Nouryon Surface Chemistry LLC

Nouryon

April 17, 2023

Mr. Miguel Vega
Engineer
Chattanooga-Hamilton County
Air Pollution Control Bureau
6125 Preservation Drive, Suite 140
Chattanooga, TN 37416

Subject: Spray Drying of Morwet D425 – Process Weight Rate Increase
Certificate of Operation #0060-30101822-05C
Nouryon Surface Chemistry LLC

Dear Mr. Vega:

Attached is an installation permit application package (Form E001, Form E010, and Form E106) for the proposed increase in spray drying process weight rate of liquid Morwet D425 at Nouryon – Chattanooga Site.

Nouryon requests that the process weight rate for Morwet be increased from 2,619 lbs/hr to the maximum spray dryer capacity of 4,029 lbs/hr. This will result in potential emission rate increase of VOC and hazardous air pollutants (formaldehyde and naphthalene) as shown below:

Pollutant	Potential Emissions Before Controls (lb/hr)	Potential Emissions Before Controls (tons/yr)	Potential Emissions Before Controls (lb/hr)	Potential Emissions Before Controls (tons/yr)	Potential Emissions Before Controls (lb/hr)	Potential Emissions Before Controls (tons/yr)
	Proposed		Current Permit		Increase	
VOC	0.66	2.91	0.43	1.89	0.23	1.02
Formaldehyde (HAP)	0.08	0.36	0.05	0.24	0.03	0.13
Naphthalene (HAP)	0.04	0.18	0.03	0.12	0.01	0.06
Total HAP	0.12	0.54	0.08	0.35	0.04	0.19

If you have any questions or require additional information, please contact Marco Salenda, HSES Manager, at (423) 493-9363.

909 Mueller Avenue
Chattanooga, TN 37406

T +1 423 629 1405
F +1 423 493 9322
www.nouryon.com

Nouryon

Sincerely,
Nouryon Surface Chemistry LLC

Brad Taylor
Site Director

BASIC APPLICATION FOR EQUIPMENT / AIR POLLUTION PERMIT OR CERTIFICATE OF OPERATION

FORM E001
03/2011

1. Name of Company Nouryon Surface Chemistry LLC
(If corporation or LLC, name on file with Tennessee Secretary of State Corporate Records Division)

2. NAICS Code: 325211

3. Company Official to Contact: Marco A. Salenda

4. Phone No. 423.493.9363

5. Mailing Address: 909 Mueller Avenue (*Street or P.O. Box*) Chattanooga (*City*) TN (*State*) 37406 (*Zip Code*)

6. Physical Location
(If different from line 5) _____ (*Street*) Chattanooga (*City*) TN (*State*) 37406 (*Zip Code*)

7. Application for:
☒ Installation Permit ☐ Initial Certificate of Operation ☐ Renewal Certificate of Operation

Previous Installation Permit or Certificate of Operation No.: 0060-30101822-05C

8. Type of equipment for which application is made:

☒ Process Equipment (Form E010 or Form E010A)	☐ Previously Submitted	☒ Attached
☐ Fuel Burning Equipment (Form E011)	☐ Previously Submitted	☐ Attached
☐ Incineration Equipment (Form E012)	☐ Previously Submitted	☐ Attached
☐ Minor Pollution Source (Form E014)	☐ Previously Submitted	☐ Attached

(Less than 1000 lbs/yr and less than 10 lbs/day total uncontrolled contaminant emissions)

The following forms are filed with this application:
E010, E106

9. Equipment Name:
Spray Dryer

10. If application is for a Certificate of Operation (Initial or Renewal), are there any changes since previous application in the equipment or operation which might:

A. Increase, decrease, or alter process materials, fuel, refuse type, etc.? ☐ Yes ☐ No

B. Increase, decrease, or alter emissions or emission points? ☐ Yes ☐ No

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11. Process Weight, lb/hr, (Item 6 on Form E010), Incineration Rate, lb/hr, (Item 3C on Form E012), or Fuel Burning Rate, 1,000 Btu/hr, (Item 7C on Form E011): 4.029 lbs/hr

This is to certify that I am familiar with operations concerning this equipment and the information provided on this application is true and complete to the best of my knowledge:

