SMAQMD BACT CLEARINGHOUSE

CATEGORY Type: **PRINTING PROCESS**

BACT Category: Digital Printer

BACT Determination Number: 263	**BACT Determination Date:** 9/22/2020

Equipment Information

Permit Number: N/A -- Generic BACT Determination
Equipment Description: PRINTING PRESS
Unit Size/Rating/Capacity: < 12,667 lbs uncontrolled VOC
Equipment Location:

EXPIRED

BACT Determination Information

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

ROCs	**Standard:**	
	Technology Description:	1.Integral air pollution control system, consisting of an oil/water separator and refrigerated condenser, with an assumed control efficiency of 80%(A) or equivalent system. 2.Use of materials compliant with SMAQMD Rule 466 – Solvent Cleaning.
	Basis:	Achieved in Practice
NOx	**Standard:**	
	Technology Description:	No Standard
	Basis:	
SOx	**Standard:**	
	Technology Description:	No Standard
	Basis:	
PM10	**Standard:**	
	Technology Description:	No Standard
	Basis:	
PM2.5	**Standard:**	
	Technology Description:	No Standard
	Basis:	
CO	**Standard:**	
	Technology Description:	No Standard
	Basis:	
LEAD	**Standard:**	
	Technology Description:	
	Basis:	

Comments: T-BACT:
1.A VOC control device that has an overall system efficiency (collection and destruction) of at least 98.5% for VOC.
2.Use of materials compliant with SMAQMD Rule 466 – Solvent Cleaning.
3.Comply with VOC emission standards of SMAQMD Rule 441 – Organic Solvents.

Printed: 11/6/2020

SMAQMD BACT CLEARINGHOUSE

CATEGORY Type: **PRINTING PROCESS**

BACT Category: Digital Printer

BACT Determination Number: 264	**BACT Determination Date:** 9/22/2020

Equipment Information

Permit Number: N/A -- Generic BACT Determination
Equipment Description: PRINTING PRESS
Unit Size/Rating/Capacity: ≥ 12,667 LBS UNCONTROLLED VOC PER YEAR
Equipment Location:

EXPIRED

BACT Determination Information

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

ROCs	**Standard:**	
	Technology Description:	1.A VOC control device that has an overall system efficiency (collection and destruction) of at least 98.5% for VOC. 2.Use of materials compliant with SMAQMD Rule 466 – Solvent Cleaning.
	Basis:	Cost Effective
NOx	**Standard:**	
	Technology Description:	No Standard
	Basis:	
SOx	**Standard:**	
	Technology Description:	No Standard
	Basis:	
PM10	**Standard:**	
	Technology Description:	No Standard
	Basis:	
PM2.5	**Standard:**	
	Technology Description:	No Standard
	Basis:	
CO	**Standard:**	
	Technology Description:	No Standard
	Basis:	
LEAD	**Standard:**	
	Technology Description:	
	Basis:	

Comments: T-BACT is equivalent to BACT

Printed: 11/6/2020

777 12th Street, Third Floor

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Sacramento, CA 95814

BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

EXPIRED

DETERMINATION NO.: 263 & 264

DATE: 9/22/2020

ENGINEER: Jeffrey Quok

Category/General Equip Description: Printing Process

Equipment Specific Description: BACT # 263: Digital Printing – Liquid Electrophotography < 12,667 Lbs Uncontrolled VOC Per Year

BACT # 264: Digital Printing – Liquid Electrophotography ≥ 12,667 Lbs Uncontrolled VOC Per Year

Equipment Size/Rating: Minor Source BACT

Previous BACT Det. No.: 147 & 180

This BACT/T-BACT determination will be made for digital printing – liquid electrophotography.

BACT/T-BACT ANALYSIS

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

The following control technologies are currently employed as BACT for digital printing – liquid electrophotography 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><td colspan="2">For Digital Printing - Liquid Electrophotography</td></tr>
<tr><td>Pollutant</td><td>Standard</td></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></td></tr>
</table>

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

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

RULE REQUIREMENTS:
40 CFR 63 Subpart KK – National Emission Standards for the Printing and Publishing Industry (Amended 4/21/11)
This regulation applies to new and existing facilities that are a major source of hazardous air pollutants at which publication rotogravure, product and packaging rotogravure, or wide-web flexographic printing presses are operated. [40 CFR §63.820]

Since liquid electrophotography does not qualify as publication rotogravure, product and packaging rotogravure, or wide-web flexographic printing presses, this rule will not generally be considered T-BACT for this source category. However, for projects that include digital printing as well as one of the affected printing processes, compliance with 40 CFR, 63, Subpart KK will be considered technologically feasible T-BACT for the project.

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

BACT
Source: ARB BACT Clearinghouse

<table>
<tr><td colspan="2">For Digital Printing - Liquid Electrophotography</td></tr>
<tr><th>Pollutant</th><th>Standard</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>

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

RULE REQUIREMENTS:
None.

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

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

BACT
Source: SMAQMD BACT #147 & #180

<table>
<tr><td colspan="2">For Digital Printing - Liquid Electrophotography < 8,683 lbs VOC/year</td></tr>
<tr><th>Pollutant</th><th>Standard</th></tr>
<tr><td>VOC</td><td>1. Integral air pollution control system, consisting of an oil/water separator and refrigerated condenser, with an assumed control efficiency of 80%(A) or equivalent system.
2. Use of materials compliant with SMAQMD Rule 466 – Solvent Cleaning.
3. Comply with VOC emission standards of SMAQMD Rule 441 – Organic Solvents.</td></tr>
<tr><td>NOx</td><td>No standard</td></tr>
<tr><td>SOx</td><td>No standard</td></tr>
<tr><td>PM10</td><td>No standard</td></tr>
<tr><td>PM2.5</td><td>No standard</td></tr>
<tr><td>CO</td><td>No standard</td></tr>
</table>

(A) A control efficiency of 80% is based on EPA's Air Pollution Control Cost Manual for Refrigerated Condensers, pg 2-15 (https://www3.epa.gov/ttn/catc/dir1/cs3-1ch2.pdf). This assumed control efficiency is subject to change as more test data becomes available.

<table>
<tr><td colspan="2">For Digital Printing - Liquid Electrophotography ≥ 8,683 lbs VOC/year</td></tr>
<tr><th>Pollutant</th><th>Standard</th></tr>
<tr><td>VOC</td><td>1. A VOC control device that has an overall system efficiency (collection and destruction) of at least 98.5% for VOC.
2. Use of materials compliant with SMAQMD Rule 466 – Solvent Cleaning.
3. Comply with VOC emission standards of SMAQMD Rule 441 – Organic Solvents.</td></tr>
<tr><td>NOx</td><td>No standard</td></tr>
<tr><td>SOx</td><td>No standard</td></tr>
<tr><td>PM10</td><td>No standard</td></tr>
<tr><td>PM2.5</td><td>No standard</td></tr>
<tr><td>CO</td><td>No standard</td></tr>
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<table>
<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>SMAQMD</td><td>

T-BACT

<table>
<tr><td colspan="2">For Digital Printing - Liquid Electrophotography ≥ 8,663 lbs VOC/year</td></tr>
<tr><th>Pollutant</th><th>Standard</th></tr>
<tr><td>VOC</td><td>1. A VOC control device that has an overall system efficiency (collection and destruction) of at least 98.5% for VOC.
2. Use of materials compliant with SMAQMD Rule 466 – Solvent Cleaning.
3. Comply with VOC emission standards of SMAQMD Rule 441 – Organic Solvents.</td></tr>
</table>

RULE REQUIREMENTS:
Rule 450 – Graphic Arts Operations (Amended 10/23/08)
This rule applies to graphic arts operations. Graphic arts operations is defined as any gravure, screen printing, flexographic, lithographic, or letterpress printing operation, or any coating or laminating operation that manufactures flexible packaging material for the packing industry. Liquid electrophotography does not meet this definition and therefore this rule does not apply.

Rule 466 – Solvent Cleaning (Amended 10/28/10)
This rule applies to all persons who use VOC-containing materials in solvent cleaning operations during the production, repair, maintenance or servicing of parts, products, tools, machinery, or equipment, or in general work areas, and to all persons who store and dispose of VOC-containing materials used in solvent cleaning.

Section 301 VOC Standards:

<table>
<tr><th>Solvent Cleaning Activity</th><th>VOC limits g/l (lb/gal)</th></tr>
<tr><td>(A) General (wipe cleaning, maintenance cleaning)</td><td>25 (0.21)</td></tr>
<tr><td>(B) Product cleaning during manufacturing process or surface preparation for coating, adhesive, or ink application</td><td></td></tr>
<tr><td>(i) General</td><td>25 (0.21)</td></tr>
<tr><td>(ii) Electrical apparatus components & electronic components</td><td>100 (0.83)</td></tr>
<tr><td>(iii) Medical Devices & pharmaceuticals</td><td>800 (6.7)</td></tr>
<tr><td>(C) Repair and Maintenance Cleaning</td><td>VOC limits g/l (lb/gal)</td></tr>
<tr><td>(i) General</td><td>25 (0.21)</td></tr>
<tr><td>(ii) Electrical apparatus components & electronic components</td><td>100 (0.83)</td></tr>
</table>

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

District/Agency	Best Available Control Technology (BACT)/Requirements
SMAQMD	As an alternative to complying with the Solvent VOC limits, a person may use air pollution control equipment provided it satisfies all of the following: 1. The air pollution control equipment is approved by the Air Pollution Control Officer pursuant to Rule 201, General Permit Requirements, 2. The air pollution control equipment is designed and operated with: a. A control device efficiency of at least 95% on a mass basis, as determined pursuant to Sections 402 and 502.3, and b. An emission collection efficiency of at least 90% on a mass basis of the emissions generated by the solvent cleaning operations, as determined pursuant to Section 502.4, or c. An output of less than 50 parts per million calculated as carbon with no dilution. 3. The air pollution control equipment shall result in VOC emissions per calendar quarter no greater than would have resulted from compliance with Section 301, as calculated by the following equation: $\left[1-\left(\frac{CE}{100}\right)\left(\frac{CL}{100}\right)\right]\sum_{i=1}^{n} ACT_i(U_i) \le \sum_{i=1}^{n} LIM_i(U_i)$ Where: CE = Control device efficiency, % by mass CL = Collection efficiency, % by mass ACT_i = Actual VOC content of material "i," grams per liter LIM_i = Applicable VOC limit for material "i" in Section 301, grams per liter U_i = Usage of material "i," liters per calendar quarter. Since the costs and feasibility of installing control equipment depend on the operation and type of control equipment, this alternative isn't considered achieved in practice. Alternative emissions control equipment options are addressed in the cost effective analysis. Rule 441 – Organic Solvents (Adopted 12/6/78) This rule limits the emissions of organic solvents into the atmosphere that may result from the use of organic solvents. **Standards** For Organic Materials A person shall not discharge into the atmosphere more than 6.8 kilograms (15 pounds) of organic materials in any one day, nor more than 1.4 kilograms (3.1 pounds) in any one hour, from any article, machine, equipment or other contrivance, in which any organic solvent or any material containing organic solvent comes into contact with flame or is baked, heat-cured or heat-polymerized, in the presence of oxygen, unless said discharge has been reduced by at least 85%. Those portions of any series of articles, machines, equipment or other contrivances designed for processing a continuous web, strip or wire which emit organic materials and using operations described in this section shall be collectively subject to compliance with this section.

