ALLEGHENY COUNTY HEALTH DEPARTMENT
AIR QUALITY PROGRAM

March 14, 2024

SUBJECT: **Synthomer Jefferson Hills, LLC**
2200 State Highway 837
PO Box 545
West Elizabeth, PA 15088
Allegheny County

Title V Operating Permit No. 0058-OP24

TO: JoAnn Truchan, P.E.
Program Manager, Engineering

FROM: Helen O. Gurvich
Air Quality Engineer

FACILITY DESCRIPTION:

Synthomer Jefferson Hills, LLC (Synthomer), located in Allegheny County, Pennsylvania, produces hydrocarbon resins and dispersions used primarily in hot melt adhesives, rubber and plastic compounding, coatings, sealants, and plastic modification. The resins are produced from C5 feedstock, monomers, solvents, and catalysts by way of cationic polymerization. Resins produced include aliphatic, aliphatic/aromatic, aromatic, and liquids resins. Eastman Chemical Resins, Inc. acquired the Jefferson Site from Hercules, Inc. in 2001, and Synthomer acquired this facility from Eastman on April 1, 2022.

The facility presently consists of the following emission units:

- Three polymerization processes (C-5 Unit, MP Poly Unit, and WW Poly Unit);
- Hydrogenation Unit;
- Four finishing processes (LTC Units and C5 Unit);
- Dresinate Unit;
- Emulsion Unit;
- Pilot Plant;
- Wastewater Treatment plant;
- Storage Tanks;
- Five Boilers and one Emergency Generator;
- Miscellaneous Sources (Equipment leaks, Cooling Towers, Roadways, Degreasers).

The facility is a major source of volatile organic compounds (VOC) and hazardous air pollutants (HAPs) and a minor source of particulate matter (PM), particulate matter less than 10 µm in diameter (PM_{10}), particulate matter less than 2.5 µm in diameter ($PM_{2.5}$), oxides of nitrogen (NO_X), oxides of sulfur (SO_X), and carbon monoxide (CO) as defined in Article XXI, §2101.20. The facility is also a minor source of greenhouse gas emissions (CO_2e) as defined in the U.S. EPA Greenhouse Gas Tailoring Rule.

PERMIT APPLICATION COMPONENTS:

1. Title V Operating Permit application #0058, dated February 4, 2022
2. Installation Permit #0058-I001, issued April 3, 1996 and amended August 20, 1999 (Hydrogenation and Thermal Polymerization Units – permitted equipment covered by other installation permits; this IP no longer referenced)
3. Installation Permit #0058-I002, issued May 27, 1997 (Expansion of Solution Polymerization Unit and Tank T-1203 – permanently shut down)
4. Installation Permit #0058-I003, not issued (Condenser system for the Wastewater Treatment Plant)
5. Installation Permit #0058-I004, issued June 11, 1997 (Condenser system for the Water White Poly – replaced by IP-23a)
6. Installation Permit #0058-I005, not issued (LTC Baghouse replacement)
7. Installation Permit #0058-I006, not issued (BF_3 Storage Facility)
8. Installation Permit #0058-I007, not issued (MP Poly Unit modification)
9. Installation Permit #0058-I008, issued November 14, 2001 (C-5 Scrubbers)
10. Installation Permit #0058-I008a, not issued (C-5 Baghouse modification)
11. Installation Permit #0058-I008b, issued May 3, 2017 (C-5 Baghouse replacement)
12. Installation Permit #0058-I008c, issued March 6, 2019 (increase C-5 resin production and permit language)
13. Installation Permit #0058-I009, issued October 3, 2002 (Tank Control System - permitted equipment covered by other installation permits; this IP no longer referenced)
14. Installation Permit #0058-I010, issued October 9, 2002 (Modification V-8 Unit – permanently shut down)
15. Installation Permit #0058-I011, issued August 19, 2004 (C-5 Thermal Oxidizer)
16. Installation Permit #0058-I011a, issued November 4, 2004 (C-5 Thermal Oxidizer – corrected efficiency)
17. Installation Permit #0058-I011b, withdrawal (modification of C-5 Thermal Oxidizer)
18. Installation Permit #0058-I011c, issued June 27, 2017 (C-5 replacement equipment)
19. Installation Permit #0058-I011d, issued May 15, 2019 (revision of C-5 Pastillation Operations)
20. Installation Permit #0058-I011e, issued August 31, 2020 (modification to C-5 Process Unit)

21. Installation Permit #0058-I011f, issued November 16, 2023 (added new condition to C-5 Process Unit)
22. Installation Permit #0058-I012, issued September 13, 2006 (Dresinate TX production line)
23. Installation Permit #0058-I012a, issued October 30, 2008 (Dresinate line revisions)
24. Installation Permit #0058-I013, withdrawal (MON conditions)
25. Installation Permit #0058-I014, issued July 16, 2008 (LTC expansion -– replaced by IP-16b)
26. Installation Permit #0058-I015, issued August 25, 2008 (Pastillating Belt - – replaced by IP-18a)
27. Installation Permit #0058-I016, issued May 31, 2011 (LTC expansion)
28. Installation Permit #0058-I016a, issued April 14, 2020 (LTC corrections)
29. Installation Permit #0058-I016b, issued May 25, 2021 (LTC corrections)
30. Installation Permit #0058-I017, issued July 22, 2010 (Tank 52)
31. Installation Permit #0058-I018, issued May 9, 2011 (Pastillating Belt #2)
32. Installation Permit #0058-I018a, issued March 7, 2019 (C-5 Pastillation Operations revisions)
33. Installation Permit #0058-I019, issued March 10, 2011 (Tank 500 - – replaced by IP-11f)
34. Installation Permit #0058-I020, issued July 28, 2011 (Four Boilers and Emergency Generator)
35. Installation Permit #0058-I021, issued December 9, 2016 (Tank #53)
36. Installation Permit #0058-I022, issued June 1, 2018 (MP Poly Unit)
37. Installation Permit #0058-I022a, issued September 20, 2019 (MP Poly Unit modifications)
38. Installation Permit #0058-I023, issued August 12, 2019 (WW Poly Unit)
39. Installation Permit #0058-I023a, issued December 23, 2019 (WW Poly Unit modifications)
40. Installation Permit #0058-I024, issued May 25, 2021 (Miscellaneous Equipment)
41. Installation Permit #0058-I025, issued March 23, 2021 (Wastewater Treatment Plant)
42. Installation Permit #0058-I026, issued April 21, 2020 (RACT)
43. Installation Permit #0058-I026a, issued September 30, 2020 (RACT modifications)
44. Installation Permit #0058-I027, issued August 11, 2021 (Hydrogenation Unit)
45. Installation Permit #0058-I027a, issued September 21, 2021 (Hydrogenation Unit corrections)
46. RACT Plan Approval and Agreement #257, dated January 14, 1997
47. Consent Decree 11-1240, dated December 8, 2011
48. Consent Decree Modification 2:11-cv-1240, dated August 9, 2019
49. Correspondence, dated March 15, 2022 (PTE files)
50. Correspondence, dated June 22, 2022 (Change of Ownership)
51. Correspondence, dated August 23, 2022 (Tank 34 – AST log)
52. Correspondence, dated September 27, 2022 (Older permit table)
53. Correspondence, dated October 18, 2022 (Change of email address)
54. Correspondence, dated October 25, 2022 (C5 flow diagram)
55. Correspondence, dated November 29, 2022 (C5 flow diagram)
56. Correspondence, dated August 21, 2023 (NO_X limit – IP11e)
57. Correspondence, dated August 28, 2023 (Chiller & Heat exchanger)
58. Correspondence, dated December 4, 2023 (Emulsion unit – description & emission calculations)
59. Correspondence, dated January 10, 2024 (emission calculations)
60. Correspondence, dated January 29, 2024 (Emulsion unit – flow diagram)
61. Stack test report, dated September 28, 2022 (LTC Finishing Units & Pastillators)
62. Stack test report, dated July 27, 2023 (C5 Thermal Oxidizer)
63. Permits issued prior to 1996 (See Table below)

<u>Determinations</u>

The table below contains a list of RFDs issued after the Department received the Title V Operating Permit Application (02/04/2022).

Table 1: Determinations

RFD Received	Description	Response Date	Determination
02/24/2022	Replacement of the shell of the MP Poly Neutralizer Vent Condenser E-500-5.	02/25/2022	No permit required
04/11/2022	Replacement of 2 heat exchangers and convert Tank 34 and Tank 10	05/09/2022	No permit required; included in final permit
08/17/2022	Temporary emissions control device for Tank 50	08/29/2022	No permit required. Temporary process; not included in final permit.
06/23/2023	Replacement the cooling tower at C5 unit	06/30/2023	No permit required
07/18/2023	The degassing and inspection of Tank 510	07/21/2023	No permit required
07/31-08/18/2023	New chiller and heat exchanger at the #4 LTC Unit and #1 and #2 Pastillators	08/28/2023	No permit required; included in final permit
09/08/2023	Using sodium hydroxide at C5 Unit	09/11/2023	No permit required; included in final permit
09/27/2023	Temporary piping and mobile tank trucks at C5 unit	09/29/2023	No permit required. Temporary process; not included in final permit.
02/23/2024	Emission increase at Tank 53	03/07/2024	No permit required

<u>Older Permits</u>

The table below contains a list of permits issued prior to 1996, and the reasons the permit was not referenced in the Title V Operating Permit.

Table 2: Permits Issued Prior to 1996

Permit Number	Issue Date	Description	Reason for Exclusion from TVOP
73-O-746-C 3019006-000-00502	5/1/1973	Cleaver Brooks #5 Boiler	Unit is no longer in service and was removed from the site.
73-O-744-C 3019006-001-00901	5/1/1973	#1-#3 Boilers	Units are no longer in service and was removed from the site. Replaced by boilers permitted under IP-20.
73-O-745-C 3019006-001-00902	5/1/1973	Foster Wheeler, #4 Boiler	Unit is no longer in service and was removed from the site. Replaced by boilers permitted under IP-20.
73-O-742-C 3019006-001-24101	7/13/1973	Pipe Still, Hot Oil Heater	Unit is no longer in service and was removed from the site.
73-O-891-P 3019006-001-66501	7/13/1973	Resin Flaking, #1 Roll Flaker	Unit is no longer in service and was removed from the site.
73-O-749-C	5/1/1973	Foster Wheeler, Gas/WDLF Boiler Nos. 1-4	Units are no longer in service and were removed from the site. Replaced by boilers permitted under IP-20.
3019006-002-00503	3/13/1987 11/30/1994		
3019006-000-00504	3/13/1987		
84-I-0011-C 3019006-000-00500	6/6/1986 1/4/1994	Trane Boiler #5	Superseded by NO_X RACT Order 216.
73-O-892-P 3019006-001-66502	7/13/1973	Resin Flaking, #2 Roll Flaker	Process was shut down and equipment removed from the site.
73-O-3544-P 3019006-001-81700	7/13/1973	Recycle Solvent Distillation, OCF Unit	Process was shut down and equipment removed from the site.
73-O-3643-P	7/13/1973	Resin Finishing Unit WF	Process was shut down and equipment removed from the site.

Permit Number	Issue Date	Description	Reason for Exclusion from TVOP
73-O-0893-P	7/13/1973	Resin Flaking, Belt Flaker	Process was shut down and equipment removed from the site.
73-0-894-P	12/21/1973	Resin Flaking, Roll Flaker	This unit is currently known as the Berndorf Belt. Superseded by VOC RACT 257 and IP-16.
3019006-000-66504	11/15/1994		
73-O-9759-P	8/10/1973	Hydrocarbon Resin Polymerization #1 C Poly	Process was shut down and equipment removed from the site.
3019006-000-76210			
73-O-3757-P	8/10/1973	Hydrocarbon Resin Polymerization #2 Heat Poly	Process was shut down and equipment removed from the site.
3019006-001-76208			
73-O-3708-P	8/10/1973	Hydrocarbon Resin Polymerization #1 Heat Poly	Process was shut down and equipment removed from the site.
3019006-001-76209			
73-O-3760-P	8/10/1973	Hydrocarbon Resin Polymerization #2 C-Poly	Process was shut down and equipment removed from the site.
3019006-002-76211			
73-I-3735-P	9/14/1973	WW Unit, Feed Blend Dryer	Process was shut down and equipment removed from the site.
73-I-3949-C	10/09/1973	Cleaver Brooks IPT-200-30, H-10 Hot Oil Heater	Process was shut down and equipment removed from the site.
74-O-3949-C	12/19/1974		
74-O-3735-P	3/12/1974	Hydrocarbon Resin, Water White Unit	Superseded by VOC RACT Order 257 and IP-23
74-I-5099-P	7/19/1974	Pneumatic Loading/Soda, Ash Solution System	Process was shut down and equipment removed from the site.
74-O-5099-P	11/22/1974		
3019006-000-52904			
74-I-7025-P	9/27/1974	Resin Finishing Unit, LTC Unit	This unit is currently known as #1 LTC. Superseded by VOC RACT Order 257 and IP-16. H-8 Furnace is permanently shut down.
74-O-7025-P	2/6/1976		
3019006-000-76212	2/6/1976		
	7/10/1995	V-8 (H-8) Petro Furnace	
74-I-7027-P	9/27/1974	Resin Flaking #3 Belt Flaker	Process was permanently shut down.
74-I-7026-C	9/27/1974	Cleaver Brooks IPT-200-30, H-11 Hot Oil Heater	Currently known as #1 LTC Hot Oil Heater. Unit is permanently shut down.
74-O-7026-P	1/28/1976		
3019006-000-24103	7/24/1979		
74-O-3948-P	12/6/1974	Resin Finishing Unit, V-8	Process was permanently shut down.
3019006-000-76212	7/10/1995		
74-0-3952-C	12/19/1974	Pipe Still, H-7 Heater	Process was shut down and equipment removed from the site.
74-0-3694-P	12/24/1974	Resin Dissolving, Reclaim Kettle	Currently known as the Reclaim Tank at the LTC Unit. Superseded by VOC RACT Order 257 and IP-16.
3019006-000-52903			
75-O-1274-P	6/20/1975	Recycle Solvent Distillation, Columns	Process was shut down and equipment removed from the site.
3017006-000-81702			
75-O-1273-P	6/20/1975	Effluent Treatment - Decanting System	This equipment was installed at the PICCO facility in Clairton instead of at Jefferson.
3019006-000-52906			
75-O-1272-P	6/20/1975	Terpene Distillation, F-2 Unit	Process was shut down and equipment removed from the site.
3019006-000-81701			
75-I-0062-P	6/24/1975	Pneumatic Conveying, PE	Process was shut down and

Permit Number	Issue Date	Description	Reason for Exclusion from TVOP
3019006-000-45501		Blending	equipment removed from the site.
75-O-4184-P	6/26/1975	Resin Finishing, Unit V-3	Process was shut down and equipment removed from the site.
3019006-000-76220			
75-O-3950-P	6/26/1975	Resin Finish Unit, V-1	Process was shut down and equipment removed from the site.
3019006-000-76219			
75-O-0005-P	6/26/1975	Resin Polymerization, Bead Poly	Process was permanently shut down.
3019006-000-76213			
75-O-3951-P	6/26/1975	Resin Finishing Unit, V-2	Process was shut down and equipment removed from the site.
3019006-000-76218			
74-O-7027-P	2/6/1976	Resin Flaking, #2 Sandvik Flaker	Currently known as #2 LTC Pastillator. Superseded by VOC RACT Order 257 and IP-16.
3019006-000-76223			
74-O-3695-P	2/6/1976	Resin Flaking, #1 Sandvik Flaker	Currently known as #1 LTC Pastillator. Superseded by VOC RACT Order 257 and IP-16.
3019006-000-76221	6/26/1979		
79-I-0033-C	7/23/1979	HI-R-Hot Oil Heater B-620	Process was shut down and equipment removed from the site.
3019006-000-23803	10/15/1980		
79-I-0027-P	7/24/1979	Finishing Unit, #3 LTC	Process was permanently shut down.
79-I-0028-P	7/24/197	Resin Polymerization, F-Poly	Process was shut down and equipment removed from the site.
79-I-0029-P	7/24/1979	Hydrocarbon Resin Polymerization, Bead Poly	Process was also known as Bead Poly and was later converted to Solution Poly. This unit was sold to Sanyo Chemical Resins in 2001 and later was permanently shut down.
79-I-0030-P	7/24/1979	Resin Finishing Unit, #2 LTC	Superseded by VOC RACT Order 257 and IP-16.
3019006-000-76225	10/15/1980		
79-I-0031-P	7/24/1979	Resin Flaking, #3 Sandvik Flaker	Process was permanently shut down.
3019006-000-66505	1/26/1981		
79-I-0032-P	7/24/1979	Resin Finishing Unit, V-4	Process was shut down and equipment removed from the site.
3019006-000-76226	5/28/1981		
79-I-0034-C	7/24/1979	H-1-R-Hot Oil Heater B-355	Process was shut down and equipment removed from the site.
3019006-000-24104	11/5/1984		
79-I-0056-P	5/2/1980	Hydrocarbon Resin Polymerization, #2 C-Poly	Process was shut down and equipment removed from the site.
3019006-000-76227	10/15/1980		
81-I-0008-P	3/17/1981	Hydrogenation Unit	Superseded by VOC RACT Order 257, IP-1, and IP-27.
3019006-002-81606	3/16/1983		
3019006-002-81607	4/22/1992		
3019006-000-76214	4/6/1982	Suspension Poly	Process was also known as Bead Poly and was converted to Solution Poly. This unit was sold to Sanyo Chemical Resins in 2001 and later was permanently shut down.
3019006-000-76228	5/28/1982	Hydrocarbon Polymerization, F-Poly	Process was shut down and equipment removed from the site.
84-I-0012-P	4/25/1984	Resin Polymerization, MP-Poly Unit	Superseded by VOC RACT Order 257 and IP-22
3019006-000-52905	8/28/1986		

Permit Number	Issue Date	Description	Reason for Exclusion from TVOP
3019006-000-76229	11/5/1984	Dark Resin Finishing Unit, #3 LTC	Process was permanently shut down.
86-I-0011-P	7/23/1986	C-5 Resin Unit, Finished Resin Area	Superseded by VOC RACT Order 257, IP-11, and IP-18.
3019006-000-76230	11/16/1988		
86-I-0012-P	7/23/1986	C-5 Resin Unit, External Tank Farm	Superseded by VOC RACT Order 257 and IP-11.
3019006-000-72400	11/16/1988		
86-I-0013-P	7/23/1986	C-5 Resin Unit, C-5 Process Building Area	Superseded by VOC RACT Order 257 and IP-11.
3019006-000-76232	11/16/1988		
86-I-0014-P	7/23/1986	C-5 Resin Unit, C-5 Unit Tank Farm	Superseded by VOC RACT Order 257 and IP-11.
3019006-000-72401	11/16/1988		
86-I-0015-C	7/23/1986	C-5 Hot Oil Heater	Superseded by VOC RACT Order 257 and IP-11.
3019006-000-00620	11/16/1988		
87-I-0006-P	3/10/1987	C-5 Resin Unit, C-5 Bulk Loading Area	Superseded by VOC RACT Order 257 and IP-11.
3019006-000-76231	11/16/1988		
93-I-0011-P	1/5/1995	LTC Nos. 1 & 2 Flaker Fume Scrubber	Superseded by VOC RACT Order 257 and IP-16.
90-I-0012-P	4/17/1990	C-5 Resin Unit, BF3 scrubber B-Poly Unit	Process was shut down and equipment removed from the site.
90-I-0017-P	4/30/1990	C-9 Resin Polymerization, WW Poly Unit	C-9 Resins are no longer made at the site. Superseded by VOC RACT Order 257 and IP-23.
3019006-000-52902	11/14/1991		
91-I-0016-P	3/27/1991	C-9 Resin Polymerization, Condensers for A&B Poly	Process was shut down and equipment removed from the site.
3019006-000-76233	11/18/1991		
91-I-0024-P	5/16/1991	C-9 Resin Polymerization, Condensers for WW Poly	C-9 Resins are no longer made at the site. Superseded by VOC RACT 257 and IP-23.
90-I-0034-P	6/4/1992	C-9 Finishing, V-8 Unit	Process was permanently shut down.
92-I-0050-P	2/23/1993	Resin Disposal Site, Oil/Water Separator	Hercules retained ownership of the disposal site when Eastman purchased the Jefferson Site. Ashland Chemical is the successor to Hercules and now owns and operates the resin disposal site.
92-I-0062-P	4/7/1993	C-9 Resin Polymerization, Condensers for A&B Poly	Process was shut down and equipment removed from the site.
93-I-0012-P	7/30/1993	WW Poly Unit, Feed Dryer & Storage Tanks	Superseded by VOC RACT Order 257 and IP-23.
94-I-0081-P	11/17/1994	V-8 Unit, #4 Flaker	This unit is currently known as the Berndorf belt and is permitted under IP-16.
94-I-0074-P	1/24/1995	C-5 Resin Unit, Tank T-504 Vent Condenser	Due to a change in material stored, the vent condenser is no longer required and has been removed.
3019006-000-05300	1/27/1995	Solution Polymerization Process	Process was sold to Sanyo Chemical Resins in 2001. Unit is permanently shut down.