Marco A. Salenda
Name

HSES Manager
Title

April 17, 2023
Date

Mail completed form to:
CHATTANOOGA-HAMILTON COUNTY
AIR POLLUTION CONTROL BUREAU
6125 Preservation Drive, Suite 140
Chattanooga, TN 37416-3638

This form must be completely filled out before it will be processed

PROCESS EQUIPMENT APPLICATION

FORM E010
07/2000

1. ***Name of Company*** (as shown on Line 1, Form E001): Nouryon Surface Chemistry LLC

2. ***Equipment Name*** (as shown on Line 10, Form E001): Spray Dryer

3. ***Installation Date:*** May 31, 2023 4. ***Type of Process:*** Drying

5. ***Major Raw Materials Used:*** Sodium alkylnaphthalene sulfonate solution

6. ***Process Weight:*** 4,029 Pounds per hour
This is the total weight of all materials introduced into the process.

7. ***Control Equipment***

- ☐ Emissions Uncontrolled
- ☐ Baghouse (File Form E102)
- ☑ Wet Collecting Device (File Form E103)
- ☐ Inertial Separators (File Form E105)
- ☐ Electrostatic Precipitator (File Form E104)
- ☐ Other – Specify:

8. ***Control Efficiency***

Enter the control efficiency for each pollutant emitted by this equipment (for appropriate Forms E102, E103, E104, E105, E107, or enter zeros if the emissions are uncontrolled as noted in Item 7.

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Pollutant	% Efficiency
Particulates	98
SO_x	
NO_x	
CO	
Hydrocarbons	12.3% VOC (formaldehyde: 98%)
Other: Formaldehyde	98

9. ***Emissions Summary***

Enter the amount of each pollutant listed in pounds per hour.

Pollutant	Uncontrolled Emissions (File Form E106)	Actual Emissions (Stack Test Report)		Estimated Emissions (See Formula A)
Total Suspended Particulate	1.88 lb/hr			0.04 lb/hr
PM10	1.88 lb/hr			0.04 lb/hr
Sulfur Oxides			OR	
Nitrogen Oxides (as NO_2)				
Other (specify)				
VOC	0.66 lb/hr			0.58 lb/hr
Formaldehyde (HAP)	0.08 lb/hr			0.002 lb/hr
Naphthalene (HAP)	0.04 lb/hr			0.04 lb/hr

Formula A:

$$\text{Estimated Emissions} = \frac{(100\% - \text{Control Efficiency (\%)})}{100\%} \times \text{Uncontrolled Emissions}$$

10. ***Environmental Impact***

Those emissions indicated in Item 9 may at times under normal operating conditions cause (check all that apply):

☐ Odors ☐ Eye Irritations ☐ Property Damage ☐ Health Effects

☐ Other nuisances outside of plant property ☑ No environmental damage

11. ***Emission Point Data***

Stack Height (emission point) above ground:	60	Ft.	Volume of gas discharged into atmosphere:	14,000	cfm
Ground Elevation above sea level at stack base:	665	Ft.	Gas exit temperature:	70 - 200	°F
Stack Diameter:	2.5	Ft.			

12. ***Ave. Operating Time***

Daily: 24 hours Weekly: 7 Days Yearly: 49 Weeks

This is to certify that I am familiar with the operations concerning this equipment and that the information provided on this application is true and complete to the best of my knowledge.

Marco A. Salenda
Company Official

HSES Manager
Title

April 17, 2023
Date

CHATTANOOGA-HAMILTON COUNTY
AIR POLLUTION CONTROL BUREAU
6125 Preservation Drive, Suite 140
Chattanooga, TN 37416-3740

POLLUTION ESTIMATION FORM

FORM E106
01/2001

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1. Name of Company: Nouryon Surface Chemistry LLC
   As shown on Line 1 of Form E001
2. Equipment Name: Spray Dryer
   As shown on Line 9 of Form E001
3. Type of pollutant for which estimate is made: PM / PM10

4. Pollution Emission Factor (PEF): 0.000467 lb/lb of liquid raw material
   (Give value & units in lbs/ton, lbs/lb, lbs/gal, gr/ft³, etc.)

