologically feasible options were not cost effective	Thermal Oxidizer, Carbon Adsorption

San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 4.9.10*

Last Update: 11/18/2004

Adhesive Application for Multi-Wall Packaging Manufacturing

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	adhesives with a VOC content of <= 0.2 lb/gal (excluding water and exempt compounds) for the adhesion of plastic film to porous material adhesives with a VOC content of <= 0.13 lb/gal (excluding water and exempt compounds) for the adhesion of porous materials	1. Capture and thermal incineration 2. Capture and carbon adsorption	

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 s 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.

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Best Available Control Technology (BACT) Guideline 4.9.10 A

Emissions Unit:	Adhesive Application for Multi-Wall Packaging	**Equipment Rating:**	6,231 lb-adhesive/day
Facility:	Exopack, LLC	**References:**	ATC #C-264-14-0; # 1040496
Location:	Hanford	**Date of Determination:**	11/18/2004

Pollutant	BACT
CO	BACT NOT TRIGGERED
NOx	BACT NOT TRIGGERED
PM10	BACT NOT TRIGGERED
SOx	BACT NOT TRIGGERED
VOC	Adhesives with a VOC content of <= 0.2 lb/gal (excluding water and exempt compounds) for the adhesion of plastic film to paper material Adhesives with a VOC content of <= 0.13 lb/gal (excluding water and exempt compounds) for the adhesion of paper materials

BACT Status	Comment
Achieved in Practice	
The following alternate basic equipment was not cost effective	capture and thermal incineration; capture and carbon adsorption

San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 4.9.11*

Last Update: 11/3/2005

Adhesive Application Operation - Bonding of Fiberglass Boat Hulls and Decks, Non-Atomizing Application

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	use of adhesives with VOC content of 80 grams/liter or less (less water and exempt compounds)	1. VOC capture and incineration 2. VOC capture and carbon adsorption 3. use of low VOC content adhesives with VOC content of 50 grams/liter or less (less water and exempt compounds)	

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 s 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.

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San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 4.9.12*

Last Update: 9/22/2006

Corrugated Box Gluer

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	use of adhesives with a VOC content (less water and exempt compounds) not exceeding 0.044 lb/gal	1) capture of VOCs and thermal or catalytic oxidation 2) capture of VOCs and carbon absorption 3) capture of VOCs and regenerative thermal oxidizer 4) use of adhesives with a VOC content (less water and exempt compounds) not exceeding 0.021 lb/gal	

Replaces BACT 4.7.3

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 s 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.

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Best Available Control Technology (BACT) Guideline 4.9.12 A

Emissions Unit:	Corrugated Box Gluer	**Equipment Rating:**	< or = 54.7 lb-VOC/day
Facility:	International Paper Corporation	**References:**	C-2610-12-1, '-15-0
Location:	Hanford	**Date of Determination:**	9/22/2006

Pollutant	**BACT**
CO	BACT NOT TRIGGERED
NOx	BACT NOT TRIGGERED
PM10	BACT NOT TRIGGERED
SOx	BACT NOT TRIGGERED
VOC	Use of adhesives with a VOC content (less water and exempt compounds) not exceeding 0.021 lb/gal

BACT Status	**Comment**
Technologically Feasible BACT	
The following technologically feasible options were not cost effective	1) capture of VOCs and thermal or catalytic oxidation; 2) capture of VOCs and carbon absorption; and 3) capture of VOCs and regenerative thermal oxidizer

San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 4.9.13*

Last Update: 1/30/2015

Corrugated Cardboard Manufacturing (Corrugator)

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	Steam Conditioning of Paper - 8 lb-VOC/10^6 sq ft	1. VOC Capture and Theremal/Catalytic Incineration	
	Adhesives - 0.015 lb-VOC/gal (less water and exempt compounds)	2. VOC Capture and Carbon Adsorption	

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 s 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.

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Best Available Control Technology (BACT) Guideline 4.9.13 A

Emissions Unit:	Corrugator	**Equipment Rating:**	none
Facility:	Pacific Southwest Container	**References:**	ATC # N-3606-31-0; Project # 1130130
Location:	4530 Leckron Road in Modesto, CA	**Date of Determination:**	4/16/2013

Pollutant	**BACT**
VOC	Steam conditioning of paper - 8 lb-VOC/10^6 square feet; Adhesives - 0.015 lb-VOC/gal (less water and exempt compounds)

BACT Status	**Comment**
Achieved in Practice	

Appendix B
Cost Analysis

COST EFFECTIVENESS ANALYSIS FOR THERMAL INCINERATION

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

FACILITY NAME: VSS Counter Tops
LOCATION: 7640 Wilbuer Way
PERMIT NO.: 24317
EQUIPMENT DESCRIPTION: Adhesives Application Operation