<table>
<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>SMAQMD</td><td>
<u>For Photochemically Reactive Solvents</u>
A person shall not discharge into the atmosphere more than 18 kilograms (39.7 pounds) of organic materials in any one day, no more than 3.6 kilograms (7.9 pounds) in any one hour, from any article, machine, equipment or other contrivance used under conditions other than described in Section 301 for employing, or applying, any photochemically reactive solvent, as defined in Section 203, or material containing such photochemically reactive solvent, unless said discharge has been reduced by at least 85%. Emissions of organic materials into the atmosphere resulting from air or heated drying of products for the first 12 hours after their removal from any article, machine, equipment, or other contrivance described in this section shall be included in determining compliance with this section. Emissions resulting from baking, heat-curing, or heat-polymerizing as described in Section 201 shall be excluded from determination of compliance with this section. Those portions of any series of articles, machines, equipment or other contrivances designed for processing for a continuous web, strip, or wire which emit organic materials and using operations described in this section shall be collectively subject to compliance with this section.

<u>For Non-Photochemically Reactive Solvents</u>
A person shall not discharge into the atmosphere more than 1350 kilograms (441 pounds) in any one hour, from any article, machine, equipment or other contrivance which any non-photochemically reactive organic solvent or any material containing such solvent is employed or applied, unless said discharge has been reduced by at least 85%. Emissions of organic materials into the atmosphere resulting from air or heated drying of products for the first 12 hours after their removal from any article, machine, equipment, or other contrivance described in this section shall be included in determining compliance with this section. Emissions resulting from baking, heat-curing, or heat-polymerizing as described in Section 301 shall be excluded from determination of compliance with this section. Those portions of any series of articles, machines, equipment, or other contrivance designed for processing a continuous web, strip or wire which emit organic materials and using operations described in this section shall be collectively subject to compliance with this section.

<table>
<tr><th>Material</th><th>Hourly Emission Limit [kg/hr] (lbs/hr)</th><th>Daily Emission Limit [kg/day] (lbs/day)</th></tr>
<tr><td>Organic Materials Organic Materials which come into contact with a flame or is baked, heat-cured or heat-polymerized, in the presence of oxygen</td><td>[1.4] (3.1)</td><td>[6.8] (15)</td></tr>
<tr><td>Photochemically Reactive Solvents</td><td>[3.6] (7.9)</td><td>[18] (39.7)</td></tr>
<tr><th>Material</th><th>Hourly Emission Limit [kg/hr] (lbs/hr)</th><th>Daily Emission Limit [kg/day] (lbs/day)</th></tr>
<tr><td>Non-photochemically reactive solvents</td><td>[200] (441)</td><td>[1,350] (2,970)</td></tr>
</table>
</td></tr>
</table>

District/Agency	Best Available Control Technology (BACT)/Requirements
SMAQMD	Solvent Disposal: A person shall not, during any one day, dispose of a total of more than 5 liters (1.3 gallons) of any photochemically reactive solvent, as defined in section 203 or of any material containing more than 5 liters (1.3 gallons) of any such photochemically reactive solvent by any means which will permit the evaporation of such solvent into the atmosphere. Cleanup Emissions of organic materials into the atmosphere from cleanup with cleanup with photochemically reactive solvent as defined in Section 203 of any article, machine, equipment or other contrivance described in Sections 301, 302 or 303 shall be included with the other emissions of organic materials from that article, machine, equipment or other contrivance for determining compliance with this rule. Required Reductions Emissions of organic materials into the atmosphere required to be controlled by Sections 301, 302 or 303 shall be reduced by: 1. Incineration, provided that 90% or more of the carbon in the organic material being incinerated is oxidized to carbon dioxide, or 2. Absorption, or 3. Processing in a manner determined by the Air Pollution Control Office to be not less effective than incineration or absorption.

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

BACT
Source: SCAQMD Evaluation A/N 562397 (See Attachment C)

<table>
<tr><td colspan="2">For Digital Printing - Liquid Electrophotography</td></tr>
<tr><td>Pollutant</td><td>Standard</td></tr>
<tr><td>VOC</td><td>Integral air pollution control system, consisting of an oil/water separator and a refrigeration condenser.</td></tr>
<tr><td>NOx</td><td>No standard</td></tr>
<tr><td>SOx</td><td>No standard</td></tr>
<tr><td>PM10</td><td>No standard</td></tr>
<tr><td>PM2.5</td><td>No standard</td></tr>
<tr><td>CO</td><td>No standard</td></tr>
</table>

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

RULE REQUIREMENTS:
Rule 1130 – Graphic Arts (Amended 5/2/14)
This rule applies to any person performing graphic arts operations or who supplies, sells, offers for sale, markets, manufactures, blends, repackages, stores at a worksite, distributes, applies or solicits the application of graphic arts materials for use in the District. Graphics arts operations is define as gravure, letterpress, flexographic, and offset lithographic printing processes or related coating or laminating processes. Liquid electrophotography does not meet this definition and therefore this rule does not apply.

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.

This rule does not apply to cleaning operations in printing pre-press or graphic arts pre-press areas, including the cleaning of film processors, color scanners, plate processors, film cleaning, and plate cleaning.

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

<table>
<tr><th>District/Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>South Coast AQMD</td><td>
Solvent Requirements:
<table>
<tr><th>Solvent Cleaning Activity</th><th>VOC limits
g/l (lb/gal)</th></tr>
<tr><td>(A) Product cleaning during manufacturing process or surface preparation for coating, adhesive, or ink application</td><td></td></tr>
<tr><td>(i) General</td><td>25 (0.21)</td></tr>
<tr><td>(ii) Electrical apparatus components & electronic components</td><td>100 (0.83)</td></tr>
<tr><td>(iii) Medical Devices & pharmaceuticals</td><td>800 (6.7)</td></tr>
<tr><td>(B) Repair and Maintenance Cleaning</td><td></td></tr>
<tr><td>(i) General</td><td>25 (0.21)</td></tr>
<tr><td>(ii) Electrical apparatus components & electronic components</td><td>100 (0.83)</td></tr>
<tr><td>(C) Cleaning of coatings or adhesives application equipment</td><td>25 (0.1)</td></tr>
<tr><td>(D) Cleaning of Ink Application Equipment</td><td></td></tr>
<tr><td>(i) General</td><td>25 (0.1)</td></tr>
</table>
In lieu of complying with the above solvent requirements, a person may comply by using a VOC emission collection and control system in association with the solvent cleaning operation provided:
(A) The emission control system shall collect at least 90%, by weight, of the emissions generated by the solvent cleaning operation and
i. Have a destruction efficiency of at least 95%, by weight, or
ii. Have an output of less than 50 parts per million (ppm) calculated as carbon with no dilution;
(B) The emission control system meets the requirements of the applicable source rule of the District’s Regulation XI. The collection system for cleaning in graphic arts and screen printing and cleaning of application equipment used for graphic arts materials and screen printing materials, shall collect at least 70%, by weight, of emissions generated. This control system shall reduce emissions from the emission collection system by at least 95%.
</td></tr>
</table>

District/Agency	Best Available Control Technology (BACT)/Requirements
San Diego County APCD	**BACT** Source: NSR Requirements for BACT 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**: Rule 67.16 – Graphic Arts Operations (Effective 5/9/12) This rule applies to all continuous web or single sheet fed graphic arts printing, processing, laminating or drying operations and digital printing operations. This rule has an exemption for digital printing operations. Digital printing operations are exempt from provisions of this rule. However, digital printing operations that meet the definition of a "Large digital printing operation" are required to maintain records. Large digital printing operation is defined as a commercial digital printing operation where a print capacity of any individual printer that uses solvent based inks is 1,000 ft^2/hr or higher; or an operation where a print capacity of any individual printer that uses water based or UV inks is 10,000 ft^2/hr or higher. **Standards** For Large Commercial Digital Printing Operations 1. Maintain a current list of graphic arts materials and cleaning materials used; 2. Provide documentation containing the VOC content, less water and exempt compounds of each graphic arts material (excluding thinner), as applied and VOC content of each thinner and cleaning material and/or total VOC vapor pressure, as used 3. Keep monthly records of the type and amount of graphic arts material cleaning material used. Rule 66.1 Miscellaneous Surface Coating Operations and Other Processes Emitting Volatile Organic Compounds (Adopted 2/24/10) This rule is applicable to all surface coating, solvent cleaning or other operations or processes that may result in emissions of VOCs and are not subject to or exempt from, the following rules… (See Rule 66.1 for full list). Exemptions This rule does not apply to digital printing operations [Section(b)(1)(X)].

