Lane Regional Air Protection Agency
Construction Air Contaminant Discharge Permit

Review Report

Bakelite Chemicals LLC **Permit No. 203129**
2665 Highway 99 North
Eugene, Oregon 97402
Website: https://bakelite.com/

Source Information:

Primary SIC	2821
Secondary SIC	--
Primary NAICS	325211
Secondary NAICS	--

Source Categories (LRAPA title 37, Table 1)	Part B: 70. Synthetic resin manufacturing
Public Notice Category	III

Compliance and Emissions Monitoring Requirements:

Unassigned Emissions	N
Emission Credits	N
Compliance Schedule	N
Source Test [date(s)]	See Title V Operating

	Permit
COMS	N
CEMS	N
Ambient monitoring	N

Reporting Requirements

Annual Report (due date)	2/15
Semi-Annual Report (due date)	2/15, 8/15
GHG Report (due date)	3/31
Monthly Report (due date)	N

Quarterly Report (due date)	N
Excess Emissions Report	Y
Other Reports (due date)	N

Air Programs

NSPS (list subparts)	Dc
NESHAP (list subparts)	A, W, H, OOO, SS, UU, EEEE, ZZZZ, DDDDD
Compliance Assurance Monitoring (CAM)	N
Regional Haze (RH)	N
40 CFR Part 68 Risk Management	Y
Cleaner Air Oregon (CAO)	N
Synthetic Minor (SM)	N
SM-80	N
Title V	Y
Major FHAP Source	Y
Federal Major Source	N
TACT	N
Type A State New Source Review	N

Type B State New Source Review	N
Prevention of Significant Deterioration (PSD)	N
Nonattainment New Source Review (NNSR)	N

LIST OF ABBREVIATIONS THAT MAY BE USED IN THIS REVIEW REPORT

ACDP	Air Contaminant Discharge Permit
AQMA	Air Quality Management Area
ACS	Applied coating solids
Act	Federal Clean Air Act
ASTM	American Society of Testing and Materials
BDT	Bone dry ton
Btu	British thermal unit
CAM	Compliance Assurance Monitoring
CAO	Cleaner Air Oregon
CD ID	Control device identifier
CEMS	Continuous Emissions Monitoring System
CFR	Code of Federal Regulations
CI	Compression Ignition
CMS	Continuous Monitoring System
CO	Carbon Monoxide
CO2	Carbon dioxide
CO2e	Carbon dioxide equivalent
COMS	Continuous Opacity Monitoring System
CPDS	Certified Product Data Sheet
CPMS	Continuous parameter monitoring system
DEQ	Department of Environmental Quality
dscf	Dry standard cubic feet
EF	Emission factor
EPA	US Environmental Protection Agency
EU	Emissions Unit
EU ID	Emission unit identifier
FCAA	Federal Clean Air Act
ft2	Square foot
FSA	Fuel sampling and analysis
gal	Gallon
GHG	Greenhouse Gas
gr/dscf	Grain per dry standard cubic feet (1 pound = 7000 grains)
HAP	Hazardous Air Pollutants as defined by LRAPA title 12
HCFC	Halogenated Chlorofluorocarbons
Hr	Hour
ID	Identification number or label
I&M	Inspection and maintenance
Lb	Pound
LRAPA	Lane Regional Air Protection Agency
MACT	Maximum Achievable Control Technology
MBF	Thousand board feet
MERV	Minimum efficiency reporting values
MFHAP	Metal fabrication or finishing metal hazardous air pollutants
MM	Million
MMBtu	Million British thermal units
MMCF	Million cubic feet
NA	Not applicable
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOx	Nitrogen oxides
NSPS	New Source Performance Standards
NSR	New Source Review
O2	Oxygen
OAR	Oregon Administrative Rules
ODEQ	Oregon Department of Environmental Quality
OPR	Operation
ORS	Oregon Revised Statutes
O&M	Operation and maintenance
SB	Lead
PCD	Pollution Control Device
PM	Particulate matter
PM2.5	Particulate matter less than 2.5 microns in size
PM10	Particulate matter less than 10 microns in size
ppm	Parts per million
PSEL	Plant Site Emission Limit
psia	pounds per square inch, actual
PTE	Potential to Emit
QIP	Quality Improvement Plan
RICE	Reciprocating Internal Combustion Engine
SACC	Semi-Annual Compliance Certification
SCEMP	Surrogate Compliance Emissions Monitoring Parameter
Scf	Standard cubic foot
SDS	Safety data sheet
SER	Significant emission rate
SERP	Source emissions reduction plan
SI	Spark Ignition
SIC	Standard Industrial Code
SIP	State Implementation Plan
SO2	Sulfur dioxide
ST	Source test
TAC	Toxic air contaminant
TACT	Typically Achievable Control Technology
TEU	Toxic Emission Unit
TPY	Tons per year
VE	Visible emissions
VMT	Vehicle miles traveled
VOC	Volatile organic compounds
Year	A period consisting of any 12-consecutive calendar month

