# State of the Art (SOTA)
# Manual for Paint, Ink, and
# Adhesive Manufacturing Industries

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State of New Jersey
Department of Environmental Protection
Air Quality Permitting Program

# State of the Art (SOTA)
# Manual for Paint, Ink, and Adhesive Manufacturing Industries
# Section 3.16

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## 3.16 SOTA MANUAL FOR PAINT, INK, AND ADHESIVE MANUFACTURING INDUSTRIES

### 3.16.1 Scope

This section of the SOTA manual is intended to provide SOTA performance levels and recommended control techniques to achieve these levels for newly constructed, reconstructed, or modified equipment and control apparatus as prescribed in N.J.A.C 7:27-8 and 7:27-22.

The SOTA Performance Levels in this section of the manual apply to paint and ink manufacturing unit operations sources, including but not limited to: washing systems, fixed and portable mixers and dispensers, roller/dispersion/grinding mills, process tanks, packaging lines, and mixing/blending/holding tanks. This section also includes adhesive manufacturers. The primary Standard Industrial Classification (SIC) codes for sources covered in this section include 2851, 2891, and 2893.

### 3.16.2 SOTA Performance Levels

This manual defines SOTA Performance Levels for paint and ink manufacturing operations, emitting the following pollutants:

- Regulated volatile organic compounds (VOCs)[1]
- Hazardous Air Pollutants (HAPs)[2]
- Particulate matter (Particles including HAP and heavy metal)[3]
- Other pollutants will be handled on a case-by-case basis

The reader is advised that more stringent control levels may be required by regulation (e.g. NJAC 7:27-16). In all cases, the more stringent requirement shall apply.

#### 3.16.2.1 Performance Levels for VOC's Based on Pollution Prevention

**<u>Portable and Stationary Open-Top Mills, Tanks, Vats, or Vessels (Mixing Vats)</u>**

**1) Lids**

[1] Volatile organic compounds as defined in Subchapter 16 including Hazardous Air Pollutants.
[2] As defined in 42 U.S.C. 7412(b)(1).
[3] Defined in Subchapter 6 as "any material, except uncombined water, which exists as liquid particles or solid particles at standard conditions."

All open-top mills, tanks, vats or vessels shall be covered at all times except when clean and empty, or when access to the system is required for tasks including: addition of ingredients, sampling, maintenance, or inspection.

The lids used on these mixing vats should satisfy the following requirements:

- Lids must be maintained in good condition, such that when in place, they remain in contact with the rim for at least 90 percent of the circumference of the rim of the vat. Movable lids should extend a minimum of 0.5 inches beyond the outer rim of the tank.

- Lids may have a slit or opening to allow clearance for insertion of a mixer shaft. The slit or opening should be covered after insertion of the mixer, except to allow safe clearance for the mixer shaft. However, the difference between the diameter of the mixer shaft and the diameter of the opening in the lid for the mixer shaft should be no greater than 2 inches.

- Lids should have no holes, tears, or openings that would allow for the emission of volatile organic compounds or HAPs, except as described above for mixer shaft insertion and acceptable mixer shaft clearance, and for process exhaust.

- Non-permanent covers may be constructed of alternate material (e.g. plastic) provided that the cover material is non-porous and meets the specifications outlined above.

### 2) Equipment Cleaning Operations

Cleanup should be conducted using methods and materials that minimize emissions of VOCs (excluding low volatility compounds[4]) and HAPs. These methods should employ high-pressure water, hot alkali or detergent cleaning. Solvent containing VOCs (excluding low volatility compounds[4]) can be used for equipment cleaning provided that the equipment being cleaned is completely covered or enclosed except for an opening no larger than necessary to allow safe clearance for proper operation of the cleaning equipment, considering the method and material being used. In addition, any cleanup solvent containing VOCs or HAPs, both used and unused, should be collected and stored in closed containers.

## Mills

### 1) Grinding Mills

Grinding mills must be operated in accordance with their manufacturer's specifications. All grinding mills, excluding three roll mills, must be equipped with fully enclosed screens.