Permit Number	Issue Date	Description	Reason for Exclusion from TVOP
94-I-0069-P	4/13/1995	Resin Polymerization, MP-Poly	Superseded by VOC RACT Order 257 and IP-22.
3019006-000-23802	7/10/1995	V-8 Cleaver Brooks Furnace	Unit was permanently shut down.
98-I0005-P	7/29/1998	LTC Flakers	Superseded by VOC RACT Order 257 and IP-16.

EMISSION SOURCES:

Table 3: Emissions Sources

I.D.	Source Description	Control Device(s)	Maximum Capacity	Fuel/Raw Material	Stack I.D.
C-5 Unit - $AlCl_3$ Handling Operation					
T-210-1	$AlCl_3$ Silo	Baghouses (S-210-3), Scrubber(S-210-28)	140 MM lbs resin/year	Aluminum chloride ($AlCl_3$)	S042
S-210-11	$AlCl_3$ Receiver	Baghouses(S-210-11), Scrubber (S-210-28)			
H-210-14	$AlCl_3$ Charging Chamber	Scrubber (S-210-28)			
C-5 Unit – Polymerization Operation					
R-302-1	Reactor	Thermal oxidizer (B-411-2)	140 MM lbs/yr	$AlCl_3$, Isobutylene, Styrene, Alpha Methyl Styrene (AMS), Piperylene concentrate, Surfactants, Inhibitors	S044
A-301-1	Calcium dryer				
R-303-1	Soaker				
T-409-1	Filtrate receiver				
T-406-2	Filter condensate decanter				
T-502-4	Depentanizer overhead receiver				
T-412-1	Wash solvent receiver				
T-412-1	ANNEX wash solvent receiver				
T-404-11	Precoat knockout pot				
T-403-1	Solvent flush tank				
T-800-1	Reclaim tank				
T-506-3	Inhibitor feed tank				
T-506-1	Inhibitor make-up tank				
T-609-1	Steam jet seal pot				
S-3630-1	C5 API Separator	Thermal oxidizer (B-411-2), Carbon bed (backup) (A3631-1A/1B)			S044/ S044A
T-501	500 Battery tanks: Tank 501	Thermal oxidizer (B-411-2), Carbon bed (backup) (A3631-1A/1B)	60,914 gal	Polymerizate	S044/ S044A

I.D.	Source Description	Control Device(s)	Maximum Capacity	Fuel/Raw Material	Stack I.D.
T-502	500 Battery tanks: Tank 502	Thermal oxidizer (B-411-2), Carbon bed (backup) (A3631-1A/1B)	60,914 gal	Polymerizate	S044/ S044A
T-503	500 Battery tanks: Tank 503	Thermal oxidizer (B-411-2), Carbon bed (backup) (A3631-1A/1B)	51,184 gal	API Oil, Polymerizate, Toluene	S044/ S044A
T-505	500 Battery tanks: Tank 505	Thermal oxidizer (B-411-2), Carbon bed (backup) (A3631-1A/1B)	8,484 gal	API Oil	S044/ S044A
T-506	500 Battery tanks: Tank 506	Thermal oxidizer (B-411-2), Carbon bed (backup) (A3631-1A/1B)	8,484 gal	API Oil	S044/ S044A
NA	Resin Kettle #8	None	140 MM lbs/yr	Resin	S052
NA	Resin Kettle #9	None		Resin	S053
NA	Resin Kettle #10	None		Resin	S054
S-5191A/ 1B	Sparkler filter	Condensers (E-519-6, E-519-7)		Polymerizate	S312
T-519-2	Sparkler precoat	None		Polymerizate	NA
NA	Reclaim dump station	Baghouse		Resin	S051
NA	Inhibitor dump station	Baghouse		Inhibitor	S048
NA	Precoat tank dump station	Baghouse		Precoat material	S310
NA	Resin product loading	Drumming controlled by UHF Filter & Filter demister (S-751-1)		Loading – Resin; Drumming – White Oil & Resin	S055 for drumming
J-1000-5	Cooling tower	Drift eliminator	1,700 gpm	Municipal make-up water	NA
J-1200-1	Cooling tower	Drift eliminator	1,870 gpm	Municipal make-up water	NA
T-50	Raw material tank 50	Internal floating roof	528,765 gal	J-RAF	S216
T-52	Raw material tank 52	Internal floating roof	528,765 gal	Piperylene Concentrate	S218
T-53	Raw material tank 53	Internal floating roof	528,765 gal	Piperylene Concentrate	S219
T-54	Raw material tank 54	Internal floating roof	1,469,451 gal	Piperylene Concentrate	S060
T-55	Raw material tank 55	Internal floating roof	579,586 gal	Piperylene Concentrate	S061
T-500	Raw material tank 500	Internal floating roof	112,251 gal	Toluene	S058
T-511	Raw material tank 511	None	15,228 gal	White oil	S274

I.D.	Source Description	Control Device(s)	Maximum Capacity	Fuel/Raw Material	Stack I.D.
T-121	Storage tank	None	19,432 gal	Resin	S064
T-123	Storage tank	None	20,080 gal	Resin	S066
T-124	Storage tank	None	24,864 gal	Resin	S097
T-161	Storage tank	None	158,630 gal	Resin	S238
T-365(1)	Storage tank	None	20,728 gal	Resin	S266
T-366	Storage tank	None	20,132 gal	Resin	S267
T-367	Storage tank	None	20,132 gal	Resin	S268
T-504	Storage tank	None	62,817 gal	Resin	S059
T-601	Storage tank	None	108,291 gal	Resin	S269
T-602	Storage tank	None	108,291 gal	Resin	S270
C-5 Unit – Pastillation Operation					
Past. Belt Nos. 1 & 2	Pastillating Belt Nos. 1& 2	UHF filter & Fume filter demister (S-751-1)	11,000 lb/hr pastillated resin/belt	Resin	S055
J-1000-1	Cooling tower	Drift eliminator	4,300 gpm	Municipal make-up water	NA
J-4020-1	Cooling tower	Drift eliminator	686 gpm	Municipal make-up water	NA
Pastillator Solid Handling	Belt conveyors	Baghouse (S-726-1)	11,000 lb/hr pastillated resin/belt or 140 MM lbs resin/yr	Resin	S163
	Product Bins				
	Bag Filling Stations				
	Supersack Filling Station				
MP Poly Unit					
R-400-1	Reactor	Condenser (E-400-6), BF_3 scrubber (S-801-1)	103,000,000 lbs/year	Styrenes, HVD solvent, RHS solvent	S029
A-101, T-104-1, T-800-1, T-104-3	Mole sieve dryers, Mole sieve drain tank, Precoat tanks, Contaminated dryer solvent tank	None			S033
T-500-1, T-701-1, T-700-1, T-703-1, S-601-1, S-602-1	Neutralizers, Filtrate receiver, Solvent wash tank, Heel tank, Funda filter West, Funda filter East	Three Condensers (E-500-5, E-701-5, E-701-4)			S034
T-203-1, A-103-1	Preblend tank, Calcium chloride dryer	Condenser (E-203-4)			S035

I.D.	Source Description	Control Device(s)	Maximum Capacity	Fuel/Raw Material	Stack I.D.
T-301-1	Lime storage silo	Baghouse (S-301-2)			S030
S-303-1	Lime filter receiver	Baghouse (S-303-1)			S031
H-800-3	Precoat tank bag dump station	Baghouse (H-800-3)			F010
J-1001-1	Cooling tower	None	2,500 gpm	Municipal make-up water	NA
T-301, T-302, T-303	Storage tanks	None	75,202 gal each	Polymerizate	S039, S040, S041
	WW Poly Unit				
R-600-1	North Reactor	Condensers (E-600-6, E-600-9); BF_3 Scrubber (S-401-1)	80,000,000 lbs/yr	Styrenes, HVD solvent, RHS solvent	S017
R-601-1	South Reactor	Condensers (E-601-6, E-600-11); BF_3 Scrubber (S-401-1)			
A-100	Feed dryers	Condensers (E-200-6, E-200-7)			S013
A-100	Feed dryer (regeneration)	None			S013a
T-301-1	East preblend tank	Condenser (E-301-4)			S014
T-300-1	North preblend tank	Condenser (E-300-4)			S015
T-500-1	Slurry tank	None			S016
T-700-1	North neutralizer	Condensers (E-700-4, E-700-6)			S018
S-800-1 S-801-1	North Funda filter, South Funda filter	Condenser (E-800-3)			S019
T-800-6	Funda condensate tank	Carbon adsorber (A-800-8)			S019a
T-900-1 S-800-1	West filtrate receiver, North Funda filter	Condenser (E-900-7)			S020
T-701-1	South neutralizer	Condenser (E-701-7)			S021
T-1001-1	Reclaim pot	Condenser (E-1001-7) Baghouse (S-1003-1)			S022 S022a
T-903-1 S-800-1 S-801-1	Solvent wash receiver, North Funda filter, South Funda filter	Condenser (E-903-3)			S023
T-901-1 S-801-1	East filtrate receiver, South Funda filter	Condenser (E-901-7)			S027
T-700-1 T-701-1	North neutralizer and South neutralizer: local exhaust	None			S050

I.D.	Source Description	Control Device(s)	Maximum Capacity	Fuel/Raw Material	Stack I.D.
T-700-1 T-701-1	North neutralizer and South neutralizer: chamber below hopper	None			S050a
H-500-4	Slurry bag dump station	Baghouse (H-500-4)			S294
H-700-10	Lime/Filteraid bag dump station	Baghouse (H-700-10)			S295
J-4060-1	Cooling tower	None	1,000 gpm	Municipal make-up water	S316
T-68, T-69, T-74	Storage tanks	Condenser (E-201-1)	75,202 gal each	Polymerizate, RHS, HVD	S024
T-73, T-75, T-76, T-77	Storage tanks	Condenser (E-202-1)	75,202 gal each	Polymerizate, RHS, HVD	S025
T-67	Storage tank	Condenser (E-67-3)	75,200 gal	Polymerizate, RHS, HVD	S026
T-66	Storage tank	None	75,200 gal	HVD	S228
T-204	Storage tank	Condenser (E-204-4), Carbon adsorber (A-204-5A or 5B)	41,878 gal	Polymerizate, RHS, HVD	S300
T-205	Storage tank	Condenser (E-205-4), Carbon adsorber (A-204-5A or 5B)	25,381 gal	Polymerizate, RHS, HVD	S300
T-206	Storage tank	Condenser (E-206-4), Carbon adsorber (A-204-5A or 5B)	25,381 gal	Polymerizate, RHS, HVD	S300
T-207	Storage tank	Condenser (E-207-4), Carbon adsorber (A-204-5A or 5B)	25,381 gal	Polymerizate, RHS, HVD	S300
T-200	Storage tank	None	25,381 gal	Polymerizate, RHS, HVD	S239
T-201	Storage tank	None	25,381 gal	Polymerizate, RHS, HVD	S240
T-202	Storage tank	None	25,381 gal	Polymerizate, RHS, HVD	S241
T-10	Storage tank	None	110,159 gal	Polymerizate, RHS, HVD	S195
T-22	Storage tank	None	15,863 gal	Paramethyl styrene	S206
T-23	Storage tank	None	15,863 gal	Vinyl toluene	S207
T-24	Storage tank	None	15,863 gal	Paramethyl styrene	S208

I.D.	Source Description	Control Device(s)	Maximum Capacity	Fuel/Raw Material	Stack I.D.
T-25	Storage tank	None	15,863 gal	Vinyl toluene	S209
T-26	Storage tank	None	16,257 gal	Polymerizate, RHS	S210
T-28	Storage tank	None	16,257 gal	Polymerizate, RHS	S212
T-29	Storage tank	None	16,257 gal	Polymerizate, RHS	S213
T-34	Storage tank	None	169,000 gal	Polymerizate, RHS, HVD	S074
T-71	Storage tank	None	75,200 gal	Alpha methyl styrene	S230
T-72	Storage tank	None	75,200 gal	Styrene	S231
Hydrogenation (Hydro) Unit					
T-502-1	Solvent tank (Tank 103)	Condensers (E-200-6, E-201-2)	22,500,000 lbs/yr	Polymerizate, catalyst, hydrogen	S004
T-501-1	Unfiltered product tank (Tank 104)				
T-200-1	Metering tank				
T-603-3	Catalyst Catch tank				
S-603-1	Mott Filter				
T-603-5	Heel tank				
H-203-2	Catalyst unloading system	Baghouse (S-203-5)		Catalyst	S005
R-301-1	Autoclave #1	Condensers (E-401-2, E-402-2, E-403-2)	1,000 gal	Polymerizate, catalyst	S007
R-302-1	Autoclave #2		1,000 gal		
T-303-1	Vent tank				
T-100	Storage tank	Condenser (E-101-4)	6,000 gal	Polymerizate, RHS, HVD	S001
T-101	Storage tank		6,000 gal		
T-102	Storage tank	Condensers (E-104-1, E-104-2)	6,000 gal	Solvents	S012
T-105	Storage tank		6,000 gal		
T-106	Storage tank		6,000 gal		
J-4005-1	Cooling tower	None	400gpm	Municipal make-up water	NA
LTC Units					
T-301-1	Reclaim Solution Tank	Condenser E-301-4	67,240,000 lbs/yr	Intermediate Polymerizate	S108
NA	#1 Vacuum System	Condenser E-301B-E3			S109
NA	#2 Vacuum System	Condenser E-607-2			S110
NA	#4 Vacuum System	Condenser E-106-3			S124

I.D.	Source Description	Control Device(s)	Maximum Capacity	Fuel/Raw Material	Stack I.D.
RK#5	Resin Kettle #5	Condenser E-RK5-4			S111
RK#6	Resin Kettle #6	Condenser E-RK6-5			S112
RK#7	Resin Kettle #7	Condenser E-RK7-4			S113
NA	Nos. 1 and 2 Pastillator Belts	Scrubber S-127-3			S114
NA	Berndorf Belt	Scrubber S-105-1			S165
T-610-1	#1/#2 oil/water separator	Carbon Bed A-610-3A/3B			S110A
S-105-1	#4 oil/water separator	Carbon Bed A-108-5A/5B			S125
NA	#1 Pastillator baghouse	Baghouse S-108			S115
NA	#2 Pastillator baghouse	Baghouse S-640-1			S116
NA	Berndorf belt baghouse	Baghouse S-104-1			S084
NA	Truck loading	None	2,500.000 gal/yr		NA
NA	Drumming operation	None	1,250,000 gal/yr	Blending Solvents	NA
J-101-1	Cooling tower #1	None	375 gpm	Municipal make-up water	NA
J-645	Cooling tower #2	None	1,200 gpm	Municipal make-up water	NA
J-4030-1	Cooling tower #4	None	2,800 gpm	Municipal make-up water	NA
Dresinate Unit					
R-1-A	Crude Tall Oil Storage Tank	None	67,631 gal	Crude tall oil	S187
T-782	Tall Oil Rosin Storage Tank	None	10,000 gal	Tall oil rosin	S290
T-783(1)	Tall Oil Rosin Storage Tank	None	11,400 gal	Tall oil rosin	S160
T-80(1)	Dresinate TX Rosin Soap Percussor Storage Tank	None	24,881 gal	Dresinate TX Rosin Soap Percussor	S091
L-500-1	Double Drum Dryer	None	500 lbs/hr wet product	Wet product	S085
H-503-1	Auger Conveyor	Baghouse & Conveyor enclosure	300 lbs/hr dry product	Dry product	S086
L-501-1	Grinder	Baghouse			
NA	Bagging	Baghouse			
Emulsion Unit					
T-301-1	Emulsion Kettle #1	None	1,000 gal	Resin Blends	S291
T-302-1	Emulsion Kettle #2	None	1,000 gal	Resin Blends	S292

I.D.	Source Description	Control Device(s)	Maximum Capacity	Fuel/Raw Material	Stack I.D.
T-403-1	Storage vessel	None	2,200 gal	Water	None
T-403-3	Storage vessel	None	2,200 gal	Water	None
M-500-1, M-500-2	Mixing unit	None	NA	Emulsion product	None
T-783[(1)]	Storage Tank	None	11,400 gal	Rosin	S160
T-200-1	Storage tank	None	1,000 gal	Water condensate	S284
T-201-1	Storage tank	None	1,000 gal	Water condensate	S284
T-766	Storage tank	None	800 gal	Surfactant	S288
T-782	Storage tank	None	7,000 gal	Resin/Rosin	S290
T-761	Storage tank	None	10,000 gal	Heavy distillate	S283
T-773	Storage tank	None	2,500 gal	Crude tall oil	S289
T-402-3	Storage tank	None	17 gal	29% ammonium hydroxide	S161
T-411-1	Storage tank	None	500 gal	Surfactant	NA
T-408-1	Storage tank	None	500 gal	Surfactant	NA
T-407-1	Storage tank	None	500 gal	Surfactant	NA
T-405-1	Storage tank	None	500 gal	Surfactant	NA
T-406-1	Storage tank	None	500 gal	Surfactant	NA
T-412-1	Storage tank	None	500 gal	Surfactant	NA
T-401-1	Storage tank	None	80 gal	45% potassium hydroxide	None
T-R-1-A	Storage tank	None	17,600 gal	Crude tall oil	S187
T-775	Storage tank	None	8,768 gal	Emulsion waste	S287
T-605-1	Blend tank #5	None	20,000 gal	Bulk dispersion	S401
T-606-1	Blend tank #6	None	20,000 gal	Bulk dispersion	S400
T-504-1	Blend tank #4	None	5,000 gal	Bulk dispersion	S162
T-503-1	Blend tank #3	None	5,000 gal	Bulk dispersion	
T-502-1	Blend tank #2	None	6,000 gal	Bulk dispersion	
T-501-1	Blend tank #1	None	6,000 gal	Bulk dispersion	
Pilot Plant					
NA	Reactor – 50 gal	Carbon bed	Various	Hydrocarbon resin	S155
NA	Neutralizer				
NA	Funda filter				

I.D.	Source Description	Control Device(s)	Maximum Capacity	Fuel/Raw Material	Stack I.D.
J-125-1/J-400-1	Cooling Tower	None	400 gpm	Municipal make-up water	NA
Wastewater Treatment Plant					
701A	Wastewater tank	Condenser E-701-3, Carbon adsorber A-701-5A/5B	50,000 gal	Facility wastewater	S147
701B	Wastewater tank		50,000 gal		
T-713-1	Raw sump	Condenser E-713-2, Carbon adsorber A-701-5A/5B			
S-302-1	Air floatation tank		50,000 gal		
T-717-1	Oil sump				
T-714-1	Acid sump				
T-715-1	Final sump				
T-702-A	Pretreated water tank	None	50,000 gal	Facility wastewater	F033
T-702-B	Pretreated water tank	None	50,000 gal	Facility wastewater	F034
T-702-C	Pretreated water tank	None	50,000 gal	Facility wastewater	F035
T-411-1	Biotreatment aeration tank, including digester	None	47,304,000 gal/yr	Facility wastewater	F027
NA	Biotreatment clarifier	None	47,304,000 gal/yr	Facility wastewater	F028
T-724-1	Sludge batch tank	None	47,304,000 gal/yr	Facility wastewater	F036
S-410-1	Filter press (sludge solids handling)	None	47,304,000 gal/yr	Facility wastewater	F037
Storage Tanks (Minor significance)					
T-35	Storage tank	None	169,000 gal	Various solvent or stormwater	S075
T-78	Storage tank	None	169,000 gal	Recovered oil	S232
T-4	Storage tank	None	88,128 gal	Coproduct fuel (JSOL)	S190
T-151	Storage tank	None	1,504,044 gal	Coproduct fuel (JSOL)	S236
T-2	Storage tank	None	169,205 gal	Stormwater	S189
T-9	Storage tank	None	110,159 gal	C5 Ammonia water	S194
T-12	Storage tank	None	110,159 gal	Stormwater	S197
T-13	Storage tank	None	110,159 gal	Stormwater	S198
T-14	Storage tank	None	110,159 gal	C5 Ammonia water	S199
T-15	Storage tank	None	110,159 gal	C5 Ammonia water	S200

I.D.	Source Description	Control Device(s)	Maximum Capacity	Fuel/Raw Material	Stack I.D.
T-16	Storage tank	None	110,159 gal	C5 Ammonia water	S201
T-27	Storage tank	None	16,257 gal	Hazardous Waste	S211
T-150	Storage tank	None	1,504,044 gal	C5 Ammonia water/PMR water	S235
T-160	Storage tank	None	158,630 gal	Stormwater	-
T-208	Storage tank	None	25,381 gal	Hazardous waste (mix of. RHS/HVD)	S244
T-250	Storage tank	None	30,457 gal	Deluge water	S246
T-251	Storage tank	None	30,457 gal	Deluge water	S247
T-252	Storage tank	None	30,457 gal	Styrene or AMS	S248
T-254	Storage tank	None	15,275 gal	C5 API Discharge water (reserved for storm weather conditions)	S249
T-257	Storage tank	None	15,275 gal	C5 API Discharge water (reserved for storm weather conditions)	S252
T-261	Storage tank	None	20,728 gal	C5 Ammonia water	S256
T-262	Storage tank	None	20,080 gal	C5 Ammonia water	S038
T-263	Storage tank	None	20,080 gal	C5 API Discharge water	S257
T-264	Storage tank	None	20,080 gal	C5 API Discharge water	S258
T-265	Storage tank	None	20,080 gal	Hazardous Waste	S259
T-382	Storage tank	None	19,625 gal	Therminol	S271
T-408	Storage tank	None	9,776 gal	Anhydrous ammonia	NA
T-510	Storage tank	None	100,000 gal	Isobutylene	NA
T-513	Storage tank	None	3,714 gal	40/60 Ethylene Glycol/Water	S275
T-514	Storage tank	None	3,714 gal	40/60 Ethylene Glycol/Water	S276
T-762	Storage tank	None		Steam condensate	S284
T-763	Storage tank	None		Steam condensate	S285
T-2004-1 (T-278)	Storage tank	None		40/60 Ethylene Glycol/Water	S260