PERMITTEE IDENTIFICATION

1. Bakelite Chemicals, LLC ("Bakelite", or "the facility") operates a synthetic resin manufacturing plant located at 2665 Highway 99 North in Eugene, Oregon.

GENERAL BACKGROUND

2. Bakelite Chemicals LLC ("Bakelite" or "the facility") manufactures four (4) different liquid resins; ureaformaldehyde (UF) resin, phenol-formaldehyde (PF) resin, wet strength resin (WSR), and RESI-MIX® Phenolic Impregnating resin. Formaldehyde is reacted with either phenol or urea in three resin batch reactors (K1, K2, and K3) to manufacture these four types of liquid resins. Additionally, other raw materials are added to the reactors to manufacture differing varieties of resins. The primary liquid raw materials are stored in on-site, above-ground storage tanks and are added to the reactors through the use of mass flow metering systems. The solid raw materials are added to the reactors through the use of automated pneumatic transfer or mechanical conveyor (urea, salt and melamine) systems, or by pulling the raw materials into the reactors which operate under vacuum. Other raw materials used in smaller quantities are stored in containers such as drums, tote tanks, "super-sacks", or paper or plastic bags.

REASON FOR PERMIT ACTION AND FEE BASIS

3. On February 13, 2025 the facility submitted a permit modification application for a change in the method of operation to allow process gases from the facility's resin kettles to bypass the Regenerative Thermal Oxidizer (RTO) and vent directly to the atmosphere for a limited number of hours annually. The Construction ACDP application also includes facility requests for federally enforceable limits on the throughputs for several emission units to ensure the facility's potential to emit does not exceed the HAPs major source threshold.

4. This modification is considered a Type 3 change under subsection 34-035(3) because it will be used to establish a federally enforceable limit on the potential to emit.

5. Because the existing facility is subject to the Title V Operating Permit program, a Construction ACDP is required for Type 3 changes under paragraph 37-0025(1)(b).

6. A Construction ACDP is subject to the initial permitting application fee listed under section 37-8020, Table 2, Part 1. Initial Permitting Application Fees.

7. In conjunction with this application, the facility submitted a Title V significant permit modification application to reclassify the facility to an area source for HAPs. Once reclassified as an area source for HAPs, the facility will no longer be subject to the reactor batch process vent provisions of 40 CFR Part 63 Subpart OOO ("Resin MACT") and the requested RTO "bypass hours" may be permitted. In order to ensure the facility maintains compliance with all applicable requirements, the Title V significant permit modification and this Construction ACDP will be processed and issued concurrently.

ATTAINMENT STATUS

8. The facility is located in an area that has been designated as attainment or unclassified for all criteria pollutants. The facility is inside the Eugene-Springfield UGB as defined in LRAPA 29-0010 which designates the Eugene-Springfield CO and PM10 maintenance areas. The facility is also located inside the Eugene-Springfield UGB as described in the current Eugene-Springfield Metropolitan Area General Plan, as amended. The facility is located within 100 kilometers of three (3) Class I air quality protection areas: Diamond Peak Wilderness, Mount Washington Wilderness

and Three Sisters Wilderness area.

PERMITTING HISTORY

9. LRAPA has reviewed and issued the following permitting actions to this facility since the last permit renewal on December 21 2022

Date Approved/Valid	Permit Action Type	Description
5/2/2023	Approval to Construct, NC-203129-A23	Demolition of five resin storage tanks, modification of one resin storage tank, and construction of one resin storage tank.
Upon Issuance	Construction ACDP	Replace existing boiler (B-1) with two new identical 15.753 MMBtu/hr natural-gas fired boilers.
Upon Issuance	TV Significant Permit Modification	Reclassify facility as an area source for HAPs and remove major source NESHAP requirements that are no longer applicable.
Upon Issuance	Construction ACDP	Incorporate allowable annual RTO "bypass hours" for facility's resin reactors and add federally enforceable throughput limits for several emission units.