VOC Parameters

VOC of concern	Toluene
Molecular weight of VOC (see Control Cost Manual, p 3-63)	92.13
Heat of combustion (Btu/lb - see Control Cost Manual, p 3-63)	17,601
Heating value of VOC (Btu/scf)	4,074
Emission rate (lbs/hr - inlet)	1.93
Inlet concentration (ppm)	17

Gas Parameters

Total gas flow rate (scfm - inlet)	8000
Total gas pressure (psi - inlet)	14.7
Inlet gas temperature (deg F)	71

Equipment Parameters

Level of energy recovery (0%, 35%, 50% or 70%)	70%
Control efficiency (%)	90.0%
Equipment life (years)	10

Operating Parameters

Hours per day	8
Days per week	5
Weeks per year	52
Shifts per day	2

Incinerator Parameters

Volumetric heat of combustion of effluent (Btu/scf)	0.07
Heat of combustion per pound of effluent (Btu/lb)	0.93
Temperature Required for incineration (deg F)	1,500.00
Gas temperature at exit of pre-heater (deg F)	1,071.30
Effluent gas temperature (deg F)	499.7

Electricity Usage

Price of electricity ($/kWh)	$0.1124
System fan (kWh/yr)	61,651.20
Total Power Used (kWh/yr)	61,651.20

Gas Usage

Price of gas ($/1000 cu.ft.)	$6.41
Auxiliary fuel required (scfm)	87.58

CAPITAL COST

Direct Costs:

Incinerator	$110,000
Auxiliary equipment (if not included above)	$0
Equipment Cost (A)	**$110,000**
Instrumentation (0.1A if not included above)	$11,000
CA Sales taxes (0.085)	$9,350
Freight (0.05A)	$5,500
Total Equipment Cost (B)	**$135,850**

Direct Installation Costs:

Foundation & Supports (0.08B)	$10,868
Handling & erection (0.14B)	$19,019
Electrical (0.04B)	$5,434
Piping (0.02B)	$2,717
Insulation for duct work (0.01B)	$1,359
Painting (0.01B)	$1,359
Direct Installation Cost	**$40,755**
Site preparation	$0
Facilities & buildings	$0
Total Direct Costs	**$176,605**

Indirect Costs (installation)

Engineering (0.10B)	$13,585
Construction & field expenses (0.05B)	$6,793
Contractor fees (0.10B)	$13,585
Start-up (0.02B)	$2,717
Performance test (0.01B)	$1,359
Contingencies (0.03B)	$4,076
Total Indirect Costs	**$42,114**
TOTAL CAPITAL INVESTMENT	**$218,719**

ANNUAL COST

Direct Annual Costs

Operating Cost	
Operator (@ $15.19/hr & .5 hr per shift)	$3,949.40
Supervisor (15% of operator)	$592.41
Operating materials	$0.00
Maintenance	
Labor (@17.77/hr & .5 hr per shift)	$4,620.20
Material (same as labor)	$4,620.20
Utilities	
Price of electricity ($/kWh)	$0.11
Price of gas ($/1000 cu.ft.)	$6.41
Electricity ($/yr)	$6,929.59
Natural Gas ($/yr)	$70,062.35
Total Direct Costs	**$90,774.16**

Indirect Annual Costs

Overhead	$8,269.33
Administrative charges	$4,374.37
Property taxes	$2,187.19
Insurance	$2,187.19
Interest rate (%)	4%
Equipment life (years)	10
CRF	0.0736
Capital recovery	$16,097.68
Capital Recovery Inflation Adjustment	$18,943.24
Total Indirect Costs	**$35,961.31**

TOTAL ANNUAL COST	**$126,735.47**

Annual Cost ($/yr)	$126,735.47
Annual Emissions Reductions (tons/yr)	7.24

(annual emissions based on BACT determination limit for add-

COST PER TON OF VOCs REDUCED ($/ton)	**$17,504.90**

COST EFFECTIVENESS ANALYSIS FOR CARBON ADSORPTION

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

FACILITY NAME: VSS Counter Tops
LOCATION: 7640 Wilbuer Way
PERMIT NO.: 24317
EQUIPMENT DESCRIPTION: Adhesives Application Operation