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

BACT
Source: BAAQMD Application # 28111 (See Attachment D)

<table>
<tr><td colspan="2">For Digital Printing - Liquid Electrophotography</td></tr>
<tr><td>Pollutant</td><td>Standard</td></tr>
<tr><td>VOC</td><td>Collect and control emissions with an overall emission rate equivalent to 2.5 lb/gal</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>

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

RULE REQUIREMENTS:
Reg. 8, Rule 20 Graphic Arts Printing and Coating Operations (Amended 4/12/80)
This rule applies to graphic arts operations which is defined as a gravure, publication gravure, flexographic printing, digital printing, screen printing, letterpress, or lithographic printing operation; an associated coating, laminating, or adhesive operation to produce a printed product; and the use of solvents for any surface preparation or cleanup for any of the operations stated above. However, per Section 8-20-120, Digital Printing is exempt from the flexographic, gravure, publication gravure, letterpress, and lithographic product limit requirements (Section 8-20-302) and the cleaning product requirements (Section 8-20-309) of this rule.

Solvent Evaporative Loss Minimization: Per Section 8-20-320, the requirements of this Section shall apply to the use of solvent for surface preparation and cleanup and to the use, mixing, storage, and disposal of ink, coating or adhesive:

1. An owner or operator shall not use open containers for the storage or disposal of cloth or paper impregnated with organic compounds that are used for surface preparation, cleanup or ink, coating or adhesive removal.
2. An owner or operator shall not store in open containers spent or fresh organic compounds used for surface preparation, cleanup or removal of inks, coatings, or adhesives.
3. An owner or operator shall not leave containers of ink, coating, adhesive or fountain solution open when not in use.

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

District/Agency	Best Available Control Technology (BACT)/Requirements
Bay Area AQMD	Reg. 8, Rule 4 General Solvent and Surface Coating Operations (Amended 10/16/02) This rule applies to the use of solvents and surface coatings in any operation other than those specified by other Rules of Regulation 8. Digital printing is regulated by Reg. 8 Rule 20 Graphics Art Printing. Therefore, Digital printing would be exempt from the requirements of this rule.
San Joaquin Valley APCD	**BACT** Source: SJVUAPCD BACT Clearinghouse 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**: Rule 4607 Graphic Arts and Paper, Film, Foil and Fabric Coatings (Amended 12/18/08) This rule applies to any graphics arts printing operation, to digital printing operations, and to any paper, film, foil, or fabric coating operation and to the organic solvent cleaning materials and processes associated with such operations. According to Section 4.0, the requirements of this rule, except for the recordkeeping requirements of Section 6.1, shall not apply to digital printers and digital printing operations. Rule 4663 Organic Solvent Cleaning, Storage, and Disposal (Amended 9/20/07) The purpose of this rule is to limit the emissions of volatile organic compounds (VOCs) from organic solvent cleaning and from the storage and disposal of solvents and waste solvent materials. This rule exempts any source that is subject to or specifically exempted from the Rules listed in Section 4.3. Section 4.3 lists Rule 4607 (Graphic Arts). Therefore, digital printing is exempt from Rule 4663 Organic Solvent Cleaning, Storage, and Disposal.

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

SUMMARY OF ACHIEVED IN PRACTICE CONTROL TECHNOLOGIES	
Pollutant	**Standard**
VOC	<u>For Printing Operations:</u> 1. Integral air pollution control system, consisting of an oil/water separator and refrigerated condenser, with an assumed control efficiency of 80%(A), comply with SMAQMD Rule 466 and 411. [SMAQMD] 2. Integral air pollution control system, consisting of an oil/water separator and refrigerated condenser, with an assumed control efficiency of 80%(A) [SCAQMD] 3. Collect and control equipment with an overall emission rate equivalent to 2.5 lb/gal [BAAQMD] 4. Comply with VOC emission standards of SCAQMD Rule 1171. [SCAQMD] 5. Comply with VOC emission standards BAAQMD Regulation 8, Rule 20, Sections 8-20-320 and 8-20-308. [BAAQMD] <u>For Organic Solvent Operations:</u> Comply with VOC emission standards of SMAQMD Rule 441. [SMAQMD]
NOx	N/A – [SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD, ARB, EPA]
SOx	N/A – [SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD, ARB, EPA]
PM10	N/A – [SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD, ARB, EPA]
PM2.5	N/A – [SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD, ARB, EPA]
CO	N/A – [SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD, ARB, EPA]
T-BACT (VOC)	N/A – [SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD, ARB, EPA]

(A) A control efficiency of 80% is based on EPA's Air Pollution Control Cost Manual for Refrigerated Condensers, pg 2-15 (https://www3.epa.gov/ttn/catc/dir1/cs3-1ch2.pdf).

An integral air pollution control system consisting of an oil/water separator and refrigeration condenser is considered the most stringent control. Both SCAQMD and BAAQMD performed an evaluation on HP Indigo model printers which use the integral air pollution control system. SCAQMD determined that the control system is considered BACT while BAAQMD considers BACT to be an overall emission control system equivalent to less than 2.5 lb/gal. In BAAQMD's evaluation the integral air pollution system was calculated to have an overall emission control system equivalent to 0.55 lb/gal (see Attachment D). Since there is limited test data on these control systems, a standard percent control will be reevaluated as more systems and more test data becomes available. For now, an estimation of a 80% control efficiency will be used based on EPA's Air Pollution Control Cost Manual for Refrigerated Condensers.

Digital printing is exempt from all districts' graphic art rules and only requires record keeping for solvent and ink/coating usage. However, the digital printing operations would still be subject to solvent cleaning rules of SCAQMD, SMAQMD, and BAAQMD. The emission limits for solvent cleaning activities related to digital printing are consistent across SCAQMD Rule 1171 and SMAQMD Rule 466. Although the emission limits for solvent cleaning are the

same for SCAQMD and SMAQMD Rules, the SCAQMD Rule exempts printing pre-press or graphic arts pre-press areas from the solvent cleaning limits and SMAQMD does not. Therefore, SMAQMD's rule is considered more stringent than SCAQMD's Rule. BAAQMD's solvent cleaning rule is less stringent with a surface preparation solvent VOC limit of 50 g/l (0.42 lbs/gal) compared to SCAQMD & SMAQMD general solvent cleaning VOC limit of 25 g/l (0.21 lbs/gal).

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

BEST CONTROL TECHNOLOGIES ACHIEVED IN PRACTICE		
Pollutant	**Standard**	**Source**
VOC	1. Integral air pollution control system, consisting of an oil/water separator and refrigerated condenser, with an assumed control efficiency of 80%(A) or equivalent system. 2. Use of materials compliant with SMAQMD Rule 466 – Solvent Cleaning. 3. Comply with VOC emission standards of SMAQMD Rule 441 – Organic Solvents.	SMAQMD
NOx	No Standard	SMAQMD, SCAQMD, SJVUAPCD, SDCAPCD, BAAQMD, EPA, ARB
SOx	No Standard	SMAQMD, SCAQMD, SJVUAPCD, SDCAPCD, BAAQMD, EPA, ARB
PM10	No Standard	SMAQMD, SCAQMD, SJVUAPCD, SDCAPCD, BAAQMD, EPA, ARB
PM2.5	No Standard	SMAQMD, SCAQMD, SJVUAPCD, SDCAPCD, BAAQMD, EPA, ARB
CO	No Standard	SMAQMD, SCAQMD, SJVUAPCD, SDCAPCD, BAAQMD, EPA, ARB
VOC (T-BACT)	No Standard	SMAQMD, SCAQMD, SJVUAPCD, SDCAPCD, BAAQMD, EPA, ARB

(B) A control efficiency of 80% is based on EPA's Air Pollution Control Cost Manual for Refrigerated Condensers, pg 2-15 (https://www3.epa.gov/ttn/catc/dir1/cs3-1ch2.pdf). This assumed control efficiency is subject to change as more test data becomes available.

SMAQMD Rule 441 Emission Limits

Material	**Hourly Emission Limit [kg/hr] (lbs/hr)**	**Daily Emission Limit [kg/day] (lbs/day)**
Organic Materials which come into contact with a flame or is baked, heat-cured or heat-polymerized, in the presence of oxygen	[1.4] (3.1)	[6.8] (15)
Photochemically Reactive Solvents	[3.6] (7.9)	[18] (39.7)
Non-photochemically reactive solvents	[200] (441)	[1,350] (2,970)

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.

Low VOC Ink Discussion

BAAQMD released the *Bay Area 2010 Clean Air Plan* and discussed possible control techniques. The possibility of low VOC inks were discussed but it was found that no low VOC inks are currently available. BAAQMD states that "Lower VOC inks may be able to be developed, although the necessary properties of inks for some types of digital printing may preclude low-VOC formulations." Therefore, low VOC inks currently aren't technologically feasible.

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	VOC control device with 98.5% overall system efficiency(A)
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
VOC (T-BACT)	No other technologically feasible option identified

(A) An overall system efficiency of 98.5% is based on technologies such as carbon adsorbers and thermal oxidizers.

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 general cost effectiveness analysis determined that 8,683 lb VOC/year was the highest allowable uncontrolled emission rate that did not require any add-on control devices. However, no digital printers permtted by SMAQMD have been required to install add-on controls since none of the digital printers have emissions greater than 8,683 lb VOC/year. HP Inc., Indigo Division (HP Indigo) has submitted vendor data for control costs of a digital printer to show that the 8,683 lb VOC/year limit should be higher due to vendor cost quotes being higher then the EPA Cost Manual estimations. This BACT determination will recalculate this limit by using the submitted vendor cost data. The resulting maximum annual VOC emission limit, 12,667 lb VOC/year, will be the set limit for this determination. The cost analysis was processed in accordance with the EPA OAQPS Air Pollution Control Cost Manual (sixth Edition). The sales tax rate was based on the District's standard rate of 8.5% as approved by the district on 10/17/16. The electricity rate (13.8 cents/kWh) was 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 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) rate was based on data from the Bureau of Labor Statistics.

Basic assumptions:

1) Single digital printing press.
2) Press room dimensions: 40'W x 60'L x 20'H (because the press room is relatively small, a hood or smaller full enclosure is not necessary)
3) The press room is assumed to be the enclosure with a collection efficiency of 100%, venting through a general ventilation system to a control device capable of achieving a 98.5% control efficiency. Therefore, the carbon adsorption system will have an over-all collection/control efficiency of 98.5%. This is similar to the collection/control efficiency listed as technologically feasible in the BAAQMD BACT Guideline 83.1.
4) Cost calculations and assumptions are based on the EPA Air Pollution Control Cost Manual.