I.D.	Source Description	Control Device(s)	Maximum Capacity	Fuel/Raw Material	Stack I.D.
T-7065-1	Storage tank	None		40/60 Ethylene Glycol/Water	
T-703-3	Storage tank	None		40/60 Ethylene Glycol/Water	
T-105-2	Storage tank	None		40/60 Ethylene Glycol/Water	
T-801-4	Storage tank	None		8% Soda ash in water	
T-401-1	Storage tank	None		8% Soda ash in water	
Combustion Units					
BU-1	Unilux water-tube boiler #1, Model ZF 1800HS	Ultra-Low NO_X Burner	18.6 MMBtu/hr	Natural gas	S141
BU-2	Unilux water-tube boiler #2, Model ZF 1800HS	Ultra-Low NO_X Burner	18.6 MMBtu/hr	Natural gas	S141
BU-3	Unilux water-tube boiler #3, Model ZF 1800HS	Ultra-Low NO_X Burner	18.6 MMBtu/hr	Natural gas	S143
BU-4	Unilux water-tube boiler #4, Model ZF 1800HS	Ultra-Low NO_X Burner	18.6 MMBtu/hr	Natural gas	S143
B-5	Trane/Murray boiler #5, Model MCF2-38	None	38 MMBtu/hr	Natural gas	S144
B-3000	C5 Hot oil furnace	None	10.33 MMBtu/hr	Natural gas	S056
B-620-1	#2 LTC heater	None	8.8 MMBtu/hr	Natural gas	S107
B-9020-1	#4 LTC heater	None	10.0 MMBtu/hr	Natural gas	S119
NA	Boiler house emergency generator	None	250 kW	Diesel fuel	F100
E-9000-1	Electric heater (Emulsion Unit)	None	-	Hot oil	NA
Miscellaneous Sources					
NA	Equipment Leaks	None	NA	NA	NA
NA	Roadways	None	NA	NA	NA
NA	Barges	None	NA	NA	NA
NA	Degreasers	None	NA	NA	NA

1. Tank not included in any installation permit.

STACKS:

Table 4: Stack Data

Stack ID	Stack Height (ft)	Stack Diameter (ft)	Exhaust Rate (acfm)	Exit Temperature (ºF)	Lining/Outer Material
C5 Unit					
S042	32.5	1.33	800	ambient	CPVC
S044	40	5.0	17,168	1,400	Carbon steel / Cerwool blanker
S052	28.167	0.167	No data	No data	Carbon steel
S053	22	0.25	No data	No data	Carbon steel
S054	22	0.25	No data	No data	Carbon steel
S055	21.2	2.0	9,000	90	Carbon steel
S056	30.58	3.33	2,500	350	No data
S163	38	1.5	5,000	ambient	Carbon steel
S312	12.5	0.167	--	--	Carbon steel
MP Poly Unit					
S029	50.5	1.167	4,029 acf/batch	104	FRP
S030	1	0.5	325	ambient	PVC
S031	1	0.5	60	ambient	PVC
S033	1	0.333	13,398acf/batch	77	Carbon steel
S034	24	0.23	3,325 acf/batch	95	Stainless steel
S035	14.5	0.167	758 acf/batch	95	Carbon steel
WW Poly Unit					
S013	34	0.125	1,440 acf/batch	95	Carbon steel
S013a	On grade	0.083	--	--	Carbon steel
S014	25	0.25	416 acf/batch	104	Carbon steel
S015	25	0.25	416 acf/batch	104	Carbon steel
S016	0.167	0.333	varies	77	Carbon steel
S017	50	1.5	3,320 acf/batch	95	FRP
S018	1	2.0	790 acf/batch	95	Carbon steel
S019	25	0.167	10,000acf/batch	104	Carbon steel
S019a	12	0.167	--	--	Carbon steel
S020	28	0.25	10,790acf/batch	95	Carbon steel
S021	1	2.0	791 acf/batch	95	Carbon steel
S022	14	0.5	6,270 acf/batch	104	Stainless Steel
S022a	5	1	1,400	ambient	Stainless Steel
S023	13.5	0.25	10,790acf/batch	95	Carbon steel
S024	38	0.25	1.76	95	Stainless Steel
S025	42	0.25	3.58	95	Stainless Steel
S026	37	0.25	0.42	95	Carbon Steel
S027	38	0.25	10,790acf/batch	95	Stainless Steel
S050	25	0.833	Varies	ambient	Duct work
S050a	23	0.041	varies	ambient	Carbon Steel
S294	25	0.667	1,200	ambient	

Stack ID	Stack Height (ft)	Stack Diameter (ft)	Exhaust Rate (acfm)	Exit Temperature (°F)	Lining/Outer Material
S295	23	0.667	770	ambient	Carbon steel
S300	36	0.5	--	118	Stainless steel
Hydrogenation Unit					
S001	23.4	0.167	8	95	Carbon steel
S004	8.83	0.25	1,155acf/batch	95	Carbon steel
S005	13.67	0.417	600	ambient	Carbon steel
S006	No vent stack. Catalyst is pumped into a drum.				
S007	20.5	0.333	3,903 acf/batch	95	Carbon steel
S012	23.0	0.167	5	95	Carbon steel
LTC Units					
S108	20	0.28	1.1	104	Steel
S109	32	0.25	0.8	104	Steel
S110	32	0.25	3.3	104	Steel
S124	32	0.25	2.2	95	Steel
S111	20	0.29	14.4	104	Steel
S112	20	0.29	14.4	104	Steel
S113	20	0.29	3.7	104	Steel
S114	16	1.34	3,100	90	Steel
S165	16	1.34	2,500	100	Steel
S110A	10.25	0.167	100	ambient	Steel
S125	10.25	0.167	100	ambient	Steel
S115	32	1.62	3,500	68	Steel
S116	32	1.62	3,500	68	Steel
S084	32	1.34	2,000	68	Steel
S107	20	1	2,195	350	Steel
S119	28	1	1,750	350	Steel
Dresinate Unit					
S085	16	1.34	2,000	Varies	Steel
S086	16	1.34	3,000	Varies	Steel
Pilot Plant					
S155	4.17	1.5	Varies	Varies	Steel
Wastewater Treatment Plant					
S147	17	0.5	Varies	ambient	PVC
Combustion Units					
S141	147	3	Varies	Varies	Steel
S143	147	3	Varies	Varies	Steel
S144	73.1	3	Varies	Varies	Steel

METHOD OF DEMONSTRATING COMPLIANCE:
Methods of demonstrating compliance with the emission standards set in this permit are summarized in Table 5

below. See Operating Permit No. 0058-OP24 for the specific conditions for determining compliance with the applicable requirements. Compliance with the short-term (lb/hr) limits must be always maintained, including startup and shutdown unless explicitly stated otherwise in the permit. Any emissions due to startup and/or shutdown are included in facility's total annual emissions.

Table 5: Method(s) of Demonstrating Compliance

TVOP Section	Process	Method(s) of Demonstrating Compliance
V.A	C5 Unit - $AlCl_3$ Handling Operation	• Inspecting the $AlCl_3$ Silo during truck unloading a minimum of once per month; and $AlCl_3$ Receiver and $AlCl_3$ charging Chamber weekly. • Recordkeeping of the scrubbing liquid pH and recycle rate at least once every 15 minutes when the scrubber is in operation. • Recordkeeping the quantity of $AlCl_3$ unloaded per truck, the number of incoming $AlCl_3$ trucks, the duration of each truck unloading, and the hours of operation of the $AlCl_3$ silo baghouse during unloading. • Recording the $AlCl_3$ usage for the C-5 process monthly.
V.B	C5 Unit – Polymerization Process	• Emission testing at least once every five years for the thermal oxidizer. • Monitoring continuously the temperature of gases exiting the thermal oxidizer combustion chamber. • Monitoring the performance of the carbon bed. • Monitoring the differential pressure drops across the UHF filter and baghouse. • Recordkeeping of resin production, hours of operation, and all records of monitoring.
V.C	C5 Unit – Pastillation Process	• Monitoring the pressure drop across the UHF Filter/Demister and baghouse. • Recordkeeping of amount of molten resin and hours of operation.
V.D	C5 Unit – Storage Tanks	• Recordkeeping of material store by name, daily level of material, temperature, material vapor pressure, and throughput.
V.E	MP Poly Unit - Process	• Inspecting BF_3 Scrubber. • Monitoring the vapor pressure of the HVD and RHS solvents; the condenser coolant temperature; and the outlet gas temperature. • Recordkeeping of all records of monitoring; polymerizate production; and VOC and HAP emissions.
V.F	MP Poly Unit – Storage Tanks	• Recordkeeping of material store by name, daily level of material, temperature, material vapor pressure, and throughput.
V.G	WW Poly Unit - Process	• Inspecting BF_3 Scrubber and baghouse. • Monitoring the vapor pressure of the HVD and RHS solvents; the condenser coolant temperature; the outlet gas temperature; and the performance of the carbon bed adsorber. • Recordkeeping of all records of monitoring and VOC and HAP emissions.
V.H	WW Poly Unit – Storage Tanks	• Recordkeeping of material store by name, daily level of material, material vapor pressure, throughput, coolant inlet

TVOP Section	Process	Method(s) of Demonstrating Compliance
		temperature, outlet gas temperature, and performance of the carbon bed adsorber.
V.I	Hydro Unit - Process	• Inspecting baghouse. • Monitoring the vapor pressure of the HVD and RHS solvents; the condenser coolant temperature; and the outlet gas temperature. • Recordkeeping all vapor pressure measurements, amount of polymerizate; condenser exit gas temperature; VOC and HAP emissions.
V.J	Hydro Unit – Storage Tank	• Recordkeeping of material store by name, daily level of material, material vapor pressure, throughput, coolant outlet temperature, and outlet gas temperature.
V.K	LTC Process Operation	• Emission testing at least once every five years for the scrubbers and each vacuum system condensers. • Monitoring the scrubber liquid flow rate and the pressure drop across each scrubber; the pressure drop for each baghouse; the exit vapor temperature for condensers. • Recordkeeping of all records of monitoring; amount and maximum resin, and polymerizate feed rate.
V.L	Dresinate Unit	• Emission testing for the baghouse. • Monitoring and recording the pressure drop across the venturi scrubber and baghouse; and the scrubbing flow rate for the scrubber. • Recordkeeping raw material usage, all records of monitoring, hours of operation.
V.M	Pilot Plant	• Monitoring the performance of the carbon bed and inlet coolant temperature for condensers. • Recordkeeping of all records of monitoring; VOC and HAP emissions.
V.N	Wastewater Treatment Plant	• Monitoring the performance of the carbon bed and temperature for condensers. • Recordkeeping of all records of monitoring; VOC and HAP emissions, and throughput.
VI.A	Cooling Towers	• Recordkeeping the recirculation rate for each tower.
VI.B	Boilers B-U1, B-U2, B-U3 & B-U4	• Monitoring and recordkeeping amount of natural gas combusted in each boiler.
VI.C	Boiler #5	• Monitoring and recordkeeping amount of natural gas combusted in boiler.
VI.D	Emergency Generator	• Monitoring and recordkeeping the hours of operation.
VI.E	#2 & #4 LTC Heaters and C5 Hot Oil Furnace	• Monitoring and recordkeeping amount of natural gas combusted in furnace and heaters.

EMISSION CALCULATIONS:

C5 UNIT

Process Description

The C5 Unit consists of the aluminum chloride ($AlCl_3$) operation, the C5 process unit (polymerization and finishing), and the C5 pastillation operation.

$AlCl_3$ is used as a catalyst in the C5 resin production operations. The $AlCl_3$ handling operations consist of a silo, a receiver, and a charging chamber. Baghouses control particulate matter emissions from the silo and receiver. The baghouses and the charging chamber vent into a wet scrubbing system.

C5 resins are polymerized in a continuous stirred tank reactor. Depending on the product being made, mixtures of piperylene concentrate, and various types of monomers are reacted using $AlCl_3$ catalyst in a solution of toluene and unreacted C5 (JRAF5) solvents. The reaction takes place isothermally at moderate pressure. A soaker vessel after the reactor provides additional residence time. The resin solution is then neutralized, filtered, depentanized (recovery of JRAF5), and collected in a storage tank. Neutralization is achieved via ratio controlled anhydrous ammonia/caustic/water addition. The resulting filter cake is sent to a secure landfill. The polymerizate solution is further processed through the finishing section to recover the resin and separate the toluene from the heavy oils. The toluene is recycled back to the reactor. The heavy oil co-product is sold. The majority of the process vents in the C5 process unit are controlled using a thermal oxidizer.

Molten resin produced from upstream C5 operations can be either bulk loaded into tank trucks or railcars, pastillated, or blended with mineral oil and loaded into tank trucks or drummed at the drumming station. Currently, Synthomer operates two pastillating belts (Nos. 1 and 2 Pastillating Belts) at the C5 Unit. There are multiple fume hoods installed above each drop former and the feed end of each belt to capture emissions and duct them to a UHF Filter and Demister. The UHF Filter and the Demister control sticky aerosol and volatile organic compounds (VOC) from the #1 Pastillating Belt, #2 Pastillating Belt, and Drum Filling Station. The discharge end of each pastillator is equipped with air-conditioned hoods to facilitate cooling of the resin pastilles.

A cooling tower and chilled water system are utilized to cool the Nos. 1 and 2 Pastillating Belts, thus promoting solidification of the molten resin. After the resin is pastillated, the solid material is conveyed to product bins where it is then conveyed to a bag filling station or the supersack filling station. Baghouse S-726-1 collects particulate emissions from the material handling equipment associated with the #1 Pastillating Belt (# 1 Product Bin, Reclaim Bag Dump Station, #1 Belt Conveyors, #1 Bag Filling Station), the #2 Pastillation Belt (#2 Product Conveyors, #2 Product Bin, #2 Bag Filling Station), and Supersack Filling Station.

There is potential for fugitive VOC/HAP emissions that escape during the addition of solid material at the reclaim tank, precoat tank, and inhibitor make-up tank. These emissions are minimal and considered insignificant.

The following tanks are dedicated to the C5 Unit:

- Tanks 501, 502, 503, 505, 506: API Oil, Polymerizate, or Toluene vented to the Thermal Oxidizer.
- Raw Material Tank 50: J-RAF, Internal Floating Roof.
- Raw Material Tanks 52, 53, 54 and 55: Piperylene Concentrate, Internal Floating Roof.
- Raw Material Tank 500: Toluene, Internal Floating Roof.
- Raw Material Tank 511: White Oil, no add-on controls.
- Resin Storage Tanks 121, 123, 124, 161, 365, 366, 367, 504, 601, 602: no add-on controls.

Emission calculations

1. C5 Unit – $AlCl_3$ Handling Operation (S042)

$AlCl_3$ Silo:

Manufacturer’s specifications: Baghouse loading = 108 grains/ft^3

efficiency = 99.9%
total filter area = 126 ft^3
design flowrate = 325 acfm @ ambient conditions

Baghouse inloading = 108 grains/ft^3 × 325 acfm × 1 lb/7000 grains × 60 min/hr = 300.86 lbs/hr
@ 99.9% control efficiency = **0.301 lbs/hr**

Maximum truck loads/yr for the maximum potential production of 180 × 106 lbs/yr of resin = 47 loads of 45,000 lbs of $AlCl_3$
Maximum unloading time = 2 hrs.
Maximum potential tpy = 0.301 lbs/hr × 2 hrs × 47 loads = **28.29 lbs/yr**

<u>$AlCl_3$ Receiver:</u>
Manufacturer's specifications: Baghouse loading = 86 grains/ft^3
efficiency = 99.9%
design flowrate = 60 acfm @ ambient conditions

Baghouse inloading = 86 grains/ft^3 × 60 acfm × 1 lb/7000 grains × 60 min/hr = 44.23 lbs/hr
@ 99.9% control efficiency = **0.044 lbs/hr**

Maximum potential tpy @ 8,760 hours of operation = **385.44 lbs/yr**

<u>$AlCl_3$ Charging chamber:</u>
Maximum $AlCl_3$ = 47 trucks @ 45,000 lbs = 2,115,000 lbs/yr. Seal pot control efficiency = 90%
Assuming a 0.5% loss of material from the chamber to the seal pot gives maximum potential emissions = 2,115,000 lbs/yr × 1 yr/8,760 hrs × 0.005 × 0.1 = **0.121 lbs/hr = 1,059 lbs/yr**

<u>$AlCl_3$ Scrubber System:</u>
Scrubber system efficiency is estimated 90%. The seal pot will be removed so potential emissions from the charging chamber will remain unchanged. The two existing baghouses will remain giving 0.001 × 0.1 = 99.99% efficiency after the scrubber system for emissions from the silo and receiver.

Silo potential emissions = 0.301 lbs/hr × 0.1 = **0.030 lbs/hr = 2.83 lbs/yr**
Receiver potential emissions = 0.044 lbs/hr × 0.1 = **0.004lbs/hr = 38.54 lbs/yr**

Potential emissions are the theoretical maximum emissions from operation at the equipment design rating: 180,000,000 lbs/yr for 8,760 hrs/yr.

Table 6: $AlCl_3$ Handling Operation Emissions

Emission Unit	Simultaneous Points	Potential, lbs/hr	Potential, lbs/yr
$AlCl_3$ Silo	Worst case is that all can occur at the same time	0.030	2.83
$AlCl_3$ Receiver		0.004	38.54
$AlCl_3$ Charging Chamber		0.121	1059.00
Total		**0.155**	**1100.37 or 0.55 t/yr**

2. <u>C5 Unit – Polymerization Process</u>

Details for these emission calculations are in the Technical Support Documents for Installation Permit Nos. 0058-I011d and 0058-I011e.

C-5 Thermal Oxidizer (S044):

Emissions calculations for NO_X, VOC, Toluene, total HAPs, and Ammonia are based on maximum hourly rate among the various stack tests (2007, 2008, 2013, and 2018 years). Installation of third Funda Filter in 2020 increase VOC, HAP, and Toluene emissions. Depending on the process step, these emissions are vented indirectly to the thermal oxidizer either through other vessels such as the filtrate holding vessel or through process condensers. PM_{10} and CO emissions are based on AP-42 factors for burning natural gas.

Potential emissions:
VOC emissions – 0.11 lbs/hr or 0.46 tons/yr
NO_X emissions – 5.99 lbs/hr or 26.24 tons/yr
Toluene emissions – 0.11 lbs/hr or 0.46 tons/yr
Total HAPs emissions – 0.11 lbs/hr or 0.46 tons/yr
Ammonia emissions – 0.02 lbs/hr or 0.09 tons/yr
PM_{10} emissions – 0.046 lbs/hr or 0.20 tons/yr
CO emissions – 0.094 lbs/hr or 0.41 tons/yr

Resin Kettle #8 (S052):

Per paragraph 36 of the Consent Order, emission limits for Resin Kettle #8 to be based on stack testing conducted in 2014.

Data from 2014 Stack Test and Supplemental Report of 2015:
Hourly VOC emissions – 0.0037 lbs/hr
Test displacement rate – 0.215 acfm = 96.5 gal/hr
Material density – 7.04 lbs/gal
VOC emission factor – 0.0000383 lbs/gal of throughput

Potential VOC emissions:
140,000,000 lb/yr: 7.04 lb/gal × 0.0000383 lb/gal: 2000 lb/tons = 0.38 tons/yr

Potential HAP emissions:
Total HAP (Toluene) ratio to VOC = 0.234 (from comparison of hourly emissions from test)

Total HAP (Toluene) potential:
0.0037 lb/hr × 0.234 = 0.0009 lb/hr
0.38 tons/yr × 0.234 = 0.089 tons/yr

Resin Kettles #9 and #10 (S053 and S054):

Emission calculations are based on annual volume charged (2,743,243 gal/yr for Kettle #9 and 3,972,973 gal/yr for Kettle #10), annual weight charged (70,000,000 lbs/yr for each Kettle), liquid temperature (220°C), vapor pressure (8.693 mmHg) and equation for vessel filling contained in Section 3.1.1, Methods for Estimation from Chemical Manufacturing Facilities, EIIP, August 2007
Potential VOC emissions:
Resin Kettle #9 – 0.74 tons/yr;
Resin Kettle #10 – 1.07 tons/yr;
Total for both Kettles – 1.81tons/yr.

Sparkler Filter (S312):

This equipment has a control device – two condensers in series (E-519-6 and E-519-7) with a total 95% control efficiency. Total produced throughput for this unit is 2,146 lbs/yr. Assumes Toluene = VOC.
Maximum potential emissions for Toluene (VOC) = 2,146 lbs/yr: 2,000 lbs/ton × (1-0.95) = 0.05 tons/yr

Sparkler Precoat:
Emission calculations are based on Toluene volume per charge (350 gal/charge), charges per year (21), liquid temperature (25 °C), system pressure (760 mmHg) and equation for vessel filling contained in Section 3.1.1, Methods for Estimation from Chemical Manufacturing Facilities, EIIP, August 2007. Assumed Toluene = VOC. Maximum potential emissions for Toluene (VOC) = 0.01 tons/yr.