EMISSIONS UNIT DESCRIPTION

10. The modified emission units regulated by this Construction ACDP are the following:

Emission Unit ID	Emission Unit Description	Pollution Control Device Description
OX-1	Resin Reactors (K-1, K-2, K-3)	Regenerative Thermal Oxidizer (RTO)
Phenol Storage Tanks	Phenol Storage Tanks 302, 303	None
Formaldehyde Storage Tanks	Formaldehyde Storage Tanks 304, 306	None
Methanol Distillate Tanks	Methanol Distillate Tanks 602, 703	None
B-1	Boiler – Clever Brooks 61.7 MMBtu/hr Water tube boiler	None

11. Resin Reactors (EU: OX-1): Three resin reactors (K1, K2, and K3) are used in the manufacture of the four types of liquid resin at the facility. The K1 reactor uses steam and/or cooling coils to control the rate of reaction. K1 is vented directly to the RTO as it does not have a condenser or vacuum system. Reactors K2 and K3 use steam and/or cooling coils as well, but also have a reflux condenser with a vacuum pump system to condense and recover the heated vapors to control the reaction temperature. The resin manufacturing reaction is carried out under negative pressure with the use of a dual stage liquid ring vacuum pump and seal water system. The HAP/VOC emissions contained in the seal water are continuously stripped from the seal water tank (VS-1) and routed to the regenerative thermal oxidizer (RTO) for destruction.

    Upon issuance of this Construction ACDP, exhaust gases from the resin reactors will be permitted to bypass the Regenerative Thermal Oxidizer (RTO) control device and vent directly to the atmosphere for a limited number of hours in any consecutive 12-month period.

12. Phenol Storage Tanks 302, 303: Phenol Storage Tanks 302 and 303 are vertical fixed roof storage tanks with a capacity of 27,917 gallons each. Prior to this permitting action, the annual

throughput for each tank was 26.28 MMgal/year.

Upon issuance of this Construction ACDP, the annual throughput for Phenol Storage Tanks 302 and 303 will be limited to 20 MMgal/year each.

13. Formaldehyde Storage Tanks 304, 306: Formaldehyde Storage Tanks 304 and 306 are vertical fixed roof storage tanks with a capacity of 25,379 gallons each. Prior to this permitting action, the annual throughput for each tank was 21.9 MMgal/year.

Upon issuance of this Construction ACDP, the annual throughput for Formaldehyde Storage Tanks 304 and 306 will be limited to 18.45 MMgal/year each.

14. Methanol Distillate Tanks 602, 703: Methanol Distillate Tanks 602 and 703 are vertical fixed roof tanks. Tank 602 has a capacity of 21,149 gallons and Tank 703 has a capacity of 5,875 gallons. Prior to this permitting action the annual throughput for each tank was 480,000 gal/year.

Upon issuance of this Construction ACDP, the annual throughput for Methanol Distillate Tanks 602 and 703 will be limited to 360,000 gal/year each.

15. Boiler (EU: B-1): One (1) Cleaver Brooks water tube natural gas boiler is utilized for temperature control in the resin manufacturing process. The boiler is rated at 61.7 MMBtu/hour, operates uncontrolled, and was constructed in 1972.

Upon issuance of this Construction ACDP, the boiler (EU B-1) will not be permitted to burn fuel oil.

NUISANCE, DEPOSITION AND OTHER LIMITATIONS

16. There are no changes to the nuisance, deposition, and other limitation requirements as a result of this Construction ACDP.

EMISSION LIMITATIONS

17. The facility is not subject to additional emission limitations as a result of this Construction ACDP.

OPERATING LIMITATIONS

18. The facility has requested the following federally enforceable operating limitations as a result of this Construction ACDP:

18.a. The permittee shall not allow exhaust gases from the resin reactor K-1 in Emission Unit OX-1 to bypass the Regenerative Thermal Oxidizer for more than 336 hours in any consecutive 12-month period.
18.b. The permittee shall not allow exhaust gases from the resin reactors K-2 and K-3 in Emission Unit OX-1 to bypass the Regenerative Thermal Oxidizer for more than 672 hours in any consecutive 12-month period.
18.c. The permittee must limit the throughput of Emission Unit Phenol Storage Tanks (302 and 303) to 20MM gallons in any consecutive 12-month period.
18.d. The permittee must limit the throughput of Emission Unit Formaldehyde Storage Tanks (304, 306) to 18.45 MM gallons in any consecutive 12-month period.
18.e. The permittee must limit the throughput of Emission Unit Methanol Distillate Tanks (602, 703) to 720,000 gallons in any consecutive 12-month period.
18.f. The permittee shall not burn fuel oil in Emission Unit B-1 (Boiler).