Carbon Adsorption System

Waste Gas Flow Rate = 8,000 acfm (10 air changes per hour)

Equipment Life = 10 years

Total Capital Investment = $514,449

Direct Annual Cost = $19,450 per year

Indirect Annual Cost = $93,989 per year

Total Annual Cost = $109,322 per year

VOC Removed = 6.24 tons per year

Cost of VOC Removal = $17,523 per ton reduced

A detailed calculation of the cost effectiveness for VOC removal with a carbon absorber is shown in Attachment A. Uncontrolled VOC emissions of 12,667 lb/year or greater is

the cost-effective threshold for control equipment using carbon absorption control technology.

Thermal Oxidizer:

Waste Gas Flow Rate = 20,000 acfm (EPA Recommended Value)

Equipment Life = 20 years

Total Capital Investment = $1,120,944

Direct Annual Cost = $74,737 per year

Indirect Annual Cost = $141,446 per year

Total Annual Cost = $216,184 per year

VOC Removed = 12.31 tons per year

Cost of VOC Removal = $17,566 per ton reduced

A detailed calculation of the cost effectiveness for VOC removal with a thermal oxidizer is shown in Attachment B. Uncontrolled VOC emissions of 24,983 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 12,667 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 24,983 lb per year or greater must be reached in order for a thermal oxidizer to be cost effective. The emissions level for the cost effectiveness of controls is based on the District cost effective limit for VOC of $17,500 per ton controlled.

C: SELECTION OF BACT

TABLE 1: BACT #263 FOR DIGITAL PRINTING – LIQUID ELECTROPHOTOGRAPHY < 12,667 LBS UNCONTROLLED VOC PER YEAR		
Pollutant	**Standard**	**Source**
VOC	1. Integral air pollution control system, consisting of an oil/water separator and refrigerated condenser, with an assumed control efficiency of 80%(A) or equivalent system. 2. Use of materials compliant with SMAQMD Rule 466 – Solvent Cleaning. 3. Comply with VOC emission standards of SMAQMD Rule 441 – Organic Solvents.	SMAQMD,SCAQMD, BAAQMD
NOx	No Standard	SMAQMD, SCAQMD, SJVUAPCD, SDCAPCD, BAAQMD, EPA, ARB
SOx	No Standard	SMAQMD, SCAQMD, SJVUAPCD, SDCAPCD, BAAQMD, EPA, ARB
PM10	No Standard	SMAQMD, SCAQMD, SJVUAPCD, SDCAPCD, BAAQMD, EPA, ARB
PM2.5	No Standard	SMAQMD, SCAQMD, SJVUAPCD, SDCAPCD, BAAQMD, EPA, ARB
CO	No Standard	SMAQMD, SCAQMD, SJVUAPCD, SDCAPCD, BAAQMD, EPA, ARB

(A) A control efficiency of 80% is based on EPA's Air Pollution Control Cost Manual for Refrigerated Condensers, pg 2-15 (https://www3.epa.gov/ttn/catc/dir1/cs3-1ch2.pdf). This assumed control efficiency is subject to change as more test data becomes available.

TABLE 2: BACT #264 FOR DIGITAL PRINTING – LIQUID ELECTROPHOTOGRAPHY ≥ 12,667 LBS UNCONTROLLED VOC PER YEAR		
Pollutant	**Standard**	**Source**
VOC	1. A VOC control device that has an overall system efficiency (collection and destruction) of at least 98.5% for VOC. 2. Use of materials compliant with SMAQMD Rule 466 – Solvent Cleaning. 3. Comply with VOC emission standards of SMAQMD Rule 441 – Organic Solvents.	SMAQMD
NOx	No Standard	SMAQMD, SCAQMD, SJVUAPCD, SDCAPCD, BAAQMD, EPA, ARB
SOx	No Standard	SMAQMD, SCAQMD, SJVUAPCD, SDCAPCD, BAAQMD, EPA, ARB
PM10	No Standard	SMAQMD, SCAQMD, SJVUAPCD, SDCAPCD, BAAQMD, EPA, ARB
PM2.5	No Standard	SMAQMD, SCAQMD, SJVUAPCD, SDCAPCD, BAAQMD, EPA, ARB
CO	No Standard	SMAQMD, SCAQMD, SJVUAPCD, SDCAPCD, BAAQMD, EPA, ARB

D: SELECTION OF T-BACT

For this category of equipment T-BACT will be compliance with BACT for VOCs with add on control. For projects also involving publication rotogravure presses, product and packaging rotogravure presses, or wide-web flexographic printing presses, T-BACT will be determined on a case-by-case basis.

T-BACT FOR DIGITAL PRINTING – LIQUID ELECTROPHOTOGRAPHY		
Pollutant	**Standard**	**Source**
Organic HAP/VHAP	1. A VOC control device that has an overall system efficiency (collection and destruction) of at least 98.5% for VOC. 2. Use of materials compliant with SMAQMD Rule 466 – Solvent Cleaning. 3. Comply with VOC emission standards of SMAQMD Rule 441 – Organic Solvents.	SMAQMD

APPROVED BY: *Brian F Krebs* **DATE:** 9/22/2020

Attachment A

Cost Effectiveness Analysis for Carbon Adsorption

Data Inputs

Select the type of carbon adsorber system: Fixed-Bed Carbon Adsorber with Steam Regeneration

RESET

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

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)	8,000	acfm (at atmospheric pressure and 77°F)	
VOC Emission Rate (m_{voc})	6.090	lbs/hour	
Required VOC removal efficiency (E)	98.5	percent	
Superficial Bed Velocity (v_b)	75.00	ft/min	
Equipment (n)	10	Years	FALSE
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_b)	6	hours	
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:**	
Parameter "m" for Toluene	0.110	Typical values of "k" and "m" for some common VOCs are shown in Table A.	

Enter the cost data for the carbon adsorber:

Desired dollar-year	2020			
CEPCI* for 2020	567.5	CEPCI value for 2020	390.6	1999
Annual Interest Rate (i)	5	percent*	* 5 percent is a default value. User should enter current prime bank 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 recovered VOC/HAP, if known.
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 zero if th

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.

Design Parameters

The following design parameters for the carbon adsorber were calculated based on the values entered on the *Data Inputs* tab. These values were used to prepare the costs shown on the *Cost Estimate* tab.

Type of Carbon Adsorber:	**Fixed-Bed Carbon Adsorber with Steam Regeneration**
Name of VOC Controlled:	**Toluene**

Parameter	Equation	Calculated Value	Units
Quantity of Toluene Recovered:			
Quantity of Toluene Recovered (Wvoc) =	$W_{voc} = m_{voc} \times \Theta_s \times E$ =	6.239	tons/year
Time required for Desorption (Θ_D) =		6	hours
Time for Adsorption (Θ_A) =		12	hours
Time Available for Desorption =	$\Theta_A (N_D/N_A)$ =	6	hours
Adsorber Parameters:			
Equilibrium Capacity at the Inlet ($W_{e(max)}$) =	$k \times P^m$ =	0.333	lb. VOC/lb. Carbon
Working Capacity (w_c) =	0.5 x $w_{e(max)}$ =	0.167	lb. VOC/lb. Carbon
Adjustment Factor for Adorber Vessel Material (F_m) =		1.0	(* Stainless Steel, 304)
Number of Bed Desorbing (N_D) =	$N_{total} - N_A$ =	1	Bed
Number of Bed Adsorbing (N_A) =		2	Bed
Volumetric Flow Rate for each Vessel (Q') =	Q/N_A =	4,000	acfm/Bed
Carbon Bed Thickness (t_b) =	Vendor Specs	3.30	ft.
Pressure Drop (ΔP_s) =	$t_b \times (0.03679 v_b + 1.107 \times 10^{-4} v_b^2) + 1$ =	12.16	inches
Cooling Fan Operating Time (Θ_{cf}) =	$0.4 \times \Theta_D \times (N_A \times \Theta_s)/\Theta_A$ =	832	hours
Estimated Carbon Required:			
Estimated Carbon Consumption (M_c) for a continuously operated system =	$(m_{voc}/w_c) \times \Theta_A (1 + N_D/N_A)$ =	657	lbs.
Carbon Required for each Vessel (M_c') =	$M_c/(N_A + N_D)$ =	219	lbs./Bed
Estimated Adsorber Vessel Dimensions and Surface Area:			
Vessel Orientation =		Horizontal	
Vessel Diameter (D) =	Vendor Specs	8.24	ft.
Vessel Length (L) =	Vendor Specs	7.30	ft.
Surface Area of Adsorber Vessel (S) =	$\pi \times D \times (L+D/2)$ =	296	sq.ft
Electricity Consumption:			
Electricity Consumed by the system fan (Q_{sf}) =	$(0.746 kW/hp) \times 2.5 \times 10^{-4} \times Q \times \Delta P_s \times \Theta_s$ =	37,738	kWh/year
Electricity Consumed by the cooling fan (Q_{cf}) =	$(0.746 kW/hp) \times 2.5 \times 10^{-4} \times Q_{cf} \times \Delta P_s \times \Theta_{cf}$ =	5,661	kWh/year
Electricity Consumed by the Cooling Water Fan (Q_{cwf}) =	$(0.746 kW/hp) \times [2.52 \times 10^{-4} \times 100/\eta] \times [\Theta_{cwp}/(0.6 \times \Theta_D \times N_A \times \Theta_D/\Theta_A) \times 60 mins/hour]$ =	218	kWh/year
Total Estimated Electricity Consumption (Q_{Elec}) =	Qsf + Qcf + Qcsf =	43,617	kWh/year
Steam Consumption:			
Total Steam Consumption (Q_{Steam}) =	= 3.5 x $M_{voc} \times \Theta_s$ =	44,335	lbs./year
Cooling Water Consumption:			
Total Cooling Water Consumption (Q_{cw}) =	= 3.43 x C_s/P_s =	152,070	gallons/year
Capital Recovery Factor:			
Capital Recovery Factor for adsorber vessels and auxiliary equipment (CFRabsorber)=	$[i \times (1 + i)^n] / [(1 + i)^n - 1]$ = Where n = Equipment Life and i = Interest Rate	0.1295	
Capital Recovery Factor for carbon (CRF_{Carbon}) =	$[i \times (1 + i)^n] / [(1 + i)^n - 1]$ = Where n = Carbon Life and i = Interest Rate	0.2310	