Reclaim, Inhibitor, and Precoat Tank Dump Station Baghouses (S048, S051, S310):
Process equipment includes three baghouses. Emission calculations are based on manufacturer data for each baghouse: maximum throughput and a 99.9% removal efficiency. The emission factors were derived by assuming 5% of material is lost and directed to baghouses. Maximum potential $PM_{10}/PM_{2.5}$ emissions are:
Reclaim Dump Station – 0.026 tons/yr
Inhibitor Dump Station – 0.007 tons/yr
Precoat Tank Dump Station – 0.000 tons/yr

Fugitive emissions were calculated based on AP-42, Section 13.2.4, Aggregate Handling and Storage Piles, 11/6. Maximum potential fugitive emissions are negligible for all these sources.

Cooling Towers J-1000-5 and J-1200-1:
Emission calculations are based on recirculation rate 1,700 gpm and 1,870 gpm; water total dissolved solids (TDS) concentration 1,500 ppm and emission factors contained in AP-42, Section 13.4, Wet Cooling Towers, 1/95. The emission factor was adjusted as follows: based on AP-42 emission factor = 0.019 lb/10^3gal at TDS = 12,000 ppm; so, for TDS = 1,500 ppm emission factor will be 0.002375 lb/10^3gal. The emission factor is for PM_{10} but is assumed the same for PM and $PM_{2.5}$.
1,700 gpm × 0.002375 lb/10^3gal × 60 min = 0.242 lb/hr = 1.06 tons/yr
1,670 gpm × 0.002375 lb/10^3gal × 60 min = 0.266 lb/hr = 1.17 tons/yr

Product Loading:
Railcar and Truck Loading from Kettle Nos. 9 and 10
Emission calculations are based on C-5 resin production (140 MM lbs/yr), C-5 resin density (7.40 lbs/gal), loading temperature (220 °C), and emission factors derived from AP-42, Section 5.2, Transportation and Marketing of Petroleum Liquids, 1/95, equation (1).
Potential VOC emissions = 0.796 tons/yr.

Drumming of Blended resin from Kettle 8 (UHF Filter)
Emission calculations are based on annual volume charged (383,283 gal/yr), density (7.04 lb/gal), liquid temperature (220 °C), system pressure (760 mmHg), and equation for vessel filling, Ideal Gas Law, contained in Section 3.1.1, Methods for Estimation from Chemical Manufacturing Facilities, EIIP, August 2007.
Potential VOC emissions = 0.14 tons/yr.

Total Product Loading VOC emissions = 0.94 tons/yr.

C-5 Hot Oil Furnace (S056):
The PM, SO_2, NO_X, CO, and VOC calculations used factors from AP-42, Section 1.4, Natural Gas Combustion, 7/98. Per AP-42, PM, PM_{10}, and $PM_{2.5}$ are the same when natural gas used as the fuel. The PM, PM_{10}, and $PM_{2.5}$ include both filterable and condensable fractions. A 15% adjustment factor was added to all emissions calculated using AP-42 factors to account for operational variability of equipment.

Emission Limits:
PM, PM_{10}, and $PM_{2.5}$: 0.059 × 1.15 = 0.068 lbs/hr or 0.297 tons/yr
SO_X: 0.006 × 1.15 = 0.007 lbs/hr or 0.030 tons/yr
NO_X: 1.033 × 1.15 = 1.188 lbs/hr or 5.20 tons/yr
CO: 0.868 × 1.15 = 0.998 lbs/hr or 4.37 tons/yr
VOC: 0.057 × 1.15 = 0.066 lbs/hr or 0.287 tons/yr

Tank 161 (Resin Storage Tank):
Per paragraph 36 of the Consent Order, emission limits for Tank 161 are to be based on stack testing conducted in 2014.

Data from 2014 Stack Test and Supplemental Report of 2015:
Hourly VOC emissions – 0.4413 lbs/hr
Test displacement rate – 1.252 acfm = 561.9 gal/hr
VOC emission factor – 0.000785 lbs/gal of throughput
Maximum annual throughput – 2,500,000 gal/yr

Potential VOC emissions:
2,500,000 lb/yr × 0.000785 lb/gal: 2,000 hr/yr = 1.00 tons/yr

Potential HAP emissions:
Total HAP ratio to VOC = 0.027 (from comparison of hourly emissions from test)
Toluene ratio to VOC = 0.026 (from comparison of hourly emissions from test)

Total HAP potential:
0.4413 lb/hr × 0.027 = 0.012 lb/hr
1.00 tons/yr × 0.027 = 0.027 tons/yr

Toluene potential:
0.4413 lb/hr × 0.026 = 0.011 lb/hr
1.00 tons/yr × 0.026 = 0.026 tons/yr

Tank 504 (Resin Storage Tank):
Per paragraph 36 of the Consent Order, emission limits for Tank 504 are to be based on stack testing conducted in 2014.

Data from 2014 Stack Test and Supplemental Report of 2015:
Hourly VOC emissions – 0.021 lbs/hr
Test displacement rate – 0.133 acfm = 59.7 gal/hr
VOC emission factor – 0.000352 lbs/gal of throughput
Maximum annual throughput – 5,700,000 gal/yr

Potential VOC emissions:
5,700,000 lb/yr × 0.000352 lb/gal: 2,000 hr/yr = 1.00 tons/yr

Potential HAP emissions:
Total HAP ratio to VOC = 0.048 (from comparison of hourly emissions from test)
Toluene ratio to VOC = 0.033 (from comparison of hourly emissions from test)

Total HAP potential:
0.021 lb/hr × 0.048 = 0.001 lb/hr
1.00 tons/yr × 0.048 = 0.048 tons/yr

Toluene potential:
0.021 lb/hr × 0.033 = 0.001 lb/hr
1.00 tons/yr × 0.033 = 0.033 tons/yr

Raw Material Tanks (50, 54, 55, 500 & 511):
Storage tanks 50, 54, 55, and 500 are internal floating roof tanks for the storage of different kind of raw materials.

Storage tank 511 is a vertical fixed roof tank for the storage of White Oil with emissions vented to the atmosphere. All storage tanks have a different capacity from 182,769 to 15,053,540 gallons per year. Emissions from the tanks were calculated with the Tanks 4.0.9d program, based on a maximum throughput rate of raw material a year through each.

Potential VOC emissions for all of these tanks – 5.908 tons/yr

Raw Material Tanks 52 and 53:
Details for these emission calculations in the Technical Support Documents for Installation Permit Nos. 0058-I017 and 0058-I021.

Storage tanks 52 and 53 are internal floating roof tanks for the storage of Piperylene concentrate. Emissions from the tanks were calculated with the Tanks 4.0.9d program, based on a maximum throughput rate. Fugitive emissions for these tanks were calculated with the emission factors taken from "Protocol for Equipment Leak Emission Estimates", November 1995; Table 2-5, SOCMI Screening Ranges Emission Factor.

Potential VOC emissions:
Tank 52: 1.49 tons/yr (tank) & 0.88 tons/yr (fugitive)
Tank 53: 0.41 tons/yr (tank) & 2.31 tons/yr (fugitive)

Resin Storage Tanks (121, 123, 124, 365, 366, 367, 601 & 602):
Storage tanks 121, 123, 124, 366, 367, 601, and 602 are vertical fixed roof tanks for the storage of resin with emissions vented to the atmosphere. All storage tanks have a different capacity from 2,483 to 715,310 gallons per year.

Data for emission calculations:
Emission Factor – 0.3225 lb/1,000 gal (based on TANKS updated with Piccotac 9095 Antoines & MW = 228)
Resin Density – 7.4 lb/gal
Maximum Throughput – 81,400,000 lb/yr
Maximum Throughput – 11,000 10^3 gal/yr
Potential VOC emissions for all these thanks – 1.78 tons/yr

Table 7a: Summary of Maximum Potential Emissions for C-5 Polymerization Process, Tons/Year[1]

Emission Point	Process Unit	PM	PM_{10}	VOC	Toluene	Total HAP	NO_X
S044	Thermal Oxidizer	0.20	0.20	0.46	0.46	0.46	26.24
S056	Hot Oil Furnace	0.30	0.30	0.29	-	-	5.20
S052	Resin Kettle #8	-	-	0.38	0.09	0.09	-
	Resin Kettle Nos. 9 & 10	-	-	1.81	-	-	-
	Cooling Towers J-1000-5 & J-1200-1	2.23	2.23	-	-	-	-
S312	Sparkler Filter	-	-	0.05	0.05	0.05	-
	Sparkler Precoat	-	-	0.01	0.01	0.01	-
S051	Reclaim Dump Station	0.03	0.03	-	-	-	-
S048	Inhibitor Dump Station	0.01	0.01	-	-	-	-
S310	Precoat Tank Dump Station	0.00	0.00	-	-	-	-
	Raw Material Tanks[2]	-	-	8.15	0.20	0.20	-
	Resin Storage Tanks[3]	-	-	3.78	0.06	0.26	-
	Resin Product Loading	-	-	0.94	-	-	-
	Total	**2.77**	**2.77**	**2.77**	**15.87**	**0.87**	**1.07**

1. A year is defined as any consecutive 12-month period.
2. Included tanks 50, 52, 53, 54, 55, 500 & 511.
3. Included tanks 121, 123, 124, 161, 365, 366, 367, 504, 601 & 602.

Table 7b: Summary of Maximum Potential Emissions for C-5 Polymerization Process, Lbs/Hour[1]

Emission Point	Process Unit	PM	PM_{10}	VOC	Toluene	Total HAP	NO_X
S044	Thermal Oxidizer	0.05	0.05	0.11	0.11	0.11	5.99
S056	Hot Oil Furnace	0.07	0.07	0.07	-	-	1.19
S052	Resin Kettle #8	-	-	0.004	0.001	0.001	-
	Resin Kettle Nos. 9 & 10	-	-	1.6	-	-	-
	Cooling Towers J-1000-5 & J-1200-1	0.51	0.51	-	-	-	-
	Total	**0.63**	**0.63**	**1.78**	**0.11**	**0.11**	**7.18**

3. <u>C5 Unit – Pastillation Process</u>

Details for these emission calculations are in the Technical Support Documents for Installation Permit No. 0058-I018a.

Pastillating Belts (Stack S055 and fugitive):
Emissions calculations for the Pastillating Belts are based on the Belt capacity (11,000 lbs/hr per belt and 22,000 lbs/hr total); maximum annual throughput – 140 MM lbs/yr; stack test results (2012 and 2013), and 15% adjusted factor. Based on that, emissions are:
VOC stack emissions – 1.95 lbs/hr or 6.21 tons/yr
VOC fugitive emissions – 0.34 lbs/hr or 1.09 tons/yr
Toluene stack emissions – 0.14 lbs/hr or 0.45 tons/yr
Toluene fugitive emissions – 0.03 lbs/hr or 0.09 tons/yr

Dust Collector (Stack S163):
Process equipment includes belt conveyors, product bins, and bagging stations. Dust collector is a control device for this equipment. Emissions calculations were based on the Belt capacity 11,000 lbs/hr (for two belts – 22,000 lbs/hr); annual production rate - 140 MM lbs/year and 99.9% control efficiency. The emission factor derived by assuming 5% of material lost and directed to dust collector.

22,000 lbs/hr × 0.05 lbs/lbs resin × (1-99.9%) = 1.1 lbs/hr
140,000,000 lbs/yr × 0.05 lbs/lbs resin × (1-99.9%) = 7,000 lbs/yr = 3.5 tons/yr

Cooling Towers:
Emission calculations based on recirculation rate 4,300 gpm and 686 gpm; water total dissolved solids (TDS) concentration 1,500 ppm and emission factors contained in AP-42, Section 13.4, wet Cooling Towers, 1/95. The emission factor was adjusted as follows: based on AP-42 emission factor = 0.019 lb/103gal at TDS = 12,000 ppm; so, for TDS = 1,500 ppm emission factor will be 0.002375 lb/103gal. The emission factor is for PM_{10} but is assumed the same for PM and $PM_{2.5}$.

4,300 gpm × 0.002375 lb/103gal × 60 min = 0.613 lb/hr = 2.68 tons/yr
686 gpm × 0.002375 lb/103gal × 60 min = 0.10 lb/hr = 0.43 tons/yr

Table 8: Summary of Maximum Potential Emissions for C-5 Pastillation Process

Emission Point	Process Unit	PM tons/yr[1]	PM_{10} tons/yr[1]	$PM_{2.5}$ tons/yr[1]	VOCs tons/yr[1]
S055	UHF Fume Filter & Demister Stack Fugitive	0	0	0	6.21 1.09
S163	Dust Collector	3.5	3.5	3.5	0
NA	Cooling Towers	3.11	3.11	3.11	0
	Total	**6.61**	**6.61**	**6.61**	**7.30**

[1]A year is defined as any consecutive 12-month period.

4. C5 Unit Summary

Table 9: Summary Of Maximum Potential Emissions for C5 Unit, Tons/Year[1]

Pollutant	$AlCl_3$ Handling Operation	Polymerization Process	Pastillation Process	Total
PM	0.55	2.77	6.61	9.93
PM_{10}	0.55	2.77	6.61	9.93
Hydrochloric Acid	0.55	-	-	0.55
VOC	-	15.53	7.30	22.83
Toluene	-	0.87	-	0.87
Total HAP	-	1.07	-	1.07
NO_X	-	31.44	-	31.44

[1]A year is defined as any consecutive 12-month period.

MP POLY UNIT

Process Description

Hydrocarbon resins from mixtures of pure monomers such as styrene and substituted styrenes are manufactured in the MP Poly Unit in a batch polymerization process.

The solvent and monomer feeds are dried in Alumina Dryers and/or Calcium Chloride Dryer to remove moisture, then blended in the Preblend Tank. The Preblend Tank is equipped with a glycol condenser. The monomer blend is then fed into the Reactor where it is polymerized at isothermal conditions and around 1 psig pressure with Boron Trifluoride (BF_3) catalyst. The Reactor vents through a cooling tower water condenser and then through the BF_3 scrubber. After reaction, the polymerizate is neutralized with lime in the Neutralizer, where the lime reacts with the catalyst forming a filterable precipitate. Particulate emissions from the Lime Storage Silo and Lime Filter Receiver are controlled by baghouses. The Neutralizer is heated to improve filtration in the leaf-type Funda Filters.

The Neutralizer vents through two cooling tower condensers in series followed by a glycol condenser. The material in the Neutralizer is pumped through a Funda Filter, either Funda Filter West or Funda Filter East, which removes the solids from the resin/solvent solution. The filtered material is sent to the Filtrate Receiver, which vents through a cooling tower water condenser followed by a glycol condenser. The material in the Filtrate Receiver, called polymerizate, is pumped out to storage tanks (Tanks 301, 302, 303) where it is held until fed to the LTC units for final processing and packaging.

There may be fugitive VOC/HAP emissions that escape during the addition of solid material at the precoat tank. These emissions are minimal and considered insignificant.

There are also three auxiliary operations at the MP Poly Unit which are not part of every product batch cycle: unit flushing, Funda Filter cleanings, and Alumina Dryer regenerations.

- Unit Flushing: The process unit is flushed at the end of certain production campaigns. A flush is needed if residual material left in the unit from the last campaign could adversely affect the quality of the material produced in the next campaign. Unit flushing consists of the following steps:
  - Solvent is pumped to the Reactor.
  - The solvent in the Reactor is heated and circulated.
  - The solvent flush is pumped to the Neutralizer and then through the Funda filter to the Filtrate Receiver.
  - The majority of the time, a second flush is added to the reactor and the process is repeated.
  - Occasionally, the solvent flush is started in the Preblend Tank. In that case solvent is pumped directly to the Preblend Tank and circulated. It is then pumped over to the Reactor.

- Funda Filter Cleanings: Periodically, the Funda Filter must be cleaned to remove the cake from the filter. There is no set number of batches that is put through the filter between cleaning; rather, if filtration times become too long, the filter is cleaned. The cleaning process consists of the following steps:
  - The filter cake is washed with solvent to remove residual resin from it. Most of the solvent left in the filter after this step is pumped back to the Solvent Wash Tank. Any residual solvent is then blown back to the Solvent Wash Tank with nitrogen.
  - The filter cake is dried with hot nitrogen. Residual solvent from the cake is removed by the nitrogen, condensed, and collected in the Heel Tank. This activity occurs in a closed loop system, so nitrogen is not vented.
  - The cake is spun off the leaves and dropped into a bin for disposal.
  - The filter is precoated with a filter aid. This step consists of pumping a slurry of solvent and filter aid from the Precoat Tank through the filter and back to the Precoat Tank. At the end of this step, any remaining solvent in the Funda is blown back to the Precoat Tank with nitrogen. The bag dump station associated with the Precoat Tank is controlled using a baghouse.

- Regeneration of Alumina Dryers: Periodically, the alumina in the dryers must be regenerated by evaporating the moisture from the alumina beads. The following are the steps in the regeneration process:
  - The contents of the alumina dryers are drained to the Mole Sieve Drain Tank.
  - The dryers are flushed twice with solvent. These flushes are also drained to the Mole Sieve Drain Tank.
  - Hot nitrogen is circulated through the dryer to remove the moisture from the alumina beads. This is a closed loop system, and no nitrogen is vented during this time. During circulation, water and solvent removed from the dryer beads are drained to either the contaminated dryer draining's tank or the Heel Tank.

Other equipment associated with MP Poly include:

- Storage Tanks: There are three storage tanks (Tanks 301, 302, 303) used in the MP Poly process unit for storage of final product (polymerizate). There are several storage tanks used for raw materials and intermediates for both the MP Poly as well as the WW Poly Units. These tanks are listed in the WW Poly Unit.
- Secondary Emergency BF_3 Scrubber System: The secondary emergency BF_3 scrubber system is located downstream of the primary BF_3 scrubber and emission point S029. The emergency scrubber is used as an emergency scrubber for the primary scrubbers at both the MP and WW Poly Units as well as for the BF_3 storage shed.
- Blowdown Tank: Emergency Relief Vents from throughout the process are directed to the Blowdown Tank, thereby bypassing control devices in the event of an emergency.

Emission calculations

The production facility has never operated, and is not anticipated to operate, wholly on the higher vapor pressure solvent (e.g., recycled hydrogenation solvent or RHS). Actual production of RHS based products from the MP Poly unit has not exceeded 5% of the total production for the unit. Consistent with EPA guidance for estimating annual potential to emit for batch operations, the split between high emission rate products (RHS based), and low emission rate products (HVD based) has been estimated for a market scenario deemed reasonable and foreseeable for full production. This estimated split is 10% RHS based and 90% HVD based; maximum batches per year – 2,600.

The maximum emission rate per batch of product is affected by activities that increase vapor displacement or inert gas throughput. The potential to emit includes consideration of the number of "Funda pushes" (pushing product out of vessels using compressed nitrogen), unit flushes, Funda cleanings, and dryer regenerations. While a simple emission factor per batch can be derived from the performance testing that included consideration of maximum vapor displacement, such a factor over-estimates emissions for all scenarios where actions are taken that minimize emissions such as reducing the number of cleanings. Accounting for the number of each activity provides means to improve emission estimates while still utilizing the information gained from the performance tests.

For the short-term HAPs emissions limit (lb/batch) for stacks S029, S034, and S035, limit that was based on stack testing does not account for higher temperatures as experienced during warmer summer months and for adjusted vapor flowrates. So, the calculations are based on:

lb/batch = calculated stack test emission rate (lb/batch) × HAP vapor pressure at expected maximum temperature/HAP vapor pressure at stack test temperature × vapor displacement for standard batch/assumed vapor displacement during stack test.

Details of emission calculations can be found in the Technical Support Documents for Permit Nos. 0058-I022 and 0058-I022a.

Reactor (S029):
A normal batch cycle for the reactor consists of pumping from the pre-blend tank into the reactor while purging with nitrogen. BF_3 catalyst is added to the reactor. In addition, bubblers used for level measurement add nitrogen to the reactor.

Filtrate System (S034):
A batch cycle for the Filtrate Receiver may also include a nitrogen push through the Funda Filter to the Filtrate Receiver to empty the Funda Filter. It also uses nitrogen bubblers for level measurement. The nitrogen push is not always required. The calculation of emissions assumes that pushes are required between batches and this assumption ensures the maximum amount of inert gas flow is considered.

Preblend Tank (S035):
A batch cycle for the preblend tank consists of filling the vessel once and then holding the material until it can be pumped to the reactor. There is always a small flow of nitrogen into the preblend tank from a bubbler used for instrumentation.

Dryer Regenerations (S033):
Emissions are generated from this emission point when material is transferred from one dryer to another prior to regeneration.

Storage Tanks:
Storage tanks 301, 302, and 303 are vertical fixed roof tanks for the storage of polymerizate with emissions vented to the atmosphere. All three storage tanks are the same. Emissions from the tanks were calculated with the Tanks 4.0.9d program. Basis for calculations:

- All HVD material – higher HAP content than RHS
- Maximum HVD vapor pressure
- Maximum Styrene vapor pressure
- Maximum HAP content.

VOC emissions – 913.23 lbs/tank/yr × 3 tanks = 2740 lbs/yr = 1.37 tons/yr
HAP emissions – 36.14 lbs/tank/yr × 3 tanks = 108.42 lbs/yr = 0.054 tons/yr

BF_3 Scrubber:

Unlike a typical scrubber, this scrubber is a very small horizontal scrubber with a fiber mesh that allows the incoming gas and scrubber water to mix. There is no other kind of packing applicable to this process. The purpose is only to remove BF_3, and the scrubber water alone is sufficient to do that. The control efficiency is greater than 99%. Soda ash is added only to prevent corrosion of equipment. Manual samples are taken once per month to measure the pH (which needs to remain above 7.5 to prevent corrosion).