[4] Low volatility compounds as defined in Bay Area Air Quality Management District Rule 8-35-216 as "solvents with an initial boiling point greater than 120°C (248°F), and where the initial boiling point exceeds the maximum operating temperature by at least 100°C (180°F).

**2) Three Roll Mills**

Three roll mills must be operated in accordance with their manufacturer's specifications.

**3) Equipment Cleaning Operations**

Cleanup of grinding mills and related equipment should be conducted using methods and materials that minimize emissions of VOCs, excluding low volatility compounds, and HAPs. These methods should employ high pressure water, hot alkali or detergent cleaning. VOC-containing solvents, excluding low volatility compounds, can also be utilized for equipment cleaning provided that the equipment being cleaned is completely covered or enclosed except for an opening no larger than necessary to allow safe clearance for proper operation of the cleaning equipment, considering the method and material being used. In addition, any cleanup solvent containing VOCs or HAPs, including spent solvent, should be collected and stored in closed containers.

### 3.16.2.2 Add-on Control Technologies for VOC's

For sources exceeding a potential to emit[5] five tons per year of VOC (including HAP), after implementing the Performance levels listed in 3.16.2.1, an air pollution control device should be installed and the following capture and control efficiencies are considered state of the art.

**Capture Efficiency**

The state of the art for capture efficiency is 100%. This means that 100 percent of the pollutants emitted from the source are ducted to the control device as prescribed by EPA Test Method 204. (Except for charging/loading of resin manufacturing kettles shall be exempt from the 100% capture requirement) Existing sources that cannot achieve the 100 percent capture efficiency will be handled on a case-by-case basis.

**Control Efficiency**

Where multiple control devices are used in series, the overall control efficiency of the train should be at least equal to the control efficiency of a single control device that meets the SOTA levels specified above.

[5] As defined by Subchapter 8.

**Destruction Devices**

SOTA for oxidation is a minimum of 98 percent destruction efficiency of total VOCs or 20 parts per million volume (ppmv) on a dry basis at the outlet adjusted to 3% oxygen. Typical operating parameters for thermal oxidizers may include a residence time greater than 0.5 seconds, a temperature of at least 1,500 $^{O}$F and a CO concentration below 100 ppmv at the outlet, adjusted to 3% oxygen.

**Recovery Devices**

SOTA for these control technologies a minimum of 95 percent control efficiency for VOCs (Organic HAP and total) or 20 ppmv wet unadjusted at the outlet.

**Biofiltration**

A number of biofiltration applications have been permitted by NJDEP, for VOC removal and odor control. However, there is not a sufficient amount of data available at this time to justify industry-wide SOTA performance levels for biofilters. Future reviews of this SOTA section may reveal a significant amount of data that may justify a reevaluation of an industry-wide SOTA performance limit. At this point in time, NJDEP will consider biofiltration as a SOTA technology on a case-by-case basis.

**Emerging Control Technologies**

Other emerging control technologies that have been reported but are not widely used at this time are ultraviolet oxidation, ozonation, corona destruction, plasma technology, and hybrid technologies. An adequate amount of data on the efficiencies of these processes does not exist. Therefore the SOTA Performance Levels for these emerging technologies will be handled on a case-by-case basis.

**Table 1**
**SOTA Performance Levels for Organic Compounds[6]**

| Air Pollution | Total VOCs | |
|---|---|---|
| **Control Technology** | **Control Efficiency** | **Basis** |
| Destruction Devices | Minimum destruction efficiency of 98 percent by weight or 20 ppmv[7] dry at 3% $O_2$ at the outlet[8] (CO: 100 ppmv dry at 3% $O_2$) | CTC |

[6] NJAC 7:27.16 may require a control level above the efficiencies listed here. In those cases the most stringent level must be met.
[7] Expressed as methane, $C_1$, excluding methane.
[8] For $O_2$ content greater than 12%, the outlet concentration must be less than 10ppmv unadjusted.