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 x F_m x $S^{0.778}$ =	$32,919
Total Cost for All Carbon Adsorber Vessels and Carbon(EC_{Adsorb}) =	5.82 x $Q^{-0.133}$ x [C_c + (N_A + N_D) x C_v] =	$178,794
Auxiliary Equipment (EC_{aux}) =	(Based on design costs or estimated using methods provided in Section 2 $32,000 and estimated boiler cost of $50,000)	$82,000
Total Purchased Equipment Costs for Carbon Adsorber (A) =	= EC_{Adsorb} + EC_{aux} =	$260,794
Instrumentation =	0.10 × A =	Included in A
Sales taxes =	0.85 × A =	$22,167
Freight =	0.05 × A =	$13,040
	Total Purchased Equipment Costs (B) =	$296,001

Direct Installation Costs (in 2020 dollars)

Parameter	Equation	Cost
Foundations and Supports =	0.08 × B =	$23,680
Handling and Erection =	0.14 × B =	$41,440
Electrical =	0.04 × B =	$11,840
Piping =	0.02 × B =	$5,920
Insulation =	0.01 × B =	$2,960
Painting =	0.01 × B =	$2,960
Site Preparation (SP) =		$0
Buildings (Bldg) =		$0
	Total Direct Costs (DC) = B + (0.3 × B) + SP + Bldg =	$384,801

Total Indirect Installation Costs (in 2020 dollars)

Parameter	Equation	Cost
Engineering =	0.10 × B =	$29,600
Construction and field expenses =	0.05 × B =	$14,800
Contractor fees =	0.10 × B =	$29,600
Start-up =	0.02 × B =	$5,920
Performance test =	0.01 × B =	$2,960
	Total Indirect Costs (IC) =	$82,880
Contingency Cost (C) =	CF(IC+DC)=	$46,768

Total Capital Investment (TCI) =	**DC + IC + C = (1.28 × B) + SP + Bldg. + C =**	**$514,449**	**in 2020 dollars**

Annual Costs

Direct Annual Costs

Parameter	Equation	Cost	
Annual Electricity Cost =	$Q_{Elec} \times P_{elec}$ =	$6,019	
Annual Steam Cost (C_s) =	3.50 x m_{voc} x Θ_s x P_s =	$222	
Annual Cooling Water Cost (C_{cs}) =	3.43 x C_s/P_s x P_{wc} =	$540	
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 =	$12	
	Carbon = CRF_{carbon} x CC x M_c x 1.08 =	$689	
Direct Annual Costs (DAC) =		**$19,450**	**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	$10,289	
Property Taxes	= 1% of TCI	$5,144	
Insurance	= 1% of TCI	$5,144	
Capital Recovery	= $CRF_{Adsorber}$ × (TCI - [(1.08 x CC x M_c) + (LR x M_c/CRR)] =	$66,230	
Indirect Annual Costs (IAC) =		**$93,989**	**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} × Θ_s x P_{voc} x E =	$4,117

Total Annual Cost (TAC) =	**DAC + IAC + C + $Disposal_{Cost}$ - RC =**	**$109,322**	**in 2020 dollars**

Cost Effectiveness			
Parameter	**Equation**	**Cost**	
Total Annual Cost =	TAC =	$109,322	per year in 2020 dollars
Annual Quantity of VOC Removed/Recovered =	$W_{voc} = m_{voc} \times \Theta_s \times E$ =	6.24	tons/year
Cost Effectiveness =	Total Annual Cost (TAC) / Annual Quantity of VOC Removed/Recovered =	$17,523.42	per ton of pollutants removed/recovered in 2020 dollars

Attachment B

Cost Effectiveness Analysis for Thermal Oxidizers

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	42	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.

s

Enter the design data for the proposed oxidizer:

Number of operating hours/year	2,080	hours/year	
Inlet volumetric flow rate(Q_{wi}) 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_{wi}) (actual conditions)	20,900	acfm*	* 20,900 acfm is a default volumetric flow rate. User should enter actual value, if known.
Pressure drop (ΔP)	23	inches of water*	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})	2,000	°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
Destruction and Removal Efficiency (DRE)	98.5	percent	
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	2020			
CEPCI* for 2020	541.7	Enter the CEPCI value for 2020	541.7	2016 CEPCI
Annual Interest Rate (i)	5	Percent		
Electricity ($Cost_{elect}$)	0.138	$/kWh		
Natural Gas Fuel Cost ($Cost_{fuel}$)	0.00712	$/scf		
Operator Labor Rate	$26.61	per hour		* $26.61 per hour is a default labor rate. User should enter actual value, if known.
Maintenance Labor rate	$27.40	per hour		* $27.40 per hour is a default labor rate. User should enter actual value, if known.
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) =	$546,578	in 2020 dollars
Instrumentation[b] =	0.10 × A =	$54,658	
Sales taxes =	0.03 × A =	$16,397	
Freight =	0.05 × A =	$27,329	
	Total Purchased equipment costs (B) =	$644,962	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 =	$51,597	
Handlong and Errection =	0.14 × B =	$90,295	
Electrical =	0.04 × B =	$25,798	
Piping =	0.02 × B =	$12,899	
Insulation for Ductwork =	0.01 × B =	$6,450	
Painting =	0.01 × B =	$6,450	
Site Preparation (SP) =		$0	
Buildings (Bldg) =		$0	
	Total Direct Installaton Costs =	$193,489	
Total Direct Costs (DC) =	Total Purchase Equipment Costs (B) + Total Direct Installation Costs =	$838,450	in 2020 dollars
Total Indirect Installation Costs (in 2020 dollars)			
Engineering =	0.10 × B =	$64,496	
Construction and field expenses =	0.05 × B =	$32,248	
Contractor fees =	0.10 × B =	$64,496	
Start-up =	0.02 × B =	$12,899	
Performance test =	0.01 × B =	$6,450	
	Total Indirect Costs (IC) =	$180,589	
Continency Cost (C) =	CF(IC+DC)=	$101,904	
Total Capital Investment =	**DC + IC +C =**	**$1,120,944**	**in 2020 dollars**

Direct Annual Costs		
Annual Electricity Cost	= Fan Power Consumption × Operating Hours/year × Electricity Price =	$26,906
Annual Fuel Costs for Natural Gas	= $Cost_{fuel}$ × Fuel Usage Rate × 60 min/hr × Operating hours/year	$36,729
Operating Labor	Operator = 0.5hours/shift × Labor Rate × (Operating hours/8 hours/shift)	$3,459
	Supervisor = 15% of Operator	$519
Maintenance Costs	Labor = 0.5 hours/shift × Labor Rate × (Operating Hours/8 hours/shift)	$3,562
	Materials = 100% of maintenance labor	$3,562
Direct Annual Costs (DC) =		**$74,737 in 2020 dollars**

Indirect Annual Costs		
Overhead	= 60% of sum of operating, supervisor, maintenance labor and maintenance materials	$6,661
Administrative Charges	= 2% of TCI	$22,419
Property Taxes	= 1% of TCI	$11,209
Insurance	= 1% of TCI	$11,209
Capital Recovery	= CRF[TCI-1.08(cat. Cost)]	$89,947
Indirect Annual Costs (IC) =		**$141,446 in 2020 dollars**

Total Annual Cost =	**DC + IC =**	**$216,184 in 2020 dollars**

Cost Effectiveness

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

Total Annual Cost (TAC) =	$216,184 per year in 2020 dollars
VOC/HAP Pollutants Destroyed =	12.31 tons/year
Cost Effectiveness =	$17,566 per ton of pollutants removed in 2020 dollars

Attachment C

SCAQMD Evaluation A/N 2562397

PO no PC
Digital Printing Press

Legal Owner or Operator: SOUTHERN CALIFORNIA GRAPHICS
8432 STELLER DR
CULVER CITY, CA 90232-2489

ID 62280

Equipment Location: SAME AS ABOVE

Equipment Description:
A/N 562397 (PO no PC, previously R219 Exempt)
Digital Laser Offset Printing, Hewlett Packard, Model HP Indigo 10000, S/N I15000132, 6-Color Units, 21.5-Inch Sheet Width.

History

The company is currently operating two sheet-fed IR-dried lithographic printing presses with a facility limit of 2038 pounds VOC per month per facility. The company has also accepted a 10-ton per year limit of VOC to be excluded from the Title V program.

In this project, the company is adding a laser offset printer as described above. This printer was installed in 2012 and had been operated under Rule 219 exemption status for low usages of VOC materials. The company is expecting higher usages, which will not be qualified for the Rule 219 exemption.

Based on the District compliance database, the facility has been operating at the above facility without creating any public nuisance and without receiving any NC or NOV.

Process Description

The company prints reports, inserts, magazines, brochures, and other printed items, using lithographic and digital printing technology. The following are its normal and maximum operating schedules:

	Hr/dy	dy/wk	wk/yr
Normal	24	7	52
Maximum	24	7	52

In this project, a new type of offsetting printing technology by HP is proposed. In the HP Indigo printing process, a laser beam creates an image on a smooth surface plate (called a PIP). Then, proprietary HP ink (called ElectroInk) adheres to the plate. Then,

the wet image is transferred to a heated blanket, before being printed on a final substrate

This added offset step enhances the creation of high image resolution, much better than conventional direct laser printing, since normal paper surfaces are either just too porous, too rough or too glossy, not an ideal surface for a high resolution image that a laser beam is capable to produce on a PIP. In addition, special ElectroInk, that is semi-transparent, can be used to adapt to different final substrate surfaces, forming as an intermediary base layer, to be followed by final printing layers. As a result, indigo printing output is much closer in appearance to conventional offset lithography.

The ElectroInk is currently not regulated, not subject to Rule 1130. However, these inks contain above 5 pounds of VOC per gallon. With high usage throughputs, VOC emissions above the Rule 219 exemption thresholds, 3 pounds per day or 66 pounds per calendar month, are expected from each printing unit. Therefore, each printing unit is then subject to Rule 201 and 203. In this project, the equipment was already installed and initially operated with low usage throughputs below Rule 219 exemption.