Cooling Tower:

Emission calculations are based on emission factors contained in AP-42, Section 13.4, Wet Cooling Towers, 1/95; a recirculation rate 2,500 gpm; and a water total dissolved solids (TDS) concentration of 1,603 ppm. Maximum potential emissions will be 0.38 lb/hr or 1.67 tons/yr.

Baghouses (S030, S031):

Process equipment includes three baghouses. Emission calculations are based on manufacturer data for each baghouse: maximum dust loading, operating hours of 8,760 per year, and a 99.0% removal efficiency. Precoat tank/Bag dump Baghouse (emission point F010) not included in this estimate as it does not vent outside the building.

Table 10: Maximum Potential Emissions Summary for MP Poly Unit

Stack ID	Equipment Description	VOC		HAPs		PM	
		tons/yr[1]	lb/batch	tons/yr[1]	lb/batch	tons/yr[1]	lb/batch
S029	Reactor	1.65	7.9	0.009	0.085	-	-
S030	Lime Silo Storage Tank	-	-	-	-	0.001	-
S031	Lime Filter Receiver	-	-	-	-	0.096	-
S033	Dryers regeneration, Precoat tank, Mole sieve drain tank	0.51	-	0.031	-	-	-
S034	Filtrate system (filtrate receiver, neutralizer, solvent wash tank, heel tank, Funda filter)	10.33	11.0	0.334	0.152	-	-
S035	Preblend Tank	0.99	2.6	0.087	0.102	-	-
	Storage Tanks 301, 302, and 303	1.37	-	0.054	-	-	-
F010	Baghouse (bag dump station)					0.029	-
	Cooling Tower	-	-	-	-	1.67	-
	Total	**14.85**	**21.5**	**0.49**	**0.34**	**1.796**	**-**

[1] A year is defined as any consecutive 12-month period.

Table 11: MP Poly Unit Hazardous Air Pollutant Emissions

Emission Points	Styrene tons/yr[1]	Xylene tons/yr[1]	Ethylbenzene tons/yr[1]	Cumene tons/yr[1]	Benzene tons/yr[1]
Reactor	0.002	0.002	0.002	0.003	
Dryer regeneration	0.017	0.008	0.002	0.004	
Filtrate system	0.112	0.098	0.057	0.067	0.001
Preblend tank	0.072	0.004	0.006	0.003	
Tanks 301, 302, and 303	0.009	0.009	0.004	0.007	
Total	**0.212**	**0.121**	**0.071**	**0.084**	**0.001**

[1] A year is defined as any consecutive 12-month period.

WW POLY UNIT

Process Description

Hydrocarbon resins from mixtures of pure monomers such as styrene and substituted styrenes are manufactured in the WW Poly Unit in a batch polymerization process using either boron trifluoride (BF_3) or acid clay catalyst.

The first step in the process is to dry the monomers and solvent, either high-value-distillate (HVD) solvent or recycled hydrogenation. Hydrocarbon resins from mixtures of pure monomers such as styrene and substituted styrenes are manufactured in the WW Poly Unit in a batch polymerization process using either boron trifluoride (BF_3) or acid clay catalyst.

The first step in the process is to dry the monomers and solvent, either high-value-distillate (HVD) solvent or recycled hydrogenation solvent (RHS), through one of three activated Alumina Feed Dryers and into either the North Preblend Tank or the East Preblend Tank. There are no process emissions from the Alumina Feed Dryers during normal operation; there are only emissions during regeneration, which is discussed below. Each Preblend Tank is equipped with a water-cooled condenser supplied with cooling tower water. When acid clay is used as the catalyst, the solid catalyst is added to solvent to form a slurry in the Slurry Tank.

The monomer and solvent are pumped from the Preblend Tanks to either the North Reactor or South Reactor and polymerized isothermally at atmospheric pressure using acid clay or BF_3. The material in the reactor is circulated through a heat exchanger to remove the heat from the polymerization reaction. After the reaction is complete, the polymerizate (solvent/resin) is pumped over to either the North Neutralizer or South Neutralizer. The material is heated and lime is added (if BF_3 is used). A solvent flush is then typically added to the reactors to remove any residual material. The material then gets pumped to the neutralizers. Following this, the reactor may be purged with nitrogen. Each Reactor is cooled by a cooling water condenser followed by a glycol cooled condenser. The gas from the glycol condensers is then passed through a scrubber, which uses a soda ash solution to remove any residual BF_3. The North Neutralizer is equipped with a cooling tower water condenser followed by a chilled glycol condenser to control emissions prior to discharge to the atmosphere. The South Neutralizer is equipped with a chilled glycol condenser.

The polymerizate is pumped from the Neutralizers through one of two Funda Filters, North Funda Filter and South Funda Filter. The lime and lime-BF_3 salts or acid clay are deposited on the leaves of the filter, while the filtered polymerizate passes through to either the West Filtrate Receiver or East Filtrate Receiver. After the neutralizer is empty, the remaining liquid in the filter is blown over to the respective receiver using a nitrogen purge. The material is held in the receiver until the quality has been determined to be acceptable at which point it is pumped to an intermediate product storage tank. The Filtrate Receivers are each equipped with their own glycol cooled condensers.

There may be fugitive VOC/HAP emissions that escape during the addition of solid material at the reclaim tank, slurry tank, and neutralizer dump station. These emissions are minimal and considered insignificant.
There are other auxiliary operations at the WW Poly Unit which are not part of every product batch cycle: unit flushing, Funda Filter cleanings, Alumina Dryer regenerations, and Reclaiming.

- Unit Flushing: The process unit is flushed at the end of some production campaigns. Unit flushing consists of the following steps:
    - The solvent is pumped to either the North or South Reactor where it is heated and circulated through the reactor and cooling loop.
    - The solvent is pumped to the other reactor and circulated.
    - The solvent is pumped to the Neutralizers and then through the Funda Filters to the Filtrate Receiver.
- Funda Filter Cleanings: Periodically, the Funda Filters must be cleaned to remove the cake from the filter. There is no set number of batches that is put through the filter between cleaning; rather, if filtration times become too long, the filter is cleaned. The cleaning process consists of the following steps:
    - The filter cake is washed with solvent to remove residual resin from it. Solvent is transferred from the Solvent Wash Receiver to one of the Neutralizers. The solvent is heated in the Neutralizer and then circulated through the Funda Filter and back to the Neutralizer. Once this process is complete,

the solvent from the Funda Filter discharge line is directed to the Solvent Wash Receiver and the Neutralizer is pumped empty. Any remaining solvent in the Funda Filter is then nitrogen blown to the Solvent Wash Receiver. A glycol chilled condenser controls any emissions from the solvent wash receiver as materials are transferred.

  - The filter cake is steamed to remove residual solvent. The vapor is condensed in cooling water cooled condenser and collected in the Funda Condensate Tank where the solvent separates from the water. Vapors from this tank are treated by passing them through carbon absorber.
  - The cake is spun off the leaves and dropped into a bin for disposal. There are no VOC emissions from this step.
  - The filter is pre-coated with a filter aid. This step consists of adding solvent and filter aid to one of the Neutralizers. This slurry is circulated from the neutralizer through the Funda Filter and back to the neutralizer. The filter aid is deposited on the filter leaves. After circulation of the slurry is complete, the flow of material from the discharge of the Funda Filter is directed into the Solvent Wash Receiver. Any remaining solvent in the filter is blown out with nitrogen to the Solvent Wash Receiver.
- Regeneration of Alumina Dryers. Periodically, the Alumina Dryers must be regenerated to remove the water that has been absorbed by the alumina beads. This is accomplished by using an internal electric heater to heat the beads while passing a small nitrogen purge through the dryer. The dryer is also placed under vacuum during the regeneration process using a steam jet. Water and solvent are removed from the beads, condensed, and sent to a tank for disposal as waste. The gas from the process is passed through a cooling water condenser followed by a glycol condenser prior to being discharged to the atmosphere.
- Reclaiming. The Reclaim Pot is used to re-dissolve non-conforming product in solvent for recovery into current production. Bags of pastillated resin are dumped manually into the vessel and dissolved in the solvent. The material from the reclaim pot is pumped directly to the appropriate poly oil storage tanks. Emissions from the reclaim pot are controlled by a cooling tower water condenser.

Other equipment associated with WW Poly include:

- Storage Tanks 68, 69, 74: These tanks exhaust through a common glycol cooled condenser.
  - Tanks 68 and 69 receive and store resin/RHS solvent mixtures that have been processed through the Hydrogenation Unit. This material is sent for solvent stripping at the facility's Limited Thermal Contact (LTC) units where the finished product resin is separated from the solvent.
  - Tank 74 is used to store RHS, which is used at the WW Poly Unit. It is recycled back to the tank from the LTC finishing units.
- • Storage Tanks 73, 75, 76, 77: These tanks exhaust through a common glycol cooled condenser.
  - Tanks 73, 75, and 76 are used to store polymerizate from the WW Poly Unit. Material is pumped from these tanks to the LTC units where the finished product resin is separated from the solvent.
  - Tank 77 is used to store HVD, which is used at the WW and MP Poly Units. It is recycled back to the tank from the LTC finishing units.
- Storage Tank 67: Tank 67 is used to store HVD solvent that is used at the WW Poly and MP Poly Units. Solvent is recycled back to this tank from the LTCs. Tank 67 exhausts through a dedicated glycol cooled condenser.
- Miscellaneous Tanks: A number of tanks in addition to those described above are used throughout the WW Poly Unit and other areas for storage of raw and intermediate materials.
  - Tanks 204, 205, 206, 207: These tanks are controlled with cooling tower water condensers, followed by a carbon adsorber.
  - Tank 35, 10, 22, 24, 23, 25, 26, 28, 29, 34, 66, 71, 72, 200, 201, 202: These tanks do not have emission control devices on them.
- Secondary Emergency BF_3 Scrubber System: The secondary emergency BF_3 scrubber system is located downstream of the primary BF_3 scrubber. The emergency scrubber is used as an emergency scrubber for the primary scrubbers at both the MP and WW Poly Units as well as for the BF_3 storage shed.
- Blowdown Tank: Emergency Relief Vents from the Funda filters, reactors, and neutralizers are directed to the Blowdown Tank, thereby bypassing control devices in the event of an emergency.

- Knockout Pot: Emergency relief vents from the Preblend Tanks, Dryers, Receivers, Slurry Pot, and Dryer Condensate Pot are directed to the knockout pot, thereby bypassing control devices in the event of an emergency. Tanks 27 is used as an overflow tank for the knockout pot.

Emission calculations
Details of emission calculations can be found in the Technical Support Document for Permit No. 0058-I023.

Feed Dryers (S013):
The after-condenser for emission point S013 is isolated from the feed dryer during normal operation since the dryers operate liquid full of a continuous liquid stream being pumped through them. No emissions are generated at the dryers during the drying step. The after-condenser is used when the feed dryer bed is being regenerated. Emissions occur from the nitrogen purge that is used on the dryer when regenerating. Revised Supplemental Test Report methodologies (report dated April 4, 2017) have been used as the basis for the stack testing emissions calculations.

Feed Dryers (S013a):
Emissions are generated from the S013a by displacement of vapor when the contents of a liquid filled dryer are transferred to an empty dryer prior to regeneration.

East and North Preblend Tanks (S014, S015):
Emissions occur when monomer and/or solvent are pumped into the blend tanks during the blending step and unit flushing. There is also a small flow of nitrogen into the preblend tank from bubblers used for instrumentation. These have a maximum setting of 2 ACFM each. Revised Supplemental Test Report methodologies (report dated April 4, 2017) have been used as the basis for the stack testing emissions calculations.

Slurry Tank (S016):
Emissions from the slurry tank occur when solvent is pumped into the tank to produce a clay/solvent slurry.

North and South Reactors (S017):
The two reactors have a common vent point at the BF_3 scrubber. Unlike a typical scrubber, this scrubber is a very small horizontal scrubber with a fiber mesh that allows the incoming gas and scrubber water to mix. There is no other kind of packing applicable to this process. The purpose is only to remove BF_3, and the scrubber water alone is sufficient to do that. The control efficiency is greater than 90%. Soda ash is added only to prevent corrosion of equipment. Manual samples are taken once per month to measure the pH (which needs to remain above 7.5 to prevent corrosion).

Emissions occur from displacement of vapor when material is pumped into a reactor, nitrogen purging between and during batches, and heating of the reactor contents. Revised Supplemental Test Report methodologies (refer to report of April 4, 2017) have been used as the basis for the stack testing emissions calculations.

Neutralizers (S018, S021):
Emission occurs from displacement of vapor when material including batches, solvent flushes, and solvent for Funda filter flushing/precoating is pumped into a neutralizer. Additional emissions occur from heating of the material, and nitrogen from bubblers used for level measurement. Revised Supplemental Test Report methodologies (report dated April 4, 2017) have been used as the basis for the stack testing emissions calculations. Emissions are divided evenly between two Neutralizers.

Funda Filter Steam-out Process/Recycle Tank (S019, S019a):
These emissions points are not connected to the normal flow of product through the Funda filters and are only used during the steaming step of the Funda cleaning process. Revised Supplemental Test Report methodologies (report dated April 4, 2017) have been used as the basis for the stack testing emissions calculations.

West Filtrate Receiver/East Filtrate Receiver (S020, S027):
Emissions occur from the filtered material entering the Filtrate Receiver (T-900-1) from the Funda filters. Emissions from the filtrate receiver are controlled by a glycol chilled condenser (E-900-7).

The Auxiliary Receiver (T-901-1) is a secondary receiver that allows for two independent batch processing systems, serving the same functionality as the existing Filtrate Receiver (T-900-1). Emissions from the auxiliary receiver is controlled by a glycol-cooled condenser (E-901-7). Emissions are divided evenly between two receivers.

Reclaim Pot (S022) and Reclaim Dust Collector (S022a):
Emissions from the reclaim pot occur when pumping solvent into the vessel and when heating the vessel contents. Revised Supplemental Test Report methodologies (report dated April 4, 2017) have been used as the basis for the stack testing emissions calculations.

Emission occurs from the reclaim dust collector when bags of resin pastilles are dumped into the reclaim pot. Emission calculations are based on the total throughput, estimated loss (0.5%), and removal efficiency of 99.9% (by vendor).

Solvent Wash Receiver (S023):
Emissions from the reclaim storage tank (T-1000-1) occur when material is pumped into the tank. A glycol-cooled condenser (E-1000-5) controls emissions generated during Funda cleaning and precoating operations.

Tanks 68, 69, 74 (S024):
Tanks 68 and 69 receive and store resin/RHS solvent mixtures that have been processed through the facility's Hydrogenation Unit. This material is sent for solvent stripping at the facility's Limited Thermal Contact (LTC) units where the finished product resin is separated from the solvent.

Tank 74 is used to store RHS, which is used at the WW Poly Unit. It is recycled back to the tank from the LTC finishing units.

Tanks 68, 69, and 74 exhaust through a common glycol cooled condenser (E-201-1) identified as emission point S024. Emissions were calculated with the Tanks 4.0.9d program, based on a maximum throughput rate. Revised Supplemental Test Report methodologies (report dated October 7, 2016) have been used as the basis for the stack testing emissions calculations.

Tanks 73, 75, 76, 77 (S025):
Tanks 73, 75, and 76 are used to store polymerizate from the WW Poly Unit. Material is pumped from these tanks to the LTC units where the finished product resin is separated from the solvent.

Tank 77 is used to store HVD, which is used at the WW and MP Poly Units. It is recycled back to the tank from the LTC finishing units.

Tanks 73, 75, 76, and 77 exhaust through a common glycol cooled condenser (E-202-1) identified as emission point S025. Emissions were calculated with the Tanks 4.0.9d program, based on a maximum throughput rate. Revised Supplemental Test Report methodologies (report dated October 7, 2016) have been used as the basis for the stack testing emissions calculations.

Tank 67 (S026):
Tank 67 is used to store HVD solvent that is used at the WW Poly and Multi-Purpose Polymerization (MP Poly) units. Solvent is recycled back to this tank from the LTCs.

Tank 67 exhausts through a dedicated glycol cooled condenser (E-67-3) identified as emission point S026. Emissions were calculated with the Tanks 4.0.9d program, based on a maximum throughput rate. Revised

Supplemental Test Report methodologies (report dated October 7, 2016) have been used as the basis for the stack testing emissions calculations.

Neutralizer Bag Dump Station (S295), Local Exhaust at Neutralizer (S050), and Intermittent Vent during Solids Addition (S050a):

Emissions occur from S295 when bags of lime are emptied into the bag dump station and conveyed to the neutralizers. The bag dump station is vented through integral filter cartridges, outside of the building. Emission calculations are based on the total throughput, estimated loss (0.5%), and removal efficiency of 99.9%.

Local exhaust ducts above the hopper/dump chamber and manway on each neutralizer vent to S050. Emissions occur when the lime is conveyed to the hopper and gravity fed to the dump chamber underneath or when filter aid is added directly to the hopper.

The dump chamber is equipped with top and bottom valves. After the lime or filter aid in the chamber is pressurized into the vessel with nitrogen, the chamber is vented to the atmosphere through S050a to relieve any remaining pressure.

Emission factors for calculations PM emissions from S050 and S050a are from AP-42, Section 13.2.4, Aggregate Handling and Storage Piles, 11/06.

Slurry Bag Dump Station (S294):

Emissions occur from the slurry bag dump station when bags of clay are added to the slurry tank. Emission calculations based on the total throughput, estimated loss (0.5%), and removal efficiency of 99.9% (by vendor).

Additional Storage Tanks:

There are several storage tanks used for raw materials and intermediates for both the MP Poly process as well as the WW Poly process included in this permit. Emissions from these tanks were calculated with the Tanks 4.0.9d program, based on a maximum throughput rate.

Carbon Beds (S019a, S300):

Process equipment includes three carbon beds. Emission calculations are based on manufacturer data for each carbon bed and a 95% control efficiency.

Cooling Tower (S316):

Emission calculations are based on emission factors contained in AP-42, Section 13.4, Wet Cooling Towers, 1/95; a recirculation rate 1,000 gpm; and a water total dissolved solids (TDS) concentration of 1,500 ppm.

Table 12: Maximum Potential Emissions Summary for WW Poly Unit

Stack ID	Equipment Description	VOC	HAPs	Styrene	$PM/PM_{10}/PM_{2.5}$
		tons/yr[1]	tons/yr[1]	tons/yr[1]	tons/yr[1]
S013	Feed dryers	4.85	0.04	0.01	-
S013a	Feed dryer regeneration	0.01	0.00	0.00	-
S014	East Preblend tank	0.57	0.47	0.47	-
S015	North Preblend tank	0.57	0.47	0.47	-
S016	Slurry tank	0.02	0.00	0.00	-
S017	North and South Reactors	1.78	1.13	1.09	-
S018	North Neutralizer	0.31	0.02	0.01	-
S019	Funda Filter Steam Out/Flushing	0.01	0.00	0.00	-
S019a	Funda Filter Condensate Tank	0.00	0.00	0.00	-
S020	West Filtrate Receiver	5.11	0.21	0.08	-
S021	South Neutralizer	0.31	0.02	0.01	-
S022	Reclaim Pot	0.13	0.04	0.01	-
S022a	Reclaim Dust Collector	-	-	-	0.01

Stack ID	Equipment Description	VOC	HAPs	Styrene	PM/PM$_{10}$/PM$_{2.5}$
		tons/yr[1]	tons/yr[1]	tons/yr[1]	tons/yr[1]
S023	Solvent Wash Receiver	7.52	0.27	0.10	-
S024 S025 S026 S228	Storage Tanks 68/69/74 Storage Tanks 73/75/76/77 Storage Tank 67 Storage Tank 66	8.00	0.04	0.01	-
S027	East Filtrate Receiver	5.11	0.21	0.08	-
S195	Storage Tank 10	0.29	0.01	0.0	-
S206 S208	Storage Tank 22 Storage Tank 24	0.03	0.00	0.00	-
S207 S209	Storage Tank 23 Storage Tank 25	0.03	0.00	0.00	-
S211	Storage Tank 27	0.04	0.00	0.00	-
S210 S212 S213	Storage Tank 26 Storage Tank 28 Storage Tank 29	0.42	0.00	0.00	-
S074	Storage Tank 34	0.27	0.01	0.00	-
S230	Storage Tank 71	0.29	0.00	0.00	-
S231	Storage Tank 72	0.42	0.42	0.42	-
S239 S240 S241	Storage Tank 200 Storage Tank 201 Storage Tank 202	0.18	0.00	0.00	-
S300	Storage Tanks 204 - 207	0.04	0.00	0.00	-
S050	Neutralizers Local Exhaust	-	-	-	0.00002
S050a	Neutralizers Chamber Exhaust	-	-	-	0.000001
S294	Slurry Bag Dump Station	-	-	-	0.0004
S295	Lime/Filter Aid Bag Dump Station	-	-	-	0.0002
S316	Cooling Tower	-	-	-	0.62
	Total	**36.32**	**3.36**	**2.76**	**0.63**

[1] A year is defined as any consecutive 12-month period.