VOC Parameters			
	VOC of concern		Toluene
	Cost of pure VOC ($/ton)		100
	Molecular weight of VOC (Refer to Control Cost Manual, pg 3-63)		92.13
	Emission rate (lbs/hr - inlet)		1.93
	Inlet concentration (ppm)		17
	k factor (Refer to Control Cost Manual, pg 4-11)		0.551
	m factor (Refer to Control Cost Manual, pg 4-11)		0.11
	Partial pressure (psi)		0.000255334
Gas Parameters			
	Total gas flow rate (acfm - inlet)		8,000
	Total gas pressure (psi - inlet)		14.7
Equipment Parameters			
	Removal efficiency (%)		90.0%
	Adsorption time (hours)		8
	Desorption time (hours)		8
	Number of adsorbing beds		1
	Number of Desorbing beds		1
	Equipment life (years)		10
Operating Parameters			
	Hours per day		8
	Days per week		5
	Weeks per year		52
Carbon Requirements			
	Controlled VOC Emissions with max operation (tons/year)	((1.9 lbs VOC/hr)*(0.9)*(8 hours/day)*(5 days/week)*(52 weeks/year))/(2000 lbs/ton)	1.8
	VOC Emissions BACT add on limit (tons/year)		4019
	Controlled VOC Emissions BACT add on limit (tons/year)	(5015 lbs/year)*0.9	1.8
	Carbon working capacity (lb VOC/lb carbon)		0.25
	Amount of carbon needed (lbs)	(5015 lbs voc)/(0.25 lb VOC/lb carbon)	14,468
	Carbon cost	($1.5/lb carbon)*(18,054 lbs carbon)	$21,703
	Carbon life (years)		5
Direct Costs:			
	Purchased Equipment Cost		
	Adsorber and auxiliary equipment		$7,800.00
	Instrumentation	1% of equipment cost ($7800)*0.1	$780.00
	Sales taxes	(7800)*0.085 (CA sales tax)	$663.00
	Freight	5% of equipment cost ($7800)*0.05	$390.00
	Purchased Equipment Cost	($7800+$780+$663+$390)	$9,633.00
	Direct installation costs	Cannister carbon adsorption doesn't require site prep and building costs	
	Foundations & supports		$ -
	Handling & erection		$ -
	Electrical		$ -
	Piping		$ -
	Insulation		$ -
	Painting		$ -
	Direct installation costs		$ -
Indirect Costs:			
	Indirect Costs (installation)		
	Engineering		$ -
	Construction and field expenses		$ -
	Contractor fees		$ -
	Start-up	2% of equipment cost ($9663)*0.02	$ 192.66
	Performance test	1% of equipment cost ($9663)*0.01	$ 96.33
	Contingencies	3% of equipment cost ($9663)*0.03	$ 288.99
	Total Indirect Costs	($192.66+$96.33+$288.99)	$ 577.98
	Total Capital Investment	($9633.00+$577.98)	$10,210.98
	Interest Rate		0.04
	Equipment Life (years)		10
	Capital Recovery Factor (CRF)		0.1233
	Capital recovery cost	($10210.98*0.1233)	$1,258.92
	Capital Recovery Inflation adjustment	$1258.92*[(1+0.0275)^6]	$1,481.46
Direct Annual Costs			
	Labor wage ($/hr)		15.18
	operator hour (hrs/shift)		0.5
	shifts per day (shift/day)		1
	days of work per year (days/year)		260
	Operator labor		
		Bureau of Labor Statistics. Occupation Code: 51-9191	
	Operator	(Adhesive Operators) ($15.18)*(0.5 hours/shift)*(1 shift/day)*(260 days/year)	$1,973.40
	Supervisor		$0.00
	Material	equal to operator costs	$1,973.40
	Replacement labor		$0.00

Utilities		
Electrical Cost		
kW/hp		0.746
hp		10
hours/year		2080
kWh price	(Based on District's Avg. Electricity Rate for an Industrial Operation as approved on 10/17/16)	0.1124
Electrical	(0.746 kw/hp)*(10 hp)*(1,040 hours/year)*($0.1124/kwh)	$1,744.09
Total Direct Annual Costs (without carbon costs)		$5,690.89
Indirect Annual Costs		
Overhead	60% of maintenance labor and materials	$2,368.08
Administrative Charges	2% of Total Capital Investment	$ 204.22
Property Tax	1% of Total Capital Investment	$ 102.11
Insurance	1% of Total Capital Investment	$ 102.11
Total Indirect Annual Costs (without Capital Recovery)		$2,776.52
Ton VOC controlled		1.81
Carbon needed		14,468
Cost of Carbon per year	(13,428 lb carbon)*($1.50/lb carbon)	$21,702.60
Total Annual Costs	($1,481.46+$5,690.89+$2,776.52+$21,702.60)	$31,651.47
Cost of VOC Removal	($31,651.47)/(1.8 tons voc)	$17,501.02

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

Annual Direct Operating Cost (without carbon costs)	$5,690.89
Annual Indirect Operating Cost	$4,257.98
Carbon working capacity (lb carbon/lb VOC)	0.25
Annual lb VOC PTE	4019
Annual tons Controlled VOC	1.8
Control Efficiency	0.900
Amount of Carbon Needed	14468.4
Cost of Carbon	$21,702.60
Total Annual Cost	$31,651.47
Cost per ton VOC Controlled	$17,501.02