Emission Calculations

The emission sources are primarily organic solvents contained in ElectroInks and thinners (called imaging oil). The applicant estimates an average and maximum daily usage of 2.5 and 3.75 gallons respectively of ElectroInks and 0.5 and 0.75 gallons respectively of an imaging oil. ElectroInks contain a maximum VOC of 5.39 pounds per gallon. The imaging oil contains 6.34 pound of VOC per gallon. The following are the estimate VOC emissions from this printer:

MAXIMUM VOC (R1=R2) = (6.34X0.75)+(5.39X3.75) lbs/day = 24.97 lbs/day

AVERAGE VOC (R1=R2) = (6.34X0.5)+(5.39X2.5) lbs/day = 16.65 lbs/day

The following are AEI and NSR entries for this project:

AEIS:

VOC (R1=R2) = 16.65/24 lbs/hr = 0.69 lbs/hr

NSR:

VOC (R1=R2) = 24.97/24 lbs/hr = 1.04 lbs/hr

Please note that since the company proposes to bubble the above emissions into the monthly limit of 2038 pounds of ROG, the 30-DA in NSR is manually set to zero.

BACT Evaluation

The proposed equipment is equipped with an integral air pollution control (APC) system, consisting of an oil/water separator and a refrigeration condenser.

Spent water from the press contains a small amount of imaging oil. The built-in separator separates the imaging oil from spent water. The recycled water is safe and legal to discharge in the city waste water stream. The recycled oil is being re-used in the press.

VOC emissions from the use of imaging oil in this press are captured and passing through a built-in refrigeration condenser. The condensed VOC is being re-used in the press without the need to constantly adding imaging oil as compared to older models of laser offset printing presses manufactured by HP.

The equipment, including the press and the built-in APC, is not vented outside the building. The APC is working in a closed-loop system, without any stack opening. Fugitive emissions from the equipment are negligible, without creating any odors around the equipment.

The built-in APC system is therefore considered BACT to control VOC emissions from this type of digital printing press.

Rule Evaluation

Rule 212(c)(1): This section requires a public notice for all new or modified permit units that may emit air contaminants located within 1,000 feet from the outer boundary of a school.

A Rule 212(c) (1) notice will be triggered since there is a school within 1,000 ft from the facility.

Rule 212(c)(2): This section requires a public notice for all new or modified facilities that have on-site emission increases exceeding any of the daily maximums as specified by Rule 212(g).

The proposed project results in no net emission increases facility-wide. Therefore, a Rule 212(c)(2) public notice will not be triggered.

Rule 212(c)(3): This section requires a public notice for all new or modified permit unit with increases in emissions of toxic air contaminants listed in Table I of Rule 1401 resulted in MICR greater than 1E-6 per permit unit or greater than 10E-6 per facility.

The proposed project does not result in any emission increases of TACs. A Rule 212(c)(3) public notice will not be triggered.

Rule 212(g): This section requires a public notice for all new or modified sources that have equipment emission increases exceeding any of the daily maximums as specified by Rule 212(g).

The proposed project results in emission increases of VOC emissions. The proposed condition No. 8 limits the monthly emissions from all digital printing operations to less than 833 pounds per month, equivalent to less than 30 pounds of VOC per day. Therefore, a Rule 212(g) public notice will not be triggered.

Rule 401: Visible emissions are not expected with the proper operation of the equipment.

Rule 402: Nuisance is not expected with the proper operation of the equipment. There is no complaint history for this company at this location based on the District computer database.

Rule 442: All VOC emissions from digital printing operations at this facility shall be conditioned to a maximum limit of not more 833 pounds per month, in compliance with Rule 442 (Condition No. 8).

Rule 1130: Graphic art materials as defined in Rule 1130 are not used in the proposed digital printer. Therefore, this project is not subject to Rule 1130 requirements.

Rule 1171: VOC-containing materials are not used for cleaning in the proposed project. Therefore, this project is expected to be in compliance with Rule 1171 requirements.

Rule 1401: Based on the supplied MSDS, ElectroInks and image oil do not contain any Rule 1401 TACs. Therefore, compliance with this rule is expected.

Recommendation

The proposed project is expected to comply with all applicable District Rules and Regulations. Approval of a permit to operate with the following conditions is recommended:

1. Operation of this equipment shall be conducted in accordance with all data and specifications submitted with the application under which this permit is issued unless otherwise noted below.

2. This equipment shall be properly maintained and kept in good operating condition at al times.

3. This equipment shall be operated in compliance with Rules 442 and 1171.

4. The owner/operator shall maintain all press doors in the closed position at all times when the press is operating. The owner/operator shall only open the doors to change consumables, repair paper jams, or conduct urgent maintenance. Once the doors opened, the press shall be automatically shut down.

5. The owner/operator shall operate the integral VOC recovery systems of the press at all times in accordance with the HP Indigo owner's manual.

6. The owner/operator shall not leave containers of ElectroInk, Imaging Oil, or any other VOC-containing materials open when not in use.

7. The owner/operator shall store all ElectroInk, Imaging Oil, and any other VOC-containing materials in vapor tight containers.

8. Materials used in this equipment shall not contain any toxic air contaminants identified in Rule 1401, Table 1 with an effective date of September 10, 2010 or earlier.

9. The total quantity of volatile organic compounds (VOC) emissions released to the atmosphere from this facility shall be less than 2038 pounds in any calendar month.

10. The total quantity of volatile organic compounds (VOC) emissions released to the atmosphere from all digital printing operations at this facility shall be less than 833 pounds in any calendar month.

11. In addition to the record keeping requirements in Rule 109, the operator shall keep adequate records for this facility to verify the following:

A. Density of each ink in pounds per gallon.

B. The percentage by weight of lithographic oils in each ink.

C. The ink absorption factor as specified by current District guidelines.

D. The VOC content of fountain solutions, wash materials, and any other

materials used in pounds per gallon as applied, including water and exempt compounds, and in volume percent (fountain solution only).

E. Other data as required to verify compliance with conditions specified in this permit.

12. To maintain exemption from the Title V requirements, the total quantity of VOC emissions from this facility shall be less than 10 tons (20,000 pounds) in any 12 calendar month period. If the records generated after the end of any calendar month show that the total facility VOC emissions for the previous 12 calendar months exceed the emission limit of this condition, the operator shall submit an initial Title V permit application and obtain a Title V permit pursuant to the requirements specified in Rule 3003. Exceedance of the VOC emission limit of this condition shall not subject any equipment at this facility to new source review requirements if the operator complies with all other permit conditions that are applicable to such equipment.

13. To ensure compliance with the emission limits of this permit, the operator shall:
A. In addition to the recordkeeping requirements of Rule 109, the operator shall keep adequate records for all equipment and operations that are required to have written permits or are exempt from written permits pursuant to Rule 219 at this facility to verify VOC emission in pounds and the VOC content of each material as applied (including water and exempt compounds)..
B. Within 14 calendar days after the end of each calendar month, total and record VOC emissions for the calendar month and for the previous 12 calendar month period from all equipment and operations that are required to have written permits or are exempt from written permits pursuant to Rule 219. The record shall include any procedures used to account for control device efficiencies and/or waste disposal. It shall be signed and certified for accuracy by the highest ranking individual responsible for compliance with District Rules.
C. Maintain a single list which includes only the name and address of each person from whom the facility acquired VOC-containing material regulated by the District that was used or stored at the facility during the preceding 12 months.
D. Retain all purchase invoices for all VOC-containing material used or stored at the facility, and all waste manifests for all waste VOC-containing material removed from the facility.

14 . Material safety data sheets for all materials used at this facility shall be kept current and made available to District personnel upon request.

15 . All records required by this permit shall be prepared in a format which is acceptable to the District, retained at the facility for a minimum of five years, and made available to any District representative upon request.

Attachment D

BAAQMD Evaluation Application #28111

EVALUATION REPORT

Company Collotype Labels International Inc.
Application # 28111
Plant # 17834

1. Background:

Collotype Labels International Inc. (CLII) has applied for an Authority to Construct and/or Permit to Operate the following equipment:

S-22 UV Press-Sheetfed Press UV Coaters, Heidelberg, SM74
S-23 CO2 Multi Coatings Printing Press, Heidelberg, CD74
S-24 6000 Indigo, HP Indigo 6000 Digital Press
S-25 6600 Indigo, HP Indigo 6600 Digital Press
S-26 6800 Indigo, HP Indigo 6800 Digital Press
S-27 UV Presses (2 Digicon Series 2 and 1 Digicon Series 3), Omega Digicon Series 2 and 3

CLII is preparing to install and operate two lithographic presses, three digital presses and three flexographic UV presses in the Fall of 2016. These presses are being installed as part of an expansion project at their location at 21 Executive Way, Napa, CA.

Because the estimated emissions from the flexographic presses which only use ultraviolet coatings are less than 3,000 lbs/yr, the UV Presses are grouped as one source as allowed in the District's grouping policy (Grouping of Coating, Adhesive, or Printing Operations into a Single Permitted Source) and identified as S-27.

2. Emission Calculations:

S-22 and S-23 Heidelberg Presses
Based on the proposed new permit conditions for the S-22 and S-23, the following emissions are estimated:

Table I – Emission Calculations for S-22 and S-23

Material Name	Material Manufacturer	Usage (lb/yr)	Usage (gal/yr)	VOC (lb/gal)	Retention Factor [2] (%)	POC (lb/yr)	POC[1] (lb/day)
Ink							
Soy-Based Offset	Great Western Ink	21000	2488	0.81	95	100.8	0.4
UV Offset Ink	Siegwerk	3500	415	0	95	0.0	0.0
Varnish							
Rub Resistant	Great Western Ink	15000	1777	1.18	95	104.9	0.4
Aqueous Varnish	Nicoat		6000	0.74	95	222.0	0.9
UV Flexo Varnish	Siegwerk	23500	2784	0	95	0.0	0.0
UV Anti Scuff	Varnish	8000	948	0	95	0.0	0.0

[1] 260 days/yr of operation
[2] Retention Factor of 95% for Non-Heatset Lithographic Printing Operations per Regulation 8-20-409.