Every batch of material is processed through a pre-blend tank (north or east), reactor (north or south), neutralizer (north or south), and receiver (filtrate or auxiliary). Pound/batch limits are therefore based on the emissions through this equipment.

Depending on the product and other parameters in the process, auxiliary operations are performed periodically. These auxiliary operations include items such as vessel flushes, dryer regenerations, unit flushes, and funda cleanings and utilize vessels such as the solvent wash receiver and slurry tank. The emissions for the auxiliary operations have been included in the overall ton per year PTE calculations. Due to the intermittent nature and variability of these operations, they have not been included in the lb/batch calculation.

Table 13: Maximum Potential Emissions for WW Poly Unit (Short Term[1])

Stack ID	Equipment Description	VOC	HAPs	Styrene
		lb/batch	lb/batch	lb/batch
S014/S015	East/North Preblend Tank	1.82	1.25	1.25
S017	North & South Reactor	15.7	1.79	1.72
S018/S021	North/South Neutralizer	1.20	0.02	0.00
S020/S027	West Filtrate Receiver/East Filtrate Receiver	27.50	0.65	0.24
	Total	**46.22**	**3.72**	**3.21**

[1]Auxiliary operations not included.

Table 14: WW Poly Unit Hazardous Air Pollutant Emissions

Stack ID	Equipment Description	Xylene tons/yr[1]	Ethylbenzene tons/yr[1]	Cumene tons/yr[1]	Benzene tons/yr[1]
S013	Feed dryers	0.009	0.003	0.006	0.01
S013a	Feed dryer regeneration	0.0002	0.00004	0.0001	0
S014	East Preblend tank	0.001	0.0003	0.0007	0
S015	North Preblend tank	0.001	0.0003	0.0007	0
S016	Slurry tank	0.0003	0.00007	0.0002	0
S017	North and South Reactors	0.02	0.006	0.01	0.0003
S018	North Neutralizer	0.008	0.002	0.005	0
S019	Funda Filter Steam Out/Flushing	0.00007	0.00002	0.00005	0
S019a	Funda Filter Condensate Tank	0.00001	0.000001	0.000003	0
S020	West Filtrate Receiver	0.07	0.02	0.04	0
S021	South Neutralizer	0.008	0.002	0.005	0
S022	Reclaim Pot	0.01	0.003	0.008	0
S023	Solvent Wash Receiver	0.09	0.02	0.06	0
S024 S025 S026 S228	Storage Tanks 68/69/74 Storage Tanks 73/75/76/77 Storage Tank 67 Storage Tank 66	0.01	0.009	0.007	0.0002
S027	East Filtrate Receiver	0.07	0.02	0.04	0
S195	Storage Tank 10	0.003	0.001	0.002	0
S074	Storage Tank 34	0.003	0.001	0.002	0
S239 S240 S241	Storage Tank 200 Storage Tank 201 Storage Tank 202	0.001	0.0005	0.001	0
S300	Storage Tanks 204 - 207	0.0005	0.0002	0.0005	0
	Total	**0.3**	**0.09**	**0.19**	**0.003**

[1] A year is defined as any consecutive 12-month period.

HYDROGENATION (HYDRO) UNIT

Process Description

Polymerizate produced at the WW Poly and MP Poly Units is transferred to the Hydrogenation (Hydro) Unit, where it is selectively hydrogenated in a batch process. The polymerizate feed is stored in Storage Tanks 100 and 101. The polymerizate feed and a metal catalyst are pumped into the Metering Tank and subsequently metered into one of two autoclaves. Hydrogen is added to the Autoclaves to react with the polymerizate. After the reaction is complete, the contents of the Autoclaves are sent to the Vent Tank, then the unfiltered hydrogenated polymerizate is sent the Unfiltered Product Tank, also denoted Tank 104. From Tank 104, the product is sent to the Mott Filter to filter out the catalyst into the Catalyst Catch Tank and recycle it back to the process for reuse. The hydrogenated product is sent to intermediate storage tanks (Storage Tanks 102 and 105). It is then pumped to Storage Tanks 68 or 69 for processing in the LTC Finishing Unit.

Emissions from the polymerizate feed tanks (Storage Tanks 100 and 101) are controlled by a glycol condenser. Emissions from the Metering Tank, Catalyst Catch Tank, Mott Filter, Heel Tank, Solvent Tank (Tank 103) and Unfiltered Product Tank (Tank 104) are sent through two glycol condensers prior to discharge to atmosphere. Emissions from Autoclave Nos. 1, and 2, and Vent Tank are sent through various glycol condensers prior to discharge to the atmosphere. Emissions from the hydrogenated product tanks (Storage Tanks 102 and 105), as well as solvent storage tank (Storage Tank 106) are sent through a cooling tower water condenser to a glycol condenser prior to discharge to the atmosphere. The catalyst unloading system is controlled by a baghouse.

Tank 103 is used to store solvent for flushing the Mott Filter. Typically, when the unit is going to be down for a period of time, the Mott Filter is filled with solvent to prevent resin from solidifying on the filter elements. When switching products, the bottoms of the Mott Filter are sent to the Heel Tank.

<u>Emission calculations</u>
Details of emission calculations can be found in the Technical Support Document for Permit No. 0058-I027.

<u>Tanks T-100 & T-101 (S001):</u>

Control device	condenser E-101-4
Proposed outlet gas temperature	25 °C
Production throughput	3,057,065 gal/year

VOC emission calculations are based on the Supplemental Test report dated February 20, 2015. For the maximum potential emissions, a conservative emissions estimate was based on 100% RHS and RHS vapor pressure at the expected maximum temperature. HAP emissions were calculated based on the Supplemental Test Report dated February 20, 2015 and the Stack Test Report dated May 6-9, 2014. Total HAPs emissions includ HAPs from RHS- and HVD-based feed. All details of the calculations can be found in the Technical Support Document for Permit No. 0058-I027.

<u>Tanks T-103 and T-104, Metering tank, Catalyst Catch tank, Mott Filter, Heel tank (S004):</u>

Control device	condensers E-200-6 and E-201-2 in sequence
Number of production batches	3,000 batches/yr
Size of batch	7,500 lbs/batch
Production limit	22,500,000 lbs/yr
Number Hydro batches per fresh Catalyst charge	12 batches/charge
Max % of batches using HVD-based feed	20%

VOC emission calculations are based on Stack Test data from December 2019, and for the maximum potential emissions, RHS vapor pressure at expected maximum temperature was used. HAP emissions were calculated based on the Supplemental Test Report dated February 20, 2015 and updated per email to ACHD dated March 26, 2020. Maximum potential emissions were calculated for annual (tons/yr) and for short term (lb/batch). All details of the calculations can be found in of the Technical Support Document for Permit No. 0058-I027.

<u>Vent collection pot (S004):</u>

Control device	none
Emissions during Nitrogen purge	

<u>Input data – Nitrogen purge:</u>

Saturated with	RHS (for VOC), HVD (for HAP)
Nitrogen purge rate	4 scfh (2 bubblers)
Purge time	8,760 hrs
Condenser gas temperature	30 °C
System pressure	743 mmHg

Emission calculations are based on EIIP "Methods for Estimating Air Emissions from Chemical Manufacturing Facilities", August 2007, Section 3.2.2 - Purge or Gas Sweep, Ideal Gas Law. All details of the calculations can be found in the Technical Support Document for Permit No. 0058-I027.

<u>Fresh catalyst addition (S004):</u>

Control device	condensers E-200-6 and E-201-2 in sequence
Auxiliary operation	Tank T-200-1, Charging fresh catalyst

<u>Input data – purging:</u>

Material charged	35 lbs fresh catalyst (N_2 assisted)
Catalyst volume charged	7 gal (fresh catalyst – 5 lbs/gal)
Total Nitrogen flow	138 ft^3 (N_2 for fluidization and vacuum break while charging fresh catalyst)
Total volume charged	139 ft^3
Charge time	0.083 hrs
Condenser gas temperature	15 °C
System pressure	743 mmHg

Emission calculations are based on EIIP "Methods for Estimating Air Emissions from Chemical Manufacturing Facilities", August 2007, Section 3.1.1 – Charging to an Empty Vessel, Ideal Gas Law. All details of the calculations can be found in the Technical Support Document for Permit No. 0058-I027.

<u>Mott flush and N_2 purge (S004):</u>

Control device	condensers E-200-6 and E-201-2 in sequence
Weekend operation	fill Mott filter with solvent; N_2 bubblers on Metering tank (2) and Catalyst catch tank
<u>Input data (Displacement):</u>	
Material charged	RHS
Volume charged	379 gal
Charge time	0.5 hours
Condenser gas temperature	15 °C
<u>Input data (Nitrogen purge):</u>	
Saturated with	RHS
Nitrogen purge rate	6 scfh (3 bubblers)
Purge time	48 hours
Condenser gas temperature	15 °C

Emission calculations are based on EIIP "Methods for Estimating Air Emissions from Chemical Manufacturing Facilities", August 2007: For Displacement, Section 3.1.1 - Charging to an Empty Vessel, Ideal Gas Law; for Nitrogen purge, Section 3.2.2 - Purge or Gas Sweep, Ideal Gas Law. All details of the calculations can be found in the Technical Support Document for Permit No. 0058-I027.

<u>Catalyst unloading system (S005):</u>

Control device	Dust Collector S-203-5
<u>Transfer Nickel catalyst to the Metering tank:</u>	
Number of Hydro batches	3,000 batches/year
Number of Hydro batches per Fresh catalyst charge	12 batches/charge
Number of Fresh catalyst charge	250 charges/year
Fresh catalyst charge weight	35 lb/charge
Total fresh catalyst charge amount	8,750 lbs/year
Time per catalyst charge	5 min/charge
Estimated loss	0.5%
Removal efficiency	99%
PM emissions	0.44 lbs/yr or 0.021 lbs/hr or 0.00022 tpy

Dust collector efficiency – vendor information indicates 99.9%; used 99% as a conservative basis for emission estimate. All details of the calculations can be found in of the Technical Support Document for Permit No. 0058-I027.

<u>Spent catalyst drumming (S006):</u>

Control device	none

Transfer spent Nickel catalyst from Mott filter into Drums for disposal.

<u>Input data – Nitrogen purge end of filling drums:</u>

Nitrogen purge rate	200 scfh
Line purge time	0.03 hours
Outlet gas temperature	30 °C
Total N_2 volume for drumming	21.4 cf
System pressure	743 mmHg

Emission calculations are based on EIIP "Methods for Estimating Air Emissions from Chemical Manufacturing Facilities", August 2007, Section 3.2.2 - Purge or Gas Sweep, Ideal Gas Law. All details of the calculations can be found in the Technical Support Document for Permit No. 0058-I027, Table 11.

<u>Autoclave Nos. 1 and 2, Vent tank (S007):</u>

Control device:

Autoclave #1	condensers E-401-2 and E-403-2 in sequence
Autoclave #2	condensers E-402-2 and E-403-2 in sequence
Vent tank	condensers E-401-2, E-402-2 and E-403-2 in sequence

<u>Autoclaves to Vent tank:</u>

Proposed outlet gas temperature	10 °C
RHS batches	3,000 batches/year
Maximum temperature (batch)	30 °C

<u>Autoclave #1 charging:</u>

Proposed outlet gas temperature	10 °C
Control device	condensers E-104-1 and E-104-2 in order
Proposed outlet gas temperature	25 °C
RHS production throughput	3,057,065 gal/year
Total annual throughput	11,234,874 gal/year
RHS batches	1,500 batches/year
Maximum temperature (batch)	30 °C

<u>Autoclave #2 charging:</u>

Proposed outlet gas temperature	10 °C
RHS batches	1,500 batches/year
Maximum temperature (batch)	30 °C

VOC emission calculations are based on the Supplemental Test report from February 23, 2015. For the maximum potential emissions a conservative emissions estimate was used based on 100% RHS and RHS vapor pressure at expected maximum temperature. All details of the calculations can be found in the Technical Support Document for Permit Application No. 0058-I027.

VOC emission calculations for emissions from Autoclaves to Vent tank operations were based on Stack Test data from December 2019; data for RHS vapor pressure from 2012 and 2019; and the emission rate was recalculated for RHS vapor pressure at the expected maximum temperature. VOC emission calculations for emissions from Autoclave Nos. 1 and 2 charging were based on the Supplemental Test Report from February 20, 2015 and updated per email to ACHD on March 26, 2020; data for RHS vapor pressure from 2012 and 2013; and the emission rate was recalculated for RHS vapor pressure at the expected maximum temperature.

HAP emissions were calculated based on the Supplemental Test Report from February 20, 2015, and updated per email to ACHD from March 26, 2020. Maximum potential emissions were calculated for annual (tons/yr) and for short term (lb/batch). All details of the calculations can be found in the Technical Support Document for Permit No. 0058-I027.

Cooling Tower – Hydro J-4005-1:
Emission calculations are based on emission factors contained in AP-42, Section 13.4, Wet Cooling Towers, (1/95); a recirculation rate 400 gpm; and a water total dissolved solids (TDS) concentration of 1,500 ppm. All details of the calculations can be found in the Technical Support Document for Permit No. 0058-I027.

Tanks T-102, T-105, and T-106 (S012):
All details of the calculations can be found in the Technical Support Document for Permit No. 0058-I027.

Table 15: Maximum Potential Emissions for Hydro Unit

Stack ID	Equipment Description	VOC		HAPs		PM	
		tpy[1]	lb/batch	tpy[1]	lb/batch	tpy[1]	lb/hr
S001	Tanks T-100 & T-101	1.27	-	0.0074	-	-	-
S004	Tanks T-103 and T-104, Metering tank, Catalyst Catch tank, Mott Filter, Heel tank	12.75	21.54	0.071	0.71	-	-
	Vent collection pot	0.14	-	0.0007	-	-	-
	Fresh catalyst addition	0.06	-	0.0002	-	-	-
	Mott flush and N_2 purge	0.033	-	0.0000	-	-	-
	Subtotal	12.97	21.54	0.071	0.71	-	-
S005	Catalyst unloading system	-	-	-	-	0.0002	0.021
S006	Spent catalyst drumming	0.05	-	-	-	-	-
S007	Vent tank	13.37	23.33	-	-	-	-
	Autoclave #1 charging	0.78	2.72	-	-	-	-
	Autoclave #2 charging	0.97	3.40	0.015	0.15	-	-
	Subtotal	15.13	26.73	0.015	0.15	-	-
S012	Tanks T-102, T-105, T-106	7.35	--	-	-	-	-
	Cooling tower	-	-	-	-	0.25	0.057
	Total	**36.77**	**48.27**	**0.094**	**0.86**	**0.25**	**0.078**

[1] A year is defined as any consecutive 12-month period.

Table 16: Hydro Unit Hazardous Air Pollutant Emissions

Stack ID	Equipment Description	Styrene tons/yr[1]	Xylene tons/yr[1]	Ethyl-benzene tons/yr[1]	Cumene tons/yr[1]	Total HAP tons/yr[1]	Max total HAP lb/batch
S001	Tanks T-100 & T-101	0.0032	0.0013	0.0010	0.0018	0.0074	NA
S004	Tanks T-103 & T-104, Metering tank, Catalyst Catch tank, Mott Filter, Heel tank	0.0282	0.0131	0.0100	0.0193	0.0706	0.71
	Vent collection pot	0.0003	0.0001	0.0001	0.0001	0.0007	NA
	Fresh catalyst addition	0.0000	0.0001	0.0000	0.0000	0.0002	NA
	Mott flush and N_2 purge	0.0000	0.0000	0.0000	0.0000	0.0000	NA
	Subtotal	0.029	0.013	0.010	0.019	0.071	0.71
S007	Vent tank	0.0000	0.0000	0.0000	0.0000	0.0000	0.00
	Autoclave #1 charging	NA	NA	NA	NA	NA	NA
	Autoclave #2 charging	0.0061	0.0027	0.0021	0.0038	0.0147	0.15

Stack ID	Equipment Description	Styrene tons/yr[1]	Xylene tons/yr[1]	Ethyl-benzene tons/yr[1]	Cumene tons/yr[1]	Total HAP tons/yr[1]	Max total HAP lb/batch
	Subtotal	0.0061	0.0027	0.0021	0.0038	0.015	0.15
	Total	**0.038**	**0.017**	**0.013**	**0.025**	**0.094**	**0.86**

[1] A year is defined as any consecutive 12-month period.

LTC UNITS

Process Description

The LTC units are used to remove solvent/oils from resin and then package the final resin product. The LTC #2 process consists of a solvent removal unit and one packaging unit. The LTC #4 process consists of a solvent removal unit and two packaging units. LTC #1 is used only for purifying solvent and does not package any resin.

Finishing

The finishing process begins when LTC Nos. 2 or 4 receives a solution of resin dissolved in organic solvent (internally known as polymerizate) from the WW Poly, MP Poly, or Hydro Units. Polymerizate is heated to the appropriate temperature through one or more heat exchangers and passed to a separator operating under vacuum. In the flash separator, the resin product is separated from the oils and the solvent. Vaporized solvent and oils are drawn through a rectification column to separate the solvent from the oils. The molten resin from LTC #4 can undergo an additional steam stripping step using an evaporator. The resin produced from both units is either sent directly to the packaging process or is held temporarily in one of three resin kettles prior to packaging and shipping.

In the rectification column, the temperature and vacuum can be controlled such that purified solvent is drawn out the top of the column and oils collected in the bottom. The heavy oils are collected and sold for fuel. The solvent overheads pass through a condenser and collect in an accumulator (LTC #2) or oil water separator S-105-1 (LTC #4). The LTC #4 oil/water separator separates condensed solvent from water (generated by condensing steam used to strip the solvent from the resin). The water is drained to the sump and then to the Wastewater Treatment Plant (WWTP). The oil/water separator is vented through the process sump, from which emissions are controlled by a carbon bed.

The solvent from the LTC Nos. 1 and 2 accumulators and the LTC #4 oil/water separator is pumped to the solvent storage tanks for reuse at MP and WW Poly. The purified solvent is either aromatic High Value Distillate (HVD) or aliphatic Recycled Hydrogenation Solvent (RHS) depending on the type of resin being finished.

The LTC #1 unit receives a mixture of contaminated solvent decanted from the WWTP. This contaminated solvent is processed in a manner like the finishing processes described above for LTC Nos. 2 and 4. The separated resinous material is sent off-site for disposal, the heavy oils are sold as fuel, and the pure solvent is reused in the process.

The processes described above are continuous and run under a vacuum to facilitate the process of separating resin from the oil/solvent. LTC Unit Nos. 1 and 2 Vacuum Systems use steam jets to generate vacuum. The exhausts from these jets are passed through water cooled condensers to minimize emissions. The condensate from these condensers is collected in a barometric tank (T-610-1 LTC Nos. 1 and 2 Oil Water Separator) which is used to separate the condensed steam from the vacuum jets from any solvent condensed in the vacuum jet condensers. The barometric tank is vented through a carbon bed.

The LTC Unit #4 Vacuum System uses a vacuum pump to generate vacuum. Its emissions are controlled by a refrigerated condenser. The condensate from the vacuum condensers is collected in the same oil/water separator, S-105-1 that is used to collect the condensed overhead solvent from the rectification column.

Packaging

Molten resin is packaged for shipment to customers either as pastilles in 50-lb bags, supersacks, or bulk boxes, in drums, or as molten resin in trucks. In the pastillation process, molten resin is fed from either the separator or the resin kettles into a rotating hollow tube known as a rotoformer. The rotoformer has precision-machined holes in its shell which allow molten resin to be discharged as small droplets (pastilles) onto a moving belt. The pastilles are cooled by water underneath the belt and air on top. Once hardened, they are discharged from the end of the belt into a material conveyor which empties into a storage bin. The pastilles in the bin are then packaged into bags or bulk containers.

Molten resin may also be fed from the resin kettles directly into drums or tank trucks. On occasion, the resin is also mixed with an oil and shipped to customers as a "solution" or "blend via tank truck.

Flushing and Reclaim
As a normal part of operation, lines and vessels must be flushed out during product changes to prevent cross-contamination. Off-specification material is also occasionally generated. Material generated from these operations is either drummed off directly or processed through a reclaim tank and/or the resin kettles, redissolved in solvent if necessary, and reprocessed through the LTC Unit to generate a material which is sold as off-grade.

Emission calculations
Details of emission calculations can be found in the Technical Support Document for Permit No. 0058-I016a.

Reclaim Solution Tank (S108):
Process equipment included in the Reclaim Solution Tank with cooling tower water condenser. Maximum potential emission calculations are based on the test data (stack testing conducted on August 2-24, 2012). The proposed limit includes a 15% safety factor for hourly emissions and double for annual emissions due to the very low emission rates.

LTC Vacuum Systems (S109, S110, and S124):
Each of the Nos. 1and 2 LTC Vacuum Systems has a cooling tower water condenser and the #4 LTC Vacuum System has a refrigerated condenser. Emission calculations from all three systems are based on the test data (stack testing conducted in 2017) and on “Method for Estimating Air Emissions from Chemical Manufacturing Facilities”, August 2007, under the EPA’s Emissions Inventory Improvements Program (EIIP). The potential air leak rate for LTC Nos. 1 and 4 is 10 lb/hr; for #2 - 15 lbs/hr.