   Source of Emission Factor: See attached calculations

5. Uncontrolled Pollution Emission Rate:

   0.000467 lb/lb (PEF from Item 4) X 4,029 lbs/hr (Give operating rate for this equipment and the appropriate units in either lbs/hr, tons/hr, gal/hr, or cfm) = 1.88 lbs/hr (Give value & units)

6. Uncontrolled Emission Rate: 1.88 lbs/hr Pounds emitted per hour

This is to certify that I am familiar with the operations concerning this equipment and that the information provided on this application is true and correct to the best of my knowledge. ***This form must be completely filled out before it is processed.***

Mail to:
CHATTANOOGA-HAMILTON COUNTY
AIR POLLUTION CONTROL BUREAU
6125 Preservation Drive
Chattanooga, TN 37416

Company Official: [signature]

Title: HSES Manager

Date: April 17, 2023

DO NOT WRITE BELOW THIS LINE

_____ Engineer Approval

This form corresponds to permit number: _____

Special Notations: _____

POLLUTION ESTIMATION FORM

FORM E106
01/2001

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CONTROL BUREAU

1. Name of Company: Nouryon Surface Chemistry LLC
   As shown on Line 1 of Form E001
2. Equipment Name: Spray Dryer
   As shown on Line 9 of Form E001
3. Type of pollutant for which estimate is made: VOC

4. Pollution Emission Factor (PEF): 0.000165 lb/lb of liquid raw material
   (Give value & units in lbs/ton, lbs/lb, lbs/gal, gr/ft³, etc.)

   Source of Emission Factor: See attached calculations

5. Uncontrolled Pollution Emission Rate:

   0.000165 lb/lb (*PEF from Item 4*) x 4,029 lbs/hr (*Give operating rate for this equipment and the appropriate units in either lbs/hr, tons/hr, gal/hr, or cfm*) = 0.66 lb/hr (Give value & units)

6. Uncontrolled Emission Rate: 0.66 lb/hr Pounds emitted per hour

This is to certify that I am familiar with the operations concerning this equipment and that the information provided on this application is true and correct to the best of my knowledge. ***This form must be completely filled out before it is processed.***

Mail to:
CHATTANOOGA-HAMILTON COUNTY
AIR POLLUTION CONTROL BUREAU
6125 Preservation Drive
Chattanooga, TN 37416

Company Official: Brian A. Sol

Title: HSES Manager

Date: April 17, 2023

DO NOT WRITE BELOW THIS LINE

_____ Engineer Approval

This form corresponds to permit number: _____

Special Notations: _____

POLLUTION ESTIMATION FORM

FORM E106
01/2001

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1. Name of Company: Nouryon Surface Chemistry LLC
   As shown on Line 1 of Form E001
2. Equipment Name: Spray Dryer
   As shown on Line 9 of Form E001
3. Type of pollutant for which estimate is made: Formaldehyde (HAP)

4. Pollution Emission Factor (PEF): 0.000021 lb/lb of liquid raw material
   (Give value & units in lbs/ton, lbs/lb, lbs/gal, gr/ft³, etc.)

   Source of Emission Factor: See attached calculations

5. Uncontrolled Pollution Emission Rate:

   0.000021 lb/lb (*PEF from Item 4*) X 4,029 lb/hr (*Give operating rate for this equipment and the appropriate units in either lbs/hr, tons/hr, gal/hr, or cfm*) = 0.08 lb/hr (Give value & units)

6. Uncontrolled Emission Rate: 0.08 lb/hr Pounds emitted per hour

This is to certify that I am familiar with the operations concerning this equipment and that the information provided on this application is true and correct to the best of my knowledge. ***This form must be completely filled out before it is processed.***

Mail to:
CHATTANOOGA-HAMILTON COUNTY
AIR POLLUTION CONTROL BUREAU
6125 Preservation Drive
Chattanooga, TN 37416

Company Official: [signature]

Title: HSES Manager

Date: April 17, 2023

DO NOT WRITE BELOW THIS LINE

_____ Engineer Approval

This form corresponds to permit number: _____

Special Notations: _____

POLLUTION ESTIMATION FORM

FORM E106
01/2001

1. Name of Company: Nouryon Surface Chemistry LLC
   As shown on Line 1 of Form E001
2. Equipment Name: Spray Dryer
   As shown on Line 9 of Form E001
3. Type of pollutant for which estimate is made: Naphthalene (HAP)

4. Pollution Emission Factor (PEF): 0.000010 lb/lb of liquid raw material
   (Give value & units in lb/ton, lb/lb, lbs/gal, gr/ft³, etc.)