Material Name	Material Manufacturer	Usage (lb/yr)	Usage (gal/yr)	VOC (lb/gal)	Retention Factor [2](%)	POC (lb/yr)	POC[1] (lb/day)
Clean-up							
Alpha 8	Explorer Press Solutions		1050	0.8		840.0	3.2
California Wash	Bottcher Systems		700	0.48		336.0	1.3
VOC Exempt Meter Cleaner	Nora Products		800	0.81		648.0	2.5
Fountain Solution Concentrate							
Supreme 8168	Varn International		65	3.97		258.1	1.0
Druck Fount	Siegwerk		65	1.29		83.9	0.3
TOTAL COMBINED EMISSIONS FOR S-22 and S-23						2593.5	**10.0**

For operating flexibility in the event that the POCs in the inks and cleanup solvents can be replaced with NPOCs, an equal amount of NPOC emissions is estimated from S-22 and S-23.

NPOC = 2593.5 lb/yr
NPOC = 10 lb/day

S-24, S-25, and S-26 HP Digital Presses

S-24 6000 Indigo Digital Press is a pre-certified source (Application # 24060), per 2-1-415.3. S-25 and S-26 6600 and 6800 Digital Presses are second and third generation models of the same pre-certified 6000 model. Enhancements have been made to the newer presses to improve capture, control, and reuse of VOC materials. Hence, the emissions profile of the pre-certified 6000 press are a conservative estimate for the 6600 and 6800 models.

Emissions of a digital press depend on the print job. The 2010 performance test of the HP Indigo 6000 press was conducted over a variety of operations. It was concluded that the worst case print job (one that has high coverage using the highest amount of ink for a 24-hour period) results in an organic emissions rate of 0.63 lb/hr. To reduce their facility potential to emit, the applicant agreed to limit operation of all three digital presses to 240 days per year of operation per press. Assuming the organic emissions are POC, the total emissions for a 24 hour, 240 day per year operation are as follows:

TABLE II – Emissions for 6000 Indigo Digital Press (Application 24060, P# 21086)

Pollutant	Lb/hr	Lb/day	Lb/year	Tons/year
POC	0.63	15.12	3629	1.81

The emissions above are for all materials used for the press. Based on the performance test that estimated worst case emissions, the throughputs of the materials used in this press are the following:

HP ElectroInks	44465 lb/yr
HP Recycle Agent	118 gal/yr
HP Imaging Oil	215 gal/yr
HP Imaging Agent	24 gal/yr

Because the facility agreed to 240 days per year of operation for each digital press, the pre-certified press template permit condition will not be imposed. Instead, the permit conditions for the digital press will be similar to the template conditions adjusted to reflect the less operating days.

S-27 UV Presses

The ultraviolet coatings used at S-27 have no VOC content. But there is solvent cleanup of the presses. The following emissions are estimated from the solvent cleanup (CeramClean Solv-It) at S-27:

POC = 100 gal/yr(2.10 lb/gal) = 210 lbs/yr
NPOC = 210 lb/yr

NPOC is estimated to be same as POC to allow for operating flexibility. Their daily emissions (operating 260 days/yr) is estimated to be the following:

POC = 210 lb/yr/260 days/yr = 0.8 lb/day
NPOC = 0.8 lb/day

TABLE III – Application Cumulative Increase Summary

Source	POC (lb/yr)	POC (TPY)	NPOC (lb/yr)	NPOC (TPY)
S-22 & S-23	2594	1.30	2594	1.30
S-24	3629	1.81		
S-25	3629	1.81		
S-26	3629	1.81		
S-27	210	0.11	210	0.11
TOTAL	**13,691**	**6.85**	**2804**	**1.41**

TOXICS

Review of the Material Safety Data Sheets for printing operation indicates the existence of butyl glycol ethers from S-22, S-23 (CAS# 112-3-4 of Nicoat Aqueous Varnish and CAS# 111-76-2 of Druck Fount, VOC Exempt Metering Roller Cleaner, Supreme 8168), and S-27 (CAS# 111-76-2 in CeramClean Solv-It MSDS). Comparing total POC Emissions to the screening level shows that total POC emissions are below screening trigger level:

Table IV – Toxic Emissions

Toxic	POC (lb/yr)	POC (lb/hr)*	Trigger Level (lb/hr)
Glycol Ether	2594 + 210 = 2,804	3	31

* Assumes worst-case operation of 260 days per year and 4 hours per day.

Hence, a Health Risk Screening Analysis (HRSA) is not required.

3. **Statement of Compliance:**

The new printing presses (S-22 through S-27) are subject to and will comply with District Regulation 8, Rule 20, and Section 302 and Section 309. Regulation 8-20-302 identifies the VOC standards for inks, coatings, and adhesives, while Regulation 8-20-309 identifies the VOC standards for cleaning products. The ink used by CLII is either UV or very low in VOC's if any. In addition, the cleaning products are also very low in VOC's.

Best Available Control Technology (BACT)

Because the daily emissions from S-22 through S-26 will exceed 10 pounds per worst-case day (See Table I and II), BACT review is required.

BACT 1 for POC and NPOC abatement has been determined to emissions controlled to an overall capture and destruction efficiency of at least 90% by weight. BACT 1 requires an overall capture and destruction efficiency of VOC by at least 90%.

Sources S-22 through S-26 are housed in the same building. To collectively abate S-22 through S-26 to a single abatement device would require at least a 5,000 cfm regenerative thermal oxidizer. Anguil provided an Equipment Cost (EC) of $265,000 for a 5000 cfm thermal oxidizer (not including installation, ducting, utilities, or taxes). Using the EPA Control Cost Manual, Table 2.8 (Capital Cost Factors for Thermal and Catalytic Incinerators), the purchased equipment cost (PEC) was estimated to be:

PEC = Oxidizer EC + Sales Tax (0.09 EC) + Freight (0.05 EC)*
PEC = EC(1.14)
PEC = $265,000(1.14) = $302,100

Note: * Instrumentation is included with Oxidizer and already included in cost.

Ductwork and stack installation would be required to collect the emissions from the S-22 through S-26. Review of the EPA Control Cost Manual, Chapter 1 provides a cost of approximately $36,000 for the ductwork and stack installation. With the oxidizer's PEC, the following total equipment cost (TEC) is estimated to be:

TEC = 302,100 + 36,000 = 338,100

The Total Capital Investment is made up of the direct and indirect equipment costs. Per Table 2.8 of EPA Control Cost Manual, the Total Capital Investment (TCC) was estimated from the TEC:

TCC = 1.61TEC
TCC = 1.61($338,100) = $544,341

The annualized cost of abatement was estimated adding the direct and indirect annual costs:

Table V – Annualized Cost of Abatement

	Formula	Reference	Annual Cost ($)
Direct Annual Cost			
Labor			
Operator	0.5 hr per day at $20/hr	Bay Area Estimate	3,650
Supervisor	15% of operator cost	EPA Cost Manual	548
Maintenance			
Labor	0.5 hr per day at $30/hr	District Estimate	5,475
Materials	100% of Maintenance Labor	EPA Cost Manual	5,475
Utilities			
Natural Gas & Elec	$0.82/hr (gas + elec)}	Anguil Estimate	4723 (24 hrs/day, 240 days/yr)
Total Direct Annual Cost (DAC)			**19,871**

	Formula	Reference	Annual Cost ($)
Indirect Annual Cost (IAC)			
Capital Recovery	0.136 TCC	BAAQMD BACT Workbook	74,030
Property Tax	0.01 TCC	BAAQMD BACT Workbook	5,443
Insurance	0.02 TCC	BAAQMD BACT Workbook	10,887
General and Administrative	0.02 TCC	BAAQMD BACT Workbook	10,887
Operation & Maintenance	0.05 TCC	BAAQMD BACT Workbook	27,217
Total Indirect Annual Cost (IAC)			**128,464**
Total Annualized Cost (TAC)	**TAC = DAC + IAC**		**148,335**

For 90% abatement of the emissions from S-22 through S-26 to be abated would result in the following emissions reduction:

Emissions Reduced = (1.30 + 1.81 + 1.81 + 1.81) (90%) = 6.06 TPY

Hence, the cost-effectiveness of abating S-22 through S-26 is estimated to be:

Cost-Effectiveness = $148,335/6.06 TPY = $24,478/ton of emissions reduced

The cost of abatement for S-22 through S-26 exceeds the BACT1 cost-effectiveness threshold of $17,500. Therefore it is not cost effective to implement add-on abatement (BACT1). BACT has been determined to compliance with existing Regulation 8-20 requirements.

BACT2 requirements for graphic arts operations is met, because the applicant will use UV inks and cleaning products which meet the Regulation 8-20-309 standards. The use of ultra-low or no-VOCs in the UV inks and cleaning materials is considered BACT for graphic arts operations.

The HP Indigo presses each have an integrated VOC recovery system that includes a vapor collection system and condenser that recovers and reuses organic liquids and reduces usage and emissions. The VOC recovery system is considered BACT for digital presses (per Application # 24060). In Application # 24060, District review also found BACT1 not to be justified for the HP Indigo Press.

BACT 2 for digital presses is not included in the BACT guidelines. Most printing press BACT 2 is the use of low VOC materials. However, this technology is not extendable to digital presses, where the electrophotography technology requires the ElectroInk materials. One BACT 2 technology is to collect and control emissions such that the overall emission would effectively be less than 2.5 lb/gal (Document 146.1, Rotogravure Printing). The HP Indigo 6000 press collection/condensing system complies with this requirement, as demonstrated in the following table:

TABLE VI – Collection/Condensing Summary

Total Ink lb/yr	Typical Ink Density lb/gal	Total Ink gal/yr	Typical Ink VOC lb/gal	Total Ink VOC lb/yr	Total Ink VOC lb/day
44,465	6.8	6,539	5.3	34,657	144
			Permitted POC Limit:		15.12
			Effective VOC lb/gal:		0.55
			Effective abatement:		89.6%

Note: Effective VOC lb/gal = 15.12 lb/day / (6,539 gal / 240 day/yr) = 0.55 lb/gal
Effective abatement = (5.3-0.55)/5.3 = 89.6%

The HP Indigo Digital Printing Press complies with BACT and is considered to have a BACT 2 level of control.