Resin Kettle Nos. 5, 6, and 7 (S111-S113):
Each Resin Kettle is controlled by a cooling tower water condenser. Resin Kettle Nos. 5 and 6 for Solvent Blending Operations may also be used for molten resin storage, but emissions from molten resin storage are assumed to be negligible, due to low vapor pressure of resin. Resin Kettle #7 fill from a reclaim tank and solvent flushing. The proposed limit includes a 15% safety factor for hourly emissions and double for annual emissions due to the very low emission rates.

Fume Scrubbers (S114, S165):
There is a fume scrubber for Nos. 1 and 2 Pastillator Belts and a fume scrubber for the Berndorf Pastillator Belt. Maximum potential emission calculations for these scrubbers are based on the test data (stack testing conducted in July 2017). The proposed limit includes a 15% safety factor. No HAPs emissions were detected during the 2017 stack test..

LTC Nos. 1 and 2 Oil/Water Separator and LTC #4 Oil/Water Separator (S110A and S125):
Each Oil/Water separator has a carbon bed for control emissions. Emission calculations are based on “Method for Estimating Air Emissions from Chemical Manufacturing Facilities”, August 2007, under EPA’s Emissions Inventory Improvements Program (EIIP). The assumed control efficiency for the carbon beds is 95%.

Baghouses (S115, S116, and S084):
The process equipment includes three baghouses - for Nos. 1 and 2 Pastillator Belts and for the Berndorf Belt. Pastillator belt baghouse emissions are based on (stacks testing conducted in July 2017). Berndorf belt baghouse emissions are based on manufacturer data (baghouse installed in 2013, RFD dated July 18, 2013).

Drumming Operations:
Process equipment includes bulk finished resin loading. There is no control device for this process. Emissions were determined using an emission factor calculated from AP-42; Section 5.2 "Transportation and Marketing of Petroleum Liquids", equation 1. Projected actual resin throughput is estimated to be 1,250,000 gallons per year.

Truck Loading:
There is no control device for this process. Emissions were determined using an emission factor calculated from AP-42; Section 5.2 "Transportation and Marketing of Petroleum Liquids", equation 1. Projected actual resin throughput is estimated to be 2,500,000 gallons per year.

Cooling Towers:
Process equipment include three existing cooling towers – LTC #2 (WW LTC), LTC #1 (Flaker), and LTC #4 (J-40301-1). Emission factors are taken from AP-42, Section 13.4, Wet Cooling Towers, 1/95; the calculation method is derived from New Mexico Environment Department – Air Quality Bureau Technical Memorandum dated September 9, 2013: Calculating TSP, PM_{10}, and $PM_{2.5}$ from Cooling Towers.

Table 17: LTC Cooling Towers

Cooling Tower	Recirculation Rate (gpm)	Potential Operating Hours	Water TDS Concentration (PPM)	Emissions (tpy)[1]		
				PM	PM_{10}	$PM_{2.5}$
LTC #1	375	8,760	1,500	0.25	0.20	0.001
LTC #2	1,200	8,760	1,500	0.79	0.65	0.002
LTC #4	2,800	8,760	1,500	1.84	1.51	0.004
			Total	2.88	2.36	0.007

[1] A year is defined as any 12 consecutive months.

Table 18: Emissions Summary for LTC Units

Stack ID	Equipment Description	VOC		HAPs		Styrene		$PM/PM_{10}/PM_{2.5}$	
		lb/hr	t/yr[1]	lb/hr	t/yr[1]	lb/hr	t/yr[1]	lb/hr	t/yr[1]
S108	Reclaim Solution Tank	0.28	0.29	0.003	0.001	0.001	0.000	-	-
S109	#1 Vacuum System	1.50	3.80	0.051	0.224	0.050	0.224	-	-
S110	#2 Vacuum System	3.20	8.09	0.070	0.308	0.070	0.308	-	-
S124	#4 Vacuum System	0.66	1.46	0.055	0.243	0.055	0.243	-	-
S111	Resin Kettle #5	2.08	0.16	0.027	0.000	0.007	0.000	-	-
S112	Resin Kettle #6	1.61	0.12	0.028	0.000	0.009	0.000	-	-
S113	Resin Kettle #7	1.08	0.34	0.032	0.000	0.009	0.000	-	-
S114	Nos. 1and 2 Pastillator Belt	1.25	2.80	-	-	-	-	-	-
S165	Berndorf Belt	0.29	0.53	-	-	-	-	-	-
S110A	Nos. 1 and 2 oil/water separator	0.00	0.01	-	-	-	-	-	-
S125	#4 oil/water separator	0.00	0.01	-	-	-	-	-	-
S115	#1 Pastillator baghouse	-	-	-	-	-	-	0.016	0.07
S116	#2 Pastillator baghouse	-	-	-	-	-	-	0.014	0.06
S084	Berndorf belt baghouse	-	-	-	-	-	-	0.08	0.35
NA	Drumming operation	0.89	0.09	0.051	0.01	0.017	0.002	-	-
NA	Truck loading	2.48	0.18	0.142	0.01	0.049	0.004	-	-
	Total	**15.32**	**17.89**	**0.46**	**0.79**	**0.27**	**0.78**	**0.11**	**0.48**

[1] A year is defined as any consecutive 12-month period.

DRESINATE UNITS

Process Description

The Dresinate Unit produces Dresinate TX, which is a water-based emulsion product that is manufactured from crude tall oil (CTO) and tall oil rosin (TOR). CTO and TOR are co-products derived from the pulping process used to make paper. CTO is typically stored in Tank R-1-A and TOR is typically stored in Tank 782.

CTO and TOR, along with water and small amounts of other additives, are combined in the dispersion unit to form a liquid intermediate. The liquid intermediate is transported to Tank 80 for storage. From Tank 80, the liquid intermediate is pumped to the Double Drum Dryer (L-500-1) where the water is removed. The dry material is ground to size and conveyed to the product storage bin for packaging and shipment to customers. Off-specification material is processed in the 25 Agitator, where the off-specification material is dissolved in water and re-dried to meet specifications.

VOC emissions from the Double Drum Dryer are routed to a process scrubber then to the atmosphere. The scrubber provides very little VOC control and is not considered a control device. It is used primarily to remove moisture. Particulate emissions from the grinding, conveying, storage, and bagging of the dry product is controlled by a baghouse (S-400-1).

Emission calculations

Details of emission calculations can be found in the Technical Support Documents for Permit No. 0058-I012 and #0058-I012a.

The measured volatile content of the Dresinate TX was determined to be 0.38% using EPA Method 24 followed by a Karl Fischer titration. A GC/MS analysis of the volatile organic content showed the presence of no hazardous air pollutants.

Material Storage:

Emissions from raw material storage are insignificant. See TANKS 4.0.9d runs in Permit Application No. 0058-I012, Appendix 1, for detailed emissions estimates from tanks R-1-A and 782.

Drying:

The Dresinate trial run performed from May 4, 2007 – July 4, 2007 showed actual VOCs at 1.25 lb/hr or 5.48 ton/yr.

Material Handling:

Historic data from the plant indicates that product is lost at a rate of 1% to 2% due to spillage, transfer inefficiencies, etc., and is emitted as PM_{10}. The baghouse has a 99.5% control efficiency. As a conservative estimate 2% loss is used for product loss.

2,500 tons/year dry Dresinate × 2% material loss × (1 - 0.995) = 0.25 tons/yr PM_{10} and 0.06 lb/hr.

Table 19: Emissions Summary for Dresinate Units

Process Description	VOC		PM/PM_{10}	
	lb/hr	tpy[1]	lb/hr	tpy[1]
Drying	1.25	5.48	-	-
Material Handling	-	-	0.06	0.25

[1]A year is defined as any consecutive 12-month period.

EMULSION UNIT

The Emulsion Unit is a batch processing unit where hydrocarbon resins, rosins, and heavy distillate are blended with surfactants and water and emulsified in a mixing unit.

The process begins by feeding raw materials (resin, rosin, or heavy distillate) into one of two emulsion kettles where the material is heated to the required temperature using an electric hot oil furnace. Once heated, these materials are fed into the mixing unit along with water and various surfactants and mixed until the resinous material is completely dispersed in water. This product is then pumped to one of four blend tanks for final quality analysis and adjustment. The finished material can then be either loaded into tank trucks or drums directly from the blend tanks or pumped to one of two storage tanks and packaged from there.

Certain products made at the Emulsion Unit are made in the emulsion kettles and pumped directly to the blend tanks without going through the mixing unit. These products use varying amounts of rosin, tall oil, and caustic as their raw ingredients. The finished product is packaged directly from the blend tanks to customers or is sent for further processing.

Waste material generated from cleanouts of the unit are discharged to the building trench and collected in the Emulsion Waste Tank for eventual disposal off-site.

Solvents are not used in this unit and therefore, VOC emissions are minimal.

Emission calculations

Resin Kettles 1 and 2:

Diagnostic stack testing in 2007 showed a worst-case emission rate of 0.277 lb/hr VOC from Resin Kettle 2. This value will be used for emissions from both Resin Kettle's.

VOC Emission rate	0.277 lb/hr
Fill time per kettle	0.5 hr

This is the only time when the kettle is discharging emissions to the atmosphere.

Batch cycle time per kettle	4 hr

Each kettle takes 4 hours to process and discharge its contents.

Kettles per day	6 kettles/day
VOC emissions	0.831 lb/day/kettle
Total daily VOC emissions	1.662 lb/day
Annual VOC emissions	0.303 tons/yr (Assumes 8,760 hr/yr of operation)

Blend Tanks 1-4:

Blend tanks are vented to a common header and are vapor balanced. Diagnostic stack testing in 2007 showed emissions of 0.015 lb/hr VOC from the combined vent of Blend Tanks 1-4. Volume of one batch of finished product is 2000 gallons or 16,000 lbs. (50% resin and additives, 50% water). Batches are pumped from the mixing unit to the blend tanks at the rate of four hours per batch. Maximum production at the Emulsion unit is 27,000,000 lb of finished material per year.

Emulsion unit capacity	27,000,000 lb/yr
Batch size	16,000 lb
Maximum batches	1,688 batches/yr
Operating time	6,750 hrs

This is the only time the blend tanks are discharging to the atmosphere.

VOC emissions	0.015 lb/hr
Annual VOC emissions	0.051 tons/yr

Blend Tanks 5 and 6:

Blend Tank 1-4 emission rate of 0.015 lb/hr VOC is representative of Blend Tanks 5 and 6. Certain products are transferred from Blend Tanks 1-4 to Blend Tank 5 or 6 before being shipped to customers. As a simplifying assumption, assume total capacity of the unit goes through Blend Tank 5 and 6.

Emulsion unit capacity	27,000,000 lb/yr
Blend tank capacity	16,000 lb per blend tank
Fill time	4 hrs
Turnovers	84 per year
Venting time per tank	337.5 hrs
VOC emissions	0.015 lb/hr per blend tank
Annual VOC emissions	0.003 tons/yr per blend tank

Emulsion Waste Tank (T-775):

Diagnostic stack testing in 2007 showed emissions of 0.508 lb/hr VOC from the Emulsion Waste Tank vent.

Tank volume	87,000 gallons
Transfer rate	50 gpm
Fill time	174 minutes
Fill frequency	52 per year
Assumes one fill per week.	
Safety factor	1.3
Vent time	196 hours
VOC emissions	0.508 lb/hr
Annual VOC emissions	0.050 tons/yr

Storage Tanks:

The Emulsion Unit uses tanks 761, 766, 773, 782, and 783 to store raw materials. Tanks range in size from 11,700 (T-783) to 800 gallons (T-766). Raw materials are rosins, resins, and tall oil, all of which have negligible vapor pressures. Rosin and resin are solid at room temperature. Storage tanks frequently change service between these raw materials as the product mix changes. Maximum raw material throughput of these tanks is 13,500,000 pounds per year. This is one half of the Emulsion Unit capacity of 27,000,000 pounds per year because finished product is 50% resin/rosin and 50% water. Worst-case emissions estimates were estimated using the largest tank (T-783) with molten resin as its contents.

Resin throughput	140,625 gallons per month
	13,500,000 lb/yr
VOC emissions	0.07 tons per month
Annual VOC emissions	0.84 tons/yr

Based on this emission calculations maximum potential VOC emissions from this process = 1.25 tpy.

PILOT PLANT

The Pilot Plant is a research and development operation that is used to test resin product formulations and processes. The plant consists of feed tanks, reactors, strippers, neutralizers, filters, presses, and a drumming area.

The vent streams from the 50-gallon reactor (S155) and neutralizer/Funda filter (S156) are piped into a common vent header, which then goes into the bottom of a 55-gallon drum filled with water solution. This scrubber is needed to remove any acidic catalyst in the vent gas prior to it entering the carbon bed to prevent corrosion of the carbon canister. The vent gas from the scrubber is then fed into the bottom of the carbon canister where it passes through the bed and then exits to the atmosphere. The carbon bed is equipped with a saturation indicator that shows when the bed is greater than 70% saturated and needs to be replaced. The carbon canister shall provide an overall control efficiency of 95% or outlet gas VOC concentration of 20 ppm or less. The carbon canisters are only required to be operated when the reactor, Funda filter, or neutralizer are in operation and contain VOC emitting materials. Other sources at the pilot plant are uncontrolled with negligible emissions.

Details of emission calculations can be found in the Technical Support Document for Permit No. 0058-I024.

As a part of the Consent Decree, Synthomer was required to conduct a design evaluation of the carbon bed system. Engineering Design Evaluation for Pilot Plant Carbon Bed was completed (see details in Attachment D in the Permit Application). Synthomer chose a vent stream containing 100% toluene as the worst-case HAP concentration.

Based on this evaluation maximum potential VOC (HAP – toluene) emissions are: 0.49 lb/hr or 2.2 tpy.

WASTEWATER TREATMENT PLANT (WWTP)

The Wastewater Treatment Plant (WWTP) treats a maximum of 90 gallons per minute (gpm), or 47,304,000 gal/yr of oil-laden wastewater generated by various processes throughout the plant, as well as water in the storage tank dikes. The WWTP consists of a primary section to remove oil and sediment and a secondary section to remove ammonia and to further reduce the organic content so that the effluent water can be directed to the West Elizabeth Sanitary Authority (WESA).

The wastewater enters the primary treatment plant at Tanks 701 A and B where oil is decanted. The bottom water layer flows to the T-713-1 Raw Sump, where hydrochloric acid is added to de-stabilize the emulsified oil. The water is then pumped to the S-302-1 Air Floatation Tank, where air is injected, and the oil is skimmed off the top. Oil decanted from Tanks 701 A and B and oil skimmed from the Air Floatation Tank is sent to the T717-1 Oil Sump, where it is then transferred to Tank 78 for accumulation and recovery. The remaining water is pumped to the T-714-1 Acid Sump and then to one of three pretreatment holding tanks (T-702-A, B, or C) to combine with the wastewaters received from the C5 processing unit.

Water from tanks T-702-A, B, and C is pumped to the T-411-1 Biotreatment Aeration Tank (Bio Tank) for secondary treatment. Secondary treatment begins in the Bio Tank, utilizing an extended aeration process to remove the remaining organics. Diluted lime slurry is periodically pumped to the aeration section of the Bio Tank to maintain pH. The mixture of activated sludge and wastewater in the aeration section flows to the Biotreatment Clarifier section where activated sludge is recovered and returned to the aeration section. The treated clear water drains from the clarifier section to the “well” section where it is pumped to WESA. To prevent becoming overwhelmed with an ever-increasing amount of living and dead bacteria in the Bio Tank, the biological mass is periodically wasted and transferred to the T-724-1 Sludge Batch Tank for filtration through the S-410-1 Filter Press and disposal as a non-hazardous waste.

Emissions from Tanks 701 A and B tanks are controlled with a chilled water condenser (E-701-3) followed by a carbon bed (A-701-5A or 5B). Emissions from the T-713-1 Raw Sump, S-302-1 Air Floatation Tank, T-717-1 Oil Sump, and T-714-1 Acid Sump are controlled by a chilled water condenser (E-713-2) followed by the same carbon bed (A-701-5A or 5B), and vapor balanced with the T-715-1 Final Sump.

Emission calculations

Details of emission calculations can be found in the Technical Support Document for Permit No. 0058-I025.

Tanks T-701A & T-701B and Back Porch Sumps (emission point S147):

The Back Porch Sumps consist of oil sump, acid sump, dissolved air flotation tank, raw sump, and final sump.

Tanks capacity	50,000 gallons each
Sumps capacity	17,500 gallons total

Data from February 2014 and October 2018 Stack Tests and Supplemental information:

Maximum throughput	90 gpm or 47,304,000 gal/yr

Note: While 90 gpm is the annualized average throughput, during rain events, throughput can be as high as 160 gpm. Therefore, maximum short-term emissions are based on 160 gpm.

Carbon Control Efficiency	95% wt (minimum efficiency required per MON MACT)

Pre-carbon VOC emission rates:

701A/701B tanks	1.3 lb/hr, at maximum throughput and temperature, based on 2018 test
Back porch sumps	0.91 lb/hr, at maximum throughput and temperature, based on 2018 test
Total pre-control	2.21 lb/hr

Final VOC emission rates:

701A/701B tanks:	0.065 lb/hr, after carbon adsorption
Back porch sumps:	0.0455 lb/hr, after carbon adsorption
Total VOC final emissions:	0.11 lb/hr or 0.48 tpy

HAP emissions were calculated based on the ratio of each chemical's emissions to total VOC emissions at the carbon bed outlet, derived from the 2014 and 2018 stack test report, and after that was taken from the maximum ratio to VOC from these two stack tests.

<u>Pre-treated Water Tanks 702A, 702B & 702C (emission points F033, F034, F035):</u>

Tanks capacity: 50,000 gallon each

Tanks inlet VOC concentrations based on Biotreatment System inlet concentrations divided by (1 – fraction emitted to air).

Influent concentration:	184.1 ppm_w
Throughput per tank:	15,768,000 gal/yr
Liquid density:	8.33 lb/gal
Operating hours:	8760 hours/yr

VOC quantity in influent to each tank:	2.8
VOC emissions (per tank):	5,890 lb/yr
VOC emissions (per tank):	2.945 tpy
Total VOC emissions:	2.017 lb/hr or 8.835 tpy

HAP emissions were calculated based on the fraction emitted to the air. The fraction, taken from WATER9 analysis done in 2015; historical data indicates that this fraction does not vary significantly from year to year.

<u>Biotreatment Aeration Tank (F027):</u>

Tanks capacity: 157,000 gallons

Tanks inlet VOC concentrations based on samples taken at the sump prior to the Biotreatment stage.

Influent concentration:	139.2 ppm_w
WWTP throughput:	47,304,000 gal/yr
Density:	8.33 lb/gal
Operating hours:	8760 hours/yr
VOC quantity in influent:	6.3 lb/hr
VOC emissions:	30,506 lb/yr or 3.482 lb/hr
VOC emissions:	15.25 tpy

HAP emissions were calculated based on the fraction emitted to the air. The Fraction emitted to the air and the fraction removed from the biotreatment taken from WATER9 analysis done in 2015; historical data indicates that this fraction does not vary significantly from year to year.

Biotreatment Clarifier (F028):

Tanks capacity: 55,000 gallons
Inlet VOC concentrations based on Bio Tank outlet concentrations; Bio Tank inlet concentrations divided by (1 – total fraction removed)
Influent concentration: 0.6 ppm_w
WWTP throughput: 47,304,000 gal/yr
Density: 8.33 lb/gal
Operating hours: 8760 hours/yr
VOC quantity in influent: 0.0 lb/hr
VOC emissions: 218 lb/yr or 0.025 lb/hr
VOC emissions: 0.109 tpy

HAP emissions were calculated based on the fraction emitted to the air. Assume that 100% chemicals emitted to the air since effluent water from Biotreatment system has non-detectable amounts of VOC.

Sludge Batch & Sludge Solids Handling (F036, F037):

Tanks capacity: 5,200 gallons (sludge batch); 6,000 gal (sludge solids handling)
Inlet VOC concentrations based on Bio Tank outlet concentrations; Bio Tank inlet concentrations divided by (1 – total fraction removed).
Sludge throughput based on actual throughput data from 2015 thru 2019, plus a safety factor.
Liquid inlet concentration: 0.06 ppm_w
Sludge throughput: 900,000 lbs/yr
Liquid fraction in sludge: 60%
VOC quantity in sludge: 0.3 lb/yr
VOC emissions: 0.3 lb/yr
VOC emissions: 0.0001 tpy

HAP emissions were calculated based on the fraction emitted to the air. For worst case, this calculation assumes 100% of the chemical content of the liquid in the sludge is emitted to the air. Pounds per hour (lb/hr) emissions are negligible.

Table 20: Emissions Summary for WWTP

Emission Point	Equipment Description	VOC		HAP		Styrene		Toluene	
		lb/hr	tpy[1]	lb/hr	tpy[1]	lb/hr	tpy[1]	lb/hr	tpy[1]
S147	T-701A, T-701B, back porch sump	0.196	0.48	0.054	0.13	0.031	0.08	0.005	0.01
F033, F034, F035	T-702A, T-702B, T-702C	3.586	8.84	3.392	8.36	0.315	0.77	3.028	7.46
F027	Bio aeration tank	6.191	15.25	5.810	14.31	0.931	2.29	4.796	11.82
F028	Bio clarifier	0.044	0.11	0.041	0.10	0.012	0.03	0.029	0.07
F036, F037	Sludge batch tank & solids handling	NA	0.00	NA	0.00	NA	0.00	NA	0.00
	Total	**10.02**	**24.68**	**9.297**	**22.91**	**1.29**	**3.17**	**7.86**	**19.36**

[1] A year is defined as any consecutive 12-month period.