**Table 1**
**SOTA Performance Levels for Organic Compounds[6]**

| Air Pollution | Total VOCs | |
|---|---|---|
| **Control Technology** | **Control Efficiency** | **Basis** |
| Recovery Devices | Minimum removal efficiency of 95 percent by weight or 20 ppmv wet, unadjusted, at the outlet | CTC, NJ DEP Permit Review |

For a single control device the control efficiency is measured from the inlet to the outlet of the device. For multiple device control systems, the overall control efficiency is measured from the inlet to the control train to the outlet of the control train. For batch operations, the control efficiency may be determined based on the batch cycle emission rate as defined in NJAC 7:27-16-1.

### 3.16.2.3 Control of Total Particulate Matter (including HAP)

SOTA for all control technologies is considered to be a maximum outlet concentration of 0.02 gr/dscf. Examples of particulate control technologies include: baghouses, fabric filters (e.g. HEPA, cartridge), electrostatic precipitators, and high energy scrubbers (e.g. venturi).

**Table 2**
**SOTA Performance Levels for Particulates**

| Air Pollution Control Technology | Particles | |
|---|---|---|
| | **Emission Limit** | **Basis** |
| Fabric Filters<br>Electrostatic Precipitators<br>Absorption<br>Inertial Separation[9] | Maximum outlet concentration of 0.02 grains per dry standard cubic foot | NJDEP 7:27-6.2 |

### 3.16.3 Technical Basis

**<u>Mixing Tanks, Vats, or Vessels</u>**

**1) Lids**

[9] Inertial Separators do not typically achieve the specified emission limit without an additional particulate control.

A review of Illinois regulations 215.624 and 218.624, Bay Area Air Quality Management District Rule 35-301, South Coast Air Quality Management District Rule 1141.1, Michigan Rule 630 and the Control of Volatile Organic Compound Emissions from Ink and Paint Manufacturing Processes, EPA-450/3-92-013, identify lids as an accepted control technology. The Control of Volatile Organic Compound Emissions from Ink and Paint Manufacturing Processes lists control efficiency ranges for lids as 40-96 percent depending on the method used to determine emissions.

**2) Equipment Cleaning Operations**

A review of Illinois regulations 215.630 and 218.630, Bay Area Air Quality Management District Rule 35-301, and Michigan Rule 630 identify the listed cleaning techniques as required control technology for those operations.

**Mills**

A review of Illinois regulation 218.625, Bay Area Air Quality Management District Rule 35-304, and South Coast Air Quality Management District Rule 1141.1 identify fully enclosed screens as the required control technology for mills.

**Add-on Controls**

Destruction Devices

A review of the Control of Volatile Organic Compound Emissions from Ink and Paint Manufacturing Processes, EPA-450/3-92-013, identify thermal and catalytic oxidation as being capable of achieving 98% efficiency.

Recovery Devices

A review of the Control of Volatile Organic Compound Emissions from Ink and Paint Manufacturing Processes, EPA-450/3-92-013, identifies adsorption as being capable of achieving 95% efficiency.

**Control of Total Particulate Matter (including HAP)**

A review of permits issued by New Jersey Department of Environmental Protection identified two sources that use fabric filters to achieve an efficiency of 99%.

### 3.16.4 Recommended Review Schedule

The recommended review schedule is two years after the effective date of the manual. This review schedule was chosen due to promulgation of MACT Standards affecting these sources in 1997 and 1998.

### 3.16.5 References


1. Control of Volatile Organic Compound Emissions from Ink and Paint Manufacturing Processes, EPA-450/3-92-013, April 1992.

2. Illinois Environmental Protection Agency Regulations Subpart AA 215.620 et seq and 218.620 et seq.

3. Bay Area (California) Air Quality Management District Rule 35.

4. South Coast (California) Air Quality Management District Rule 1141.1.

5. Michigan Department of Natural Resources Rules 630 and 631.