Offsets

The facility emissions are the following:

Table VII – POC Cumulative Increases

post 4/5/91 P O C increases as of 07-27-16 .
Collotype Label USA, Inc [plant: 17834]

Application	incr.	contemp reduction	ratio	offsets	Bank No.
14706	5.080	1.00	5.080	157	
15121	.590	1.00	.590	157	
15423	1.180	1.00	1.180	157	
15979	.800	1.00	.800	157	
17181	1.720	1.00	1.720	157	
24435	.400	1.00	.400	157	
25237	.500	1.00	.500	157	
25891	1.200	1.00	1.200	157	

11.470 tpy POC permitted since 4/5/91(*)
.000 tpy POC currently subject to offsets
4.043 tpy POC in 2016 emissions inventory

Offsets are triggered because facility POC emissions are greater than 10 TPY. Adding the existing cumulative, this application would result in a total cumulative increase of 18.32to b TPY:

POC Cumulative Increase = 11.47 (existing) + 6.85 TPY (new) = 18.32 TPY

The facility owns no offsets. Because facility emissions are less than 35 tons per year, they qualify for offsets from the small facility bank per Regulation 2-4-414:

Offsets from SFB = 6.85 TPY

NSPS & NESHAP

S-22 through S-27 are not subject to NSPS Subpart QQ "Standards of Performance for the Graphic Arts Industry: Publication Rotogravure Printing" which apply to rotogravure presses. S-22 through S-27 are not located at a major source of HAPs and therefore, are not subject to NESHAP Subpart KK "National Emission Standards for the Printing and Publishing Industry" which apply to printing operations which are major sources of HAPs.

This application is ministerial (Permit Handbook Chapter 5.4); the requirements of the California Environmental Quality Act (CEQA) are not triggered. The facility is not located within 1000 feet of any K-12 school. As a result, no public notification requirements are triggered.

4. Conditions

I recommend that the following conditions for S-22 and S-23 (Condition # 26372):

1. The owner/operator shall ensure the combined usage of the following materials at S-22 and S-23 does not exceed the following usage limits during any consecutive twelve-month period:

Great Western Soy-Based Ink	21000 Pounds
Great Western Rub Resistant Ink	15000 Pounds
UV Ink	No Limit
Nicoat Aqueous Varnish	6000 Gallons
Explorer Press Solutions Alpha 8	1050 Gallons
Bottcher Systems California Wash	700 Gallons
Nora Products VOC Exempt Meter Cleaner	800 Gallons
Varn International Supreme 8168	65 Gallons
Siegwerk Druch Fount	65 Gallons

(Basis: Cumulative Increase)

2. The owner/operator may use an alternate coating(s) or cleanup solvent(s) other than the materials specified in Part 1 and/or usages in excess of those specified in Part 1, provided that the owner/operator can demonstrate that all of the following are satisfied:
   a. Total POC emissions from S-27 do not exceed 2,594 pounds in any consecutive twelve month period;
   b. Total NPOC emissions from S-27 do not exceed 2,594 pounds in any consecutive twelve month period; and
   c. The use of these materials does not increase toxic emissions above any risk screening trigger level of Table 2-5-1 in Regulation 2-5.

   (Basis: Cumulative Increase; Toxics)

3. To determine compliance with the above parts, the owner/operator shall maintain the following records and provide all of the data necessary to evaluate compliance with the above parts, including the following information:
   a. Quantities of each type of coating and cleanup solvent used at this source on a monthly basis.
   b. If a material other than those specified in Part 1 is used, POC/NPOC and toxic component contents of each material used; and mass emission calculations to demonstrate compliance with Part 2, on a monthly basis;
   c. Monthly usage and/or emission calculations shall be totaled for each consecutive twelve-month period.
   d. Demonstration that any toxic air contaminants in new solvents in the coating and cleanup materials in Part 2, do not exceed the acute and chronic trigger levels by calculating toxic air contaminant emissions on a lb/hour and lb/year basis, respectively.

   All records shall be retained on-site for two years, from the date of entry, and made available for inspection by District staff upon request. These recordkeeping requirements shall not replace the recordkeeping requirements contained in any applicable District Regulations.
   (Basis: Cumulative Increase; Toxics)

I recommend the following permit condition for S-24, S-25, and S-26 (Condition # 26377):

1. The Owner/Operator of the HP Indigo 6000-series Digital Printing Presses S-24, S-25, and S-26 shall not exceed the following limits of gross material usage for each consecutive 12-month period per press:
    a. HP ElectroInks 44,465 pounds
    b. HP Imaging Oil 118 gallons
    c. HP Recycle Agent 215 gallons
    d. HP Imaging Agent 24 gallons
    (Basis: Cumulative Increase)

2. The Owner/Operator of S-24, S-25 and S-26 shall not exceed the following limits:
    a. 15.12 pounds of organic emissions per day at each of the above presses, based on a calendar month average.
    b. Each press shall not operate for more than 240 days in any consecutive 12-month period.
    (Basis: Cumulative Increase, BACT)

3. The Owner/Operator of S-24, S-25 and S-26 shall not operate any of the above presses within 1000 feet of any school or school grounds unless there are no Toxic Air Contaminant emissions. "School" or "School Grounds" means any public or private school used for the purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in a private home(s). "School" or "School Grounds" includes any building or structure, athletic field, or other areas of school property but does not include unimproved school property. (Basis: Regulations 2-1-106, 2-1-412)

4. The owner/operator of S-24, S-25 and S-26 shall maintain all press doors at each of the above presses in the closed position at all times when the press is operating. The owner/operator of S-24, S-25 and S-26 may open the doors to change consumables, repair paper jams, or conduct urgent maintenance. However, once the doors at the presses are opened, the press is designed to be unable to operate and the owner/operator must not defeat or in any way compromise this shutdown feature. (Basis: Cumulative Increase, BACT)

5. The owner/operator of S-24, S-25 and S-26 shall operate the integral oil recovery systems of the press at all times in accordance with the HP Indigo owner's manual. (Basis: Cumulative Increase, BACT)

6. The owner/operator of S-24, S-25 and S-26 shall not use open containers for the storage or disposal of cloth or paper impregnated with organic compounds that are used for surface preparation, cleanup or ink removal. (Basis: Regulation 8-20-320.1)

7. The owner/operator of S-24, S-25 and S-26 shall not store in open containers spent or fresh organic compounds used for surface preparation, cleanup or removal of inks. (Basis: Regulation 8-20-320.2)

8. The owner/operator of S-24, S-25 and S-26 shall not leave containers of ink, Imaging Oil, Imaging Agent, Recycle Agent or waste/spent organic material open when not in use. (Basis: Regulation 8-20-320.3)

9. The owner/operator of S-24, S-25 and S-26 shall maintain the following records for each press in a District-approved log book, and shall make the records available to District staff upon request:

a. Maintain a list of all inks, coatings, adhesives, makeup solvents, and cleaning products currently in use and document the VOC content and density of each material.
b. Record and add up on a monthly basis the type and amount (in pounds) of each ink, coating, adhesive, makeup solvent, surface preparation solvent, and cleaning product used during that month. In order to determine compliance with Part 1, HP Imaging Oil, HP Recycle Agent and HP Imaging Agent shall also be recorded in gallons.
c. Record the total pounds of VOC of each ink, coating, adhesive, makeup solvent, surface preparation solvent, and cleaning product used during that month.
d. Record the amount of organic material that is collected and sent off site or accumulated prior to being sent off site.
e. For each calendar month, the owner/operator of S-24, S-25 and S-26 shall determine compliance with Part 2 by subtracting the total pounds of organic material recorded in Part 9d from the total pounds of VOC recorded in Part 9c, and dividing the difference by the number of operating days in the month.
f. The owner/operator of S-24, S-25 and S-26 shall retain all records for a period of 24-months from the last date of entry. (Basis: Regulation 8-20-503, Cumulative Increase)

I recommend the following conditions for S-27 (Condition # 26371):

1. The owner/operator of S-27 shall not exceed the following usage limits during any consecutive twelve-month period:

UV Ink	No Limit
CeramClean Solv-It	100 Gallons

(Basis: Cumulative Increase)

2. The owner/operator may use an alternate coating(s) or cleanup solvent(s) other than the materials specified in Part 1 and/or usages in excess of those specified in Part 1, provided that the owner/operator can demonstrate that all of the following are satisfied:
   a. Total POC emissions from S-27 do not exceed 210 pounds in any consecutive twelve month period;
   b. Total NPOC emissions from S-27 do not exceed 210 pounds in any consecutive twelve month period; and
   c. The use of these materials does not increase toxic emissions above any risk screening trigger level of Table 2-5-1 in Regulation 2-5.

   (Basis: Cumulative Increase; Toxics)

3. To determine compliance with the above parts, the owner/operator shall maintain the following records and provide all of the data necessary to evaluate compliance with the above parts, including the following information:
   a. Quantities of each type of coating and cleanup solvent used at this source on a monthly basis.
   b. If a material other than those specified in Part 1 is used, POC/NPOC and toxic component contents of each material used; and mass emission calculations to demonstrate compliance with Part 2, on a monthly basis;
   c. Monthly usage and/or emission calculations shall be totaled for each consecutive twelve-month period.
   d. Demonstration that any toxic air contaminants in new solvents in the coating and cleanup materials in Part 2, do not exceed the acute and chronic trigger levels by calculating toxic air contaminant emissions on a lb/hour and lb/year basis, respectively.

   All records shall be retained on-site for two years, from the date of entry, and made available for inspection by District staff upon request. These recordkeeping requirements shall not

replace the recordkeeping requirements contained in any applicable District Regulations. (Basis: Cumulative Increase; Toxics)

5. Authority to Construct:

I recommend that the Authority to Construct issued to CLII for the following:

S-22 UV Press-Sheetfed Press UV Coaters, Heidelberg, SM74
S-23 CO2 Multi Coatings Printing Press, Heidelberg, CD74
S-24 6000 Indigo, HP Indigo 6000 Digital Press
S-25 6600 Indigo, HP Indigo 6600 Digital Press
S-26 6800 Indigo, HP Indigo 6800 Digital Press
S-27 UV Presses (2 Digicon Series 2 and 1 Digicon Series 3), Omega Digicon Series 2 and 3

6. Exemptions:

None.

12/80-ER1

By M.K. Carol Lee
Senior Air Quality Engineer

Date