   Source of Emission Factor: See attached calculations

5. Uncontrolled Pollution Emission Rate:

   0.000010 lb/lb (PEF from Item 4) X 4,029 lbs/hr (Give operating rate for this equipment and the appropriate units in either lbs/hr, tons/hr, gal/hr, or cfm) = 0.04 lb/hr (Give value & units)

6. Uncontrolled Emission Rate: 0.04 lb/hr Pounds emitted per hour

This is to certify that I am familiar with the operations concerning this equipment and that the information provided on this application is true and correct to the best of my knowledge. ***This form must be completely filled out before it is processed.***

Mail to:
CHATTANOOGA-HAMILTON COUNTY
AIR POLLUTION CONTROL BUREAU
6125 Preservation Drive
Chattanooga, TN 37416

Company Official: [signature]

Title: HSES Manager

Date: April 17, 2023

DO NOT WRITE BELOW THIS LINE

_____ Engineer Approval

This form corresponds to permit number: _____

Special Notations: _____

Process Description:
A new product called Morwet D-425 will be dried at the existing Spray Dryer process in Nouryon - Chattanooga Plant. Unlike other products that are currently dried at the Chattanooga Site, this liquid product contains formaldehyde and petroleum based-oil. The liquid product is made in Nouryon - Fort Worth, TX. The drying process will remain the same. The dried product is used as a wetting agent in the agriculture industry.

X = 35,294,040 lbs/yr of Morwet liquid ← ×24
96,696 lbs/day of Morwet liquid
4,029 lbs/hr of Morwet liquid (Process Weigh Rate)
47% active ingredient (solids) in liquid ← (wet)
45,147 lbs/day of active ingredient (solids) in liquid

$\frac{45,147}{96,696} \cdot 100\% = 46.6896\%$

Ratio: 22249 lbs Morwet liquid / 10195 lbs Morwet dry = 2.2 lbs Morwet liquid / lbs Morwet dry

Y = 7,336 tonnes/yr of Morwet dry
16,172,535 lbs/yr of Morwet dry
44,308 lbs/day of Morwet dry — 2,168
1,846 lbs/hr of Morwet dry — 365
97% active ingredient (solids) in dry
42,979 lbs/day of active ingredient (solids) in dry

8,760 hrs potential processing time
5,144 hrs actual processing time

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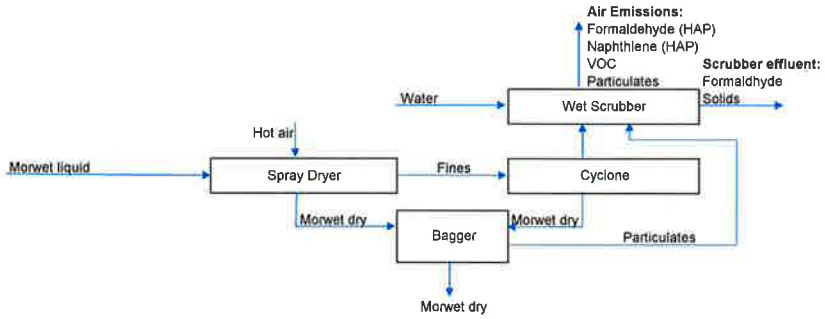
Production Yield = 95% of Morwet active ingredient (solids)
Production Loss = 5% of Morwet active ingredient (solids)
2,128 of Morwet active ingredient (solids) is lost to environment (air and wastewater)/day

a = 1.25% oil in Morwet liquid = 1,209 lbs oil in Morwet liquid/day
b = 2.50% oil in Morwet dry = 1,108 lbs oil in Morwet dry/day
101 lbs oil is lost to the environment/day



Emissions to Air

Cyclone efficiency = 99% (for PM only)
Water scrubber efficiency = 98% (for formaldehyde and PM emissions only)

Formaldehyde emitted to air = 0.1654 lb/hr / 3667 lb Morwet dry/hr = 0.000045 lb formaldehyde to air/lb Morwet dry (based on stack test information from Ft. Worth Site)

= 0.000045 lb formaldehyde to air / lb Morwet dry × 44,308 lbs/day of Morwet dry
= 2.00 lbs formaldehyde to air, uncontrolled/day
= 0.08 lbs formaldehyde to air, uncontrolled/hr ← $\frac{0.1654}{3,667} \cdot 4,029 \cdot \frac{10,195}{22,249} = 0.083272$ lb/hr
= 729 lbs formaldehyde to air, uncontrolled /yr (8760 hrs)
= 428 lbs formaldehyde to air, uncontrolled /yr (5144 hrs - maximum production forecast)