Table 21: WWTP Hazardous Air Pollutant Emissions

Emission Point	Equipment Description	Xylene tons/yr[1]	Ethylbenzene tons/yr[1]	Cumene tons/yr[1]	Misc HAP tons/yr[1]
S147	T-701A, T-701B, back porch sump	0.015	0.018	0.008	0.005
F033, F034, F035	T-702A, T-702B, T-702C	0.059	0.025	0.024	0.010
F027	Bio aeration tank	0.092	0.046	0.047	0.020
F028	Bio clarifier	0.001	0.000	0.000	0.000

Emission Point	Equipment Description	Xylene tons/yr[1]	Ethylbenzene tons/yr[1]	Cumene tons/yr[1]	Misc HAP tons/yr[1]
F036, F037	Sludge batch tank & solids handling	0.000	0.000	0.000	0.000
	Total	**0.167**	**0.090**	**0.079**	**0.035**

[1] A year is defined as any consecutive 12-month period.

STORAGE TANKS

Details of emission inventory can be found in Title V Permit Application No. 0058 (Attachment 5, Potential emissions inventory).

The potential emissions inventory for most of the storage tanks have previously been reviewed by the ACHD during the recent installation permitting efforts. Sources that were not covered by installation permits issued between 2012 to date have been characterized and included.

Table 22: Storage Tank Emissions

Tank ID (Stack ID)	Content Description	VOC tons/yr[1]	HAP tons/yr[1]	Toluene tons/yr[1]	Styrene tons/yr[1]
T-35 (S075)	Various solvents, Ammonia water	1.00	0.1	-	0.1
T-78 (S232)	Recovered oils	1.00	0.4	0.05	0.3
T-4 (S190)	Byproduct fuel	0.51	0.054	0.05	0.001
T-151 (S236)	Byproduct fuel	0.15	0.016	0.001	0.001
T-252 (S248)	Styrene or AMS	0.062	0.062	-	0.062
T-150 (S235)	C5 Ammonia wastewater or HVD/RHS basis	0.592	0.028	-	0.009
Various – typically T-2,m 12, 13, 160, 254, 257	Stormwater	0.813	0.154	0.140	0.004
T-261 (S256)	C5 Ammonia water	0.607	0.607	0.607	-
T-9 (S194)	C5 Ammonia water	0.722	0.722	0.722	-
T-14 (S199)	C5 Ammonia water	0.722	0.722	0.722	-
T-15 (S200)	C5 Ammonia water	0.722	0.722	0.722	-
T-16 (S201)	C5 Ammonia water	0.722	0.722	0.722	-
T-262 (S038)	C5 Ammonia water	0.607	0.607	0.607	-
T-263 (S257)	C5 Ammonia water	0.532	0.532	0.532	-
T-264 (S258)	C5 Ammonia water	0.532	0.532	0.532	-
T-265 (S259)	C5 Waste material	0.333	0.333	0.333	-
T-208 (S244)	Site wide Hazardous waste	0.136	0.009	0.001	0.006
T-382 (S271)	Therminol	0.01	-	-	-
	Total	**9.772**	**6.322**	**5.741**	**0.483**

COMBUSTION SOURCES

Boilers BU-1, BU-2, BU-3, BU-4, and Boiler house emergency generator

Details of emission calculations can be found in the Technical Support Document for Installation Permit No. 0058-I020.

Boilers

Maximum potential emissions calculations are based on Chapter 1.4 - Natural Gas Combustion, published July 1998 and for CO and NO_X emission factors taken from burner manufacturer data. All PM was assumed to be PM_{10}; all PM_{10} was assumed to be $PM_{2.5}$. Appendix D includes detailed emission calculations for the boilers. Average natural gas higher heating value of 1,020 BTU/scf was used to convert BTU's to scf.

<u>Input data for each boiler:</u>
Rating - 18.6 MMBTU/hr
Operating hours – 8,760 hr/yr
Emission factors (lb/10^6 scf): PM - 7.6; NO_X - 24; SO_X - 0.6; CO - 37; VOC - 5.5; CO_2 - 120,000

Example of calculations (PM emissions):
18,600,000 BTU/hr : 1,020 BTU/scf × 7.6 lbs x 10^{-6} scf = 0.14 lbs/hr = 0.61 tons/yr

<u>Emergency generator</u>
The operation of the emergency generator is limited to 500 hours per year, and the unit may not participate in an Emergency Load Response Program or any peak shaving programs without first obtaining a permit modification. Maximum potential emissions calculations are based on emissions factors provided by the engine manufacturer. Emissions for CO_2 calculated according to 40 CFR 98 Subpart C. The generator uses 19.2 gal/hr of diesel fuel when it is running; a standard high heating value (HHV) is 0.138 MM BTU/gal and CO_2 emission factor from EPA is 73.96 kg CO_2/MMBTU:

CO_2 emission = 1 × 10^{-3} × 19.2 gal/hr × 0.138 MMBTU/gal × 73.96 kg CO_2/MMBTU × 2,205 lb/kg = 432 lbs/hr

Table 23: Boilers B-U1 thru B-U4 & Boiler House Emergency Generator Emissions

Pollutant	One boiler		Four boilers		Generator		Total	
	lbs/hr	tons/yr[1]	lbs/hr	tons/yr[1]	lbs/hr	tons/yr[1]	lbs/hr	tons/yr[1]
PM (PM_{10}, $PM_{2.5}$)	0.14	0.61	0.56	2.44	0.02	0.01	0.58	2.45
SO_X	0.01	0.05	0.04	0.20	0.11	0.03	0.15	0.23
NO_X	0.44	1.92	1.76	7.68	2.92	0.73	4.68	8.41
VOC	0.10	0.44	0.40	1.76	0.04	0.01	0.44	1.77
CO	0.67	2.96	2.68	11.84	0.18	0.05	2.86	11.89
CO_2	2,188	9,584	8,752	38,336	432	108	9,184	38,444

[1] A year is defined as any consecutive 12-month period.

<u>Boiler #5, C5 Hot Oil Furnace, Nos. 2 and 4 LTC Heaters</u>
Details of emission calculations can be found in Permit Nos. 3019006-000-00500, 0058-I011e, 0058-I016a, and Permit Application No. 0058.

<u>C-5 Hot Oil Furnace (S056):</u>
The PM, SO_2, NO_X, CO, and VOC calculations used factors from AP-42, Section 1.4, Natural Gas Combustion, 7/98. Per AP-42, PM, PM_{10}, and $PM_{2.5}$ are the same when natural gas is used as the fuel. The PM, PM_{10}, and $PM_{2.5}$ include both filterable and condensable fractions. A 15% adjustment factor was added to all emissions calculated using AP-42 factors to account for operational variability of equipment.
Emission Limits:
PM, PM_{10}, and $PM_{2.5}$: 0.076 × 1.15 = 0.09 lbs/hr or 0.4 tons/yr;
SO_X: 0.006 × 1.15 = 0.007 lbs/hr or 0.030 tons/yr;
NO_X: 1.033 × 1.15 = 1.188 lbs/hr or 5.20 tons/yr;
CO: 0.868 × 1.15 = 0.998 lbs/hr or 4.37 tons/yr;
VOC: 0.057 × 1.15 = 0.066 lbs/hr or 0.287 tons/yr.

<u>Nos. 2 and 4 LTC Process Heaters:</u>
Process equipment includes two heaters – 8.8 MM BTU/hr and 10 MM BTU/hr. Potential to emit calculations are based on U.S. EPA AP-42 Chapter 1.4 - External Natural Gas Combustion, Tables 1.4-1 through 1.4-4, published July 1998. All PM is assumed to be PM_{10}, and all PM_{10} is assumed to be $PM_{2.5}$. Heating value of natural gas is 1,020 BTU/cf. A 15% adjustment factor was added to all emissions calculated using AP-42 factors to account for

operational variability of equipment. The emission factor for GHG (CO_2e) was based on 40 CFR 98, Subpart C "General Stationary Fuel Combustion Sources", Table C-1.

Table 24: Boiler #5, C5 Hot Oil Furnace, No. 2 & No. 4 LTC Heater Emissions

Pollutant	Boiler #5		C5 Hot Oil Furnace		#2 LTC Heater		#4 LTC Heater		Total	
	lbs/hr	tons/yr[1]	lbs/hr	tons/yr[1]	lbs/hr	tons/yr[1]	lbs/hr	tons/yr[1]	lbs/hr	tons/yr[1]
PM (PM_{10}, $PM_{2.5}$)	0.07	0.310	0.09	0.40	0.079	0.34	0.087	0.38	0.326	1.43
SO_X	0.02	0.10	0.007	0.03	0.006	0.03	0.007	0.03	0.04	0.19
NO_X	3.73	16.32	1.19	5.20	1.035	4.53	1.150	5.04	7.11	31.09
VOC	0.21	0.897	0.07	0.29	0.057	0.25	0.063	0.28	0.40	1.72
CO	3.13	13.71	0.998	4.37	0.869	3.81	0.966	4.23	5.96	26.12

[1] A year is defined as any consecutive 12-month period.

MISCELLANEOUS SOURCES

See Permit Application No. 0058 for emission calculations and Correspondence, dated January 10, 2024 (emission calculations).

Equipment Leaks:

Fugitive emissions were calculated based on a count of pumps, agitators, valves, and pressure relief valves (PRV's) taken from the site's engineering drawings. The number of connectors and open-ended lines was estimated based on a ratio to the number of valves. Emissions were based on SOCMI emission factors (without ethylene) for valves, connectors, pumps, and agitators with credit taken for both AVO and Method 21 monitoring required by 40 CFR 63 Subpart FFFF (MON MACT). In addition, the SOCMI no-leak factor (<10,000 ppm) was used for all PRV's in gas/vapor service and factors published by the Texas Commission on Environmental Quality were used for PRV's in light and heavy liquid service. Composition of gases and liquids in each section of piping is specific to the piping.

Maximum potential calculated emissions (tons/year):

Table 25: Equipment Leak Emissions

VOC	Cumene	Ethylbenzene	Styrene	Toluene	Xylene	Total HAP	NH_3
70.0	0.3	0.2	3.5	6.0	0.2	10.2	0.1

Barges:

Emissions from barge loading operations were calculated using AP-42 Section 5.2 Equation (1). Throughput for J-RAF (unreacted C5) was based on historic volumes of JRAF produced and ratioed up to the allowable maximum production of 140,000,000 lb/yr in Installation Permit No. 0058-I011e. Throughput for JSOL-3, also known as co-product fuel oil, was based on the maximum throughput for Tank 4 found in Installation Permit No. 0058-IP009.

Maximum potential calculated emissions (tons/year):

Table 26: Barge Emissions

	VOC	Cumene	Ethylbenzene	Styrene	Toluene	Xylene	Total HAP
J-RAF	1.944	-	-	-	0.007	-	0.007
JSOL-3	0.017	0.0001	<0.0001	0.0001	0.0034	<0.0001	0.004

Roadways:

Emissions from paved and unpaved roadways are based on Sections 13.2.1 and 13.2.2 of AP-42. Vehicle miles traveled for production-related vehicles were estimated based on historical and/or surveyed usage and adjusted by an activity factor to account for changes in production. Vehicle miles traveled for all other vehicles were estimated based on a historic average and includes a safety factor to arrive at a maximum reasonable number of miles traveled per year.

Maximum potential calculated emissions:
PM = 12.430 tons/year;
PM_{10} = 3.249 tons/year;
$PM_{2.5}$ – 0.231 tons/year.

Degreasers:

Emissions from degreasers were calculated based on emission and control factors found in Tables 4.6.2 and 4.6.3 of Section 4.6 of AP-42. The number and size of degreasers was determined by a physical inventory of the facility. Degreaser usage was assumed to be for two hours per day, five days per week, for 52 weeks each year based on historical observations of maintenance employees.

Maximum potential calculated emissions:
VOC = 0.650 tons/year;
Naphthalene = 0.004 tons/year;
Total HAPs = 0.004 tons/year.

MAXIMUM POTENTIAL EMISSION SUMMARY BY PROCESS (TPY)

Table 27: Summary of Maximum Potential Emissions by Process

Process	VOC	HAPs	PM	PM_{10}	$PM_{2.5}$	NO_X	CO	SO_X	Toluene
C5 – Handling Operation	-	-	0.55	0.55	0.55	-	-	-	-
C5 – Polymerization Process	3.65	0.61	0.24	0.24	0.24	26.24	0.41	-	0.61
C5 – Pastillation Process	6.21	-	3.50	3.50	3.50	-	-	-	-
C5 - Storage Tanks	11.93	0.46	-	-	-	-	-	-	-
MP Poly – Process	13.5	0.46	0.126	0.126	0.126	-	-	-	-
MP Poly – Storage Tanks	1.37	0.054	-	-	-	-	-	-	-
WW Poly – Process	26.30	2.88	0.01	0.01	0.01	-	-	-	-
WW Poly – Storage Tanks	10.02	0.48	-	-	-	-	-	-	-
Hydro – Process	28.10	0.086	-	-	-	-	-	-	-
Hydro – Storage Tanks	8.62	0.007	-	-	-	-	-	-	-
LTC – Process	17.89	0.79	0.48	0.48	0.48	-	-	-	-
Dresinate Unit	5.5	-	0.25	0.25	0.25	-	-	-	-
Pilot Plant	2.2	2.2	-	-	-	-	-	-	-
Wastewater Treatment	24.68	22.91	-	-	-	-	-	-	19.36

Process	VOC	HAPs	PM	PM_{10}	$PM_{2.5}$	NO_X	CO	SO_X	Toluene
Plant									
Cooling Towers	-	-	11.02	11.02	11.02	-	-	-	-
Boiler Nos. 1-4	1.76	-	2.44	2.44	2.44	7.68	11.84	0.20	-
Boiler #5	0.897	-	0.31	0.31	0.31	16.32	13.71	0.10	-
Emergency Generator	0.01	-	0.01	0.01	0.01	0.73	0.05	0.03	-
Nos. 2 & 4 LTC Heaters & C5 Furnace	0.82	0.46	1.12	1.12	1.12	14.77	12.41	0.09	-
Emulsion Unit	1.25	-	-	-	-	-	-	-	-
Storage Tanks - miscellaneous	9.772	6.322	-	-	-	-	-	-	5.741
Equipment Leaks	70.0	10.2	-	-	-	-	-	-	6.0
Roadways	-	-	12.43	3.249	0.231	-	-	-	-
Barges	1.96	0.011	-	-	-	-	-	-	-
Degreasers	0.65	0.004	-	-	-	-	-	-	-
Total	**247.09**	**47.93**	**32.49**	**23.27**	**20.25**	**65.74**	**38.42**	**0.42**	**31.71**

REGULATORY APPLICABILITY:

1. **Article XXI Requirements for Issuance:**
See Permit Application No. 0058, Section 5. The requirements of Article XXI, Parts B and C for the issuance of operating permits have been met for this facility. Article XXI, Part D, Part E & Part H will have the necessary sections addressed individually.

The cold start notification provisions of §2108.01.d do not apply to the No. 2 and No. 4 LTC process heaters and C5 furnace. Until terminated by written notice from the Department, the requirement to report cold starts 24-hours in advance is waived for boilers, and the facility may report all cold starts as part of the semiannual report.

2. **Testing Requirements:**
Testing is required on the following once every five years:
1) C5 Unit – Polymerization process
   - thermal oxidizer (VOC, HAP, NO_X, and ammonia)
   - UHF Filter (VOC)
2) C5 Unit – Pastillation process
   - UHF Filter/Demister control unit (VOC, toluene)
3) LTC process
   - scrubber (VOC, HAP)
   - each vacuum system condenser (VOC, HAP)
4) Dresinate process
   - baghouse (PM)

The Department reserves the right to require additional testing if necessary in the future to assure compliance with the terms and conditions of this Title V Operating Permit.

3. **New Source Performance Standards (NSPS):**
Boilers B-U1, B-U2, B-U3, B-U4, and #4 LTC Heater are subject to 40 CFR Part 60, Subpart Dc - *Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units.* Since the boilers and heater combust natural gas, only the fuel recording and reporting requirements apply. Because Boiler #5, #2 LTC Heater, and C5 Hot Oil Heater were constructed prior to June 9, 1989, this NSPS does not apply.

The emergency generator is subject to the standards set forth in 40 CFR Part 60, Subpart IIII - *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines.* As part of the requirements in 40 CFR §60.4200, the engine manufacturer is required to certify the equipment to meet the standards of 40 CFR §60.4205(b), which for this unit, are the standards listed in 40 CFR §89.112 and 40 CFR §89.113.

Tanks 50, 52, 53, 54, and 55 are subject to 40 CFR Part 60, Subpart Kb – *Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984*. To comply with this subpart all these tanks have a fixed roof in combination with an internal floating roof.

No other storage tanks meet the applicability requirements of 40 CFR Part 60, Subpart Kb – *Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984.* All tanks were either constructed before this date, the maximum true vapor pressure of materials stored is less than 3.5 kPa (0.508 psi), or have no VOC contents.

4. **NESHAP and MACT Standards:**
The facility is subject to 40 CFR Part 61, Subpart FF – *National Emission Standard for Benzene Waste Operations*.

The C5 Unit, LTC Unit, MP Poly Unit, WW Poly Unit, Hydrogenation Unit, and Emulsion Unit are subject to 40 CFR Part 63, Subpart FFFF - *National Emission Standard for Hazardous Air Pollutants: Miscellaneous Organic Chemical Manufacturing (MON)* because the facility is a major source of HAPs, operates numerous miscellaneous chemical processing units (MCPU's) that process, use, or generate HAPs, and produces materials or family of materials (FOMs) classified under SIC Code 282.

The C5 Unit, LTC Unit, MP Poly Unit, WW Poly Unit, Hydrogenation Unit, and Emulsion Unit are subject to 40 CFR Part 63, Subpart SS (referenced by Subpart FFFF) - *National Emission Standard for Closed Vent Systems, Control Devices, Recovery Devices, and Routing* to a fuel gas system or a process.

The C5 Unit, LTC Unit, MP Poly Unit, WW Poly Unit, Hydrogenation Unit, and Emulsion Unit are subject to 40 CFR Part 63, Subpart UU (referenced by Subpart FFFF) - *National Emission Standard for Equipment Leaks – Control Level 2 Standards.*

The Boiler Nos. 1- 5, Nos. 2 and 4 LTC heaters, and C5 Hot Oil Furnace are subject to 40 CFR Part 63, Subpart DDDDD – *National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters*. Since the boilers, heaters, and furnace combust natural gas, only the work practice standards apply.

The emergency generator is not subject to 40 CFR Part 63, Subpart ZZZZ - *National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*. The generator meets the operational requirements of "emergency stationary RICE" under §63.6640(f), and therefore are not subject to this subpart per §63.6585(f).

5. **Emission Inventory:**
This facility is required to provide annual Emission Inventory reports per §2108.01.e of Article XXI because this facility is a major source of Volatile Organic Compounds (VOC) and Hazardous Air Pollutants (HAPs).

6. **Risk Management Plan; CAA Section 112(r):**
The facility is subject to §112(r) of the Clean Air Act due to the use of toluene. There is a risk management plan in place at the facility.

7. **Greenhouse Gas Reporting (40 CFR Part 98):**
There are presently no Title V applicable requirements for greenhouse gases. Should the facility exceed 25,000 metric tons of CO_2e in any 12-month period, the facility would have to submit reports in accordance with 40 CFR Part 98.

8. **Compliance Assurance Monitoring (40 CFR Part 64):**
The Compliance Assurance Monitoring (CAM) rule found in 40 CFR 64 is not applicable to this facility. The C5 Unit, LTC Unit, MP Poly Unit, WW Poly Unit, Hydrogenation Unit, and Emulsion Unit are subject to 40 CFR 63 Subpart FFFF. These regulations were promulgated after 1990 and are therefore exempt under §64.2.b.1.i. All other processes at the facility are either uncontrolled or have an uncontrolled potential-to-emit less than the major source thresholds.

9. Environmental Justice:
West Elizabeth Borough is not considered an environmental justice (EJ) area, defined by the Pennsylvania DEP as "any census tract where 20 percent or more individuals live at or below the federal poverty line, and/or 30 percent or more of the population identifies as a non-white minority, based on data from the U.S. Census Bureau and the federal guidelines for poverty". However, the operating permit contains all testing, monitoring, recordkeeping, and reporting requirements (as required under §70.6(a)(3)).

EMISSIONS SUMMARY:

Table 28: Emissions Summary for Synthomer Jefferson Hills, LLC

Pollutant	Total (tpy*)
Particulate Matter	**32.49**
Particulate Matter <10 µm (PM_{10})	**23.31**
Particulate Matter <2.5 µm ($PM_{2.5}$)	**20.29**
Nitrogen Oxides (NO_X)	**65.74**
Sulfur Oxides (SO_X)	**0.79**
Carbon Monoxide (CO)	**38.42**
Volatile Organic Compounds (VOC)	**246.75**
Hazardous Air Pollutants (HAP)	**47.96**
Toluene	**31.71**

* A year is defined as any consecutive 12-month period.

RECOMMENDATION:

All applicable Federal, State, and County regulations have been addressed in the permit application. The Synthomer facility is currently in compliance with all applicable regulations. The Title V Operating Permit for the Synthomer Jefferson Hills, LLC should be approved with the emission limitations, terms and conditions in Permit No. 0058-OP24.