= 0.040 lbs formaldehyde to air, controlled/day
= 0.002 lbs formaldehyde to air, controlled/hr ← 0.083272 lb/hr · (1-0.98) = 0.001665 lb/hr
= 14.59 lbs formaldehyde to air, controlled /yr (8760 hrs)
= 8.57 lbs formaldehyde to air, controlled /yr (5144 hrs - maximum production forecast)

VOC (in oil) emitted to air = 1.1526 lb/hr / 3667 lb Morwet dry/hr = 0.000314 lb VOC (in oil) to air/lb Morwet dry (based on stack test information from Ft. Worth Site)

= 0.000314 lb VOC (in oil) to air / lb Morwet dry × 44,308 lbs/day of Morwet dry
= 13.93 lbs VOC (in oil) to air, uncontrolled/day
= 0.58 lbs VOC (in oil) to air, uncontrolled/hr ← $\frac{1.1526}{3,667} \cdot 4,029 \cdot \frac{10,195}{22,249} = 0.580285$ lb/hr
= 5,083 lbs VOC (in oil) to air, uncontrolled /yr (8760 hrs)
= 2,985 lbs VOC (in oil) to air, uncontrolled /yr (5144 hrs - maximum production forecast)

*VOCs in the oil are insoluble in water. Assume that VOC emissions due to the oil cannot be controlled by wet scrubber. VOCs inlcude napthalene, methylnaphthalenes, and petroleum distillates.

Uncontrolled VOC: 0.083272 lb/hr + 0.580285 lb/hr = 0.663557 lb/hr
Controlled VOC: 0.001665 lb/hr + 0.580285 lb/hr = 0.581950 lb/hr

Naphthalene (in oil) emitted to air = 0.0807 lb/hr / 3667 lb Morwet dry/hr = 0.000022 lb naphthalene to air/lb Morwet dry (based on stack test information from Ft. Worth Site)

= 0.000022 lb naphthalene to air / lb Morwet dry × 44,308 lbs/day of Morwet dry
= 0.97 lbs naphthalene to air, uncontrolled/day
= 0.04 lbs naphthalene to air, uncontrolled/hr ← $\frac{0.0807}{3,667} \cdot 4,029 \cdot \frac{10,195}{22,249} = 0.040629$ lb/hr [included above in VOC (in oil)]
= 356 lbs naphthalene to air, uncontrolled /yr (8760 hrs)
= 209 lbs naphthalene to air, uncontrolled /yr (4593 hrs - maximum production forecast)

* Napthalene content in the oil is 3% - 7%. It is insoluble in water. Assume that naphthalene emissions cannot be controlled by wet scrubber.

Total VOC emissions = Formaldehyde emissions + VOC emissions (due to oil)

= 0.08 lbs formaldehyde to air, uncontrolled/hr + 0.58 lbs VOC (in oil) to air, uncontrolled/hr = 0.66 lbs VOC to air, uncontrolled

= 0.002 lbs formaldehyde to air, controlled/hr + 0.58 lbs VOC (in oil) to air, uncontrolled/hr = 0.58 lbs VOC to air, controlled

PM emissions from spray dryer/cyclone

Based on equipment design, 10% of input in dry pounds will go to the cyclone system:

Fines to cyclone = active ingredient in liquid x 10%
= 4,029 lb/hr of Morwet liquid x 47% active ingredient (solids) x 10%
= 188.1 lbs/hr ← $4{,}029 \cdot \frac{45{,}147}{96{,}696} \cdot 0.1 = 188.1125$ lb/hr (uncontrolled)

PM emissions from cyclone to wet scrubber = Fines to cyclone x (100% - 99% cyclone eff)
= 188.1 lbs/hr x (100% - 99%
= 1.88 lbs/hr

PM emissions from wet scrubber = 1.88 lbs/ hr x (100% - 98% wet scrubber efficiency)
= 0.04 lb/hr ← $118.1125 \cdot (1-0.99) \cdot (1-0.98) = 0.037623$ lb/hr (controlled)

Summary of Air Emissions

Pollutant	Before Controls			After Controls			Emission Factor
	(lb/hr)	(lb/yr - 8760 hrs)	(tons/yr)	(lb/hr)	(lb/yr - 8760 hrs)	(tons/yr)	(lb/lb of liquid raw material)
Total VOC	0.66	5,813	2.91	0.58	5,098	2.55	0.000165
Formaldehyde (HAP)	0.08	729	0.36	0.002	15	0.01	0.000021
Naphthalene (HAP)	0.04	356	0.18	0.04	356	0.18	0.000010
Total HAPs	0.12	1,085	0.54	0.04	370	0.19	0.000031
PM	1.88	16,479	8.24	0.04	330	0.16	0.000467

Pollutant	Before Controls			After Controls			Emission Factor
	(lb/hr)	(lb/yr - 5144 hrs)	(tons/yr)	(lb/hr)	(lb/yr - 5144 hrs)	(tons/yr)	(lb/lb of liquid raw material)
Total VOC	0.66	3,413	1.71	0.58	2,994	1.50	0.000165
Formaldehyde (HAP)	0.08	428	0.21	0.002	9	0.00	0.000021
Naphthalene (HAP)	0.04	209	0.10	0.04	209	0.10	0.000010
Total HAPs	0.12	637	0.32	0.04	218	0.11	0.000031
PM	1.88	9,677	4.84	0.04	194	0.10	0.000467

Summary of Air Emissions (Certificate of Operation No. 0080-30101822-05C Issued in 2022)

Pollutant	Before Controls			After Controls			Emission Factor
	(lb/hr)	(lb/yr - 8760 hrs)	(tons/yr)	(lb/hr)	(lb/yr - 8760 hrs)	(tons/yr)	(lb/lb of liquid raw material)
Total VOC	0.43	3,778	1.89	0.38	3,314	1.66	0.000165
Formaldehyde (HAP)	0.05	474	0.24	0.001	9	0.00	0.000021
Naphthalene (HAP)	0.03	231	0.12	0.03	231	0.12	0.000010
Total HAPs	0.08	705	0.35	0.03	241	0.12	0.000031
PM	1.22	10,711	5.36	0.02	214	0.11	0.000467

Pollutant	Before Controls			After Controls			Emission Factor
	(lb/hr)	(lb/yr - 5144 hrs)	(tons/yr)	(lb/hr)	(lb/yr - 5144 hrs)	(tons/yr)	(lb/lb of liquid raw material)
Total VOC	0.43	2,219	1.11	0.38	1,946	0.97	0.000165
Formaldehyde (HAP)	0.05	278	0.14	0.00	6	0.00	0.000021
Naphthalene (HAP)	0.03	136	0.07	0.03	136	0.07	0.000010
Total HAPs	0.08	414	0.21	0.03	141	0.07	0.000031
PM	1.22	6,290	3.14	0.02	126	0.06	0.000467

Summary of Air Emissions Increase

Pollutant	Before Controls			After Controls			Emission Factor
	(lb/hr)	(lb/yr - 8760 hrs)	(tons/yr)	(lb/hr)	(lb/yr - 8760 hrs)	(tons/yr)	(lb/lb of liquid raw material)
Total VOC	0.23	2,034.52	1.02	0.20	1,784.31	0.89	0.000165
Formaldehyde (HAP)	0.03	255.32	0.13	0.00	5.11	0.00	0.000021
Naphthalene (HAP)	0.01	124.54	0.06	0.01	124.54	0.06	0.000010
Total HAPs	0.04	379.86	0.19	0.01	129.65	0.06	0.000031
PM	0.66	5,767.73	2.88	0.01	115.35	0.06	0.000467

Pollutant	Before Controls			After Controls			Emission Factor
	(lb/hr)	(lb/yr - 5144 hrs)	(tons/yr)	(lb/hr)	(lb/yr - 5144 hrs)	(tons/yr)	(lb/lb of liquid raw material)
Total VOC	0.23	1,194.67	0.60	0.20	1,047.75	0.52	0.000165
Formaldehyde (HAP)	0.03	149.92	0.07	0.00	3.00	0.00	0.000021
Naphthalene (HAP)	0.01	73.13	0.04	0.01	73.13	0.04	0.000010
Total HAPs	0.04	223.06	0.11	0.01	76.13	0.04	0.000031
PM	0.66	3,386.81	1.69	0.01	67.74	0.03	0.000467