TYPICALLY ACHIEVABLE CONTROL TECHNOLOGY (TACT)

19. There are no changes to the TACT determination of any emission unit as a result of this Construction ACDP.

NEW SOURCE PERFORMANCE STANDARDS (NSPS)

20. There are no changes to the NSPS applicability as a result of this Construction ACDP.

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)

21. There are no changes to the NESHAP applicability as a result of this Construction ACDP.

COMPLIANCE ASSURANCE MONITORING (CAM)

22. There are no changes to the CAM applicability as a result of this Construction ACDP.

PLANT SITE EMISSION LIMITS (PSELS)

23. There are no changes to the PSELs as a result of this Construction ACDP.

SIGNIFICANT EMISSION RATE

24. There are no proposed increases to the PSELs as a result of this Construction ACDP.

UNASSIGNED EMISSIONS AND EMISSION REDUCTION CREDITS

25. The facility does not have any unassigned emissions or emission reduction credits at this time.

NEW SOURCE REVIEW

26. The proposed project is not subject to Major NSR or Type A/B State NSR because the facility is not requesting an increase to any PSEL.

SHORT TERM NAAQS COMPLIANCE

27. A Type 3 change must not cause or contribute to a new exceedance of a National Ambient Air Quality Standard (NAAQS) adopted under title 50 for a new or replaced device or activity. The facility has proposed authorization to allow process gases from the facility's resin kettles to bypass the Regenerative Thermal Oxidizer (RTO) and vent directly to the atmosphere for a limited number of hours annually. The proposed bypass hours will result in an increase in the hourly emission rate of VOC from Emission unit OX-1. Because there is no NAAQS for VOC, and the facility is not proposing an increase on an hourly basis for any regulated pollutant with a short-term NAAQS, it has been determined that this Type 3 change will not cause or contribute to a new exceedance of a NAAQS.

FEDERAL HAZARDOUS AIR POLLUTANTS (HAP) AND CLEANER AIR OREGON TOXIC AIR CONTAMINANTS (TAC)

28. Under the Cleaner Air Oregon program, only existing sources that have been notified by LRAPA and new sources are required to perform risk assessments. The facility has not been notified by LRAPA and is therefore not yet required to perform a risk assessment or report annual emissions of toxic air contaminants. LRAPA required reporting of approximately 600 toxic air contaminants in 2023 and regulates approximately 260 toxic air contaminants that have Risk Based Concentrations established in rule. All FHAPs are on the list of approximately 600 toxic air

contaminants. The FHAPs and toxic air contaminants listed below are based upon source testing and/or standard emission factors for the types of emission units at this facility. After the source is notified by LRAPA, they must update their inventory and perform a risk assessment to see if they must reduce risk from their toxic air contaminant emissions. Until then, sources will be required to report toxic air contaminant emissions triennially.

29. The facility is currently permitted as a major source of FHAP. The HAP PTE for the facility is below the major source thresholds (10 tpy for any single HAP and 25 tpy for any combination of HAPs. In conjunction with this Construction ACDP application, the facility has submitted a TV significant permit modification application to reclassify the facility to an area source for HAPs. Upon issuance of the modified TV permit, the facility will be permitted as an area source of HAPs.

30. The table below represents the potential emissions of FHAP from the facility, excluding potential emissions from Categorically Insignificant Activities. The highest single FHAP emitted by the facility is hydrochloric acid.

CAS Number	Pollutant	PTE (tpy)	CAO TAC	FHAP
7664-41-7	Ammonia	0.78	Y	N
7440-38-2	Arsenic	5.32E-05	Y	Y
71-43-2	Benzene	5.60E-04	Y	Y
7440-43-9	Cadmium	2.92E-04	Y	Y
18540-29-9	Chromium	3.71E-04	Y	Y
7440-48-4	Cobalt	2.24E-05	Y	Y
95-50-1	Dichlorobenzene	3.19E-04	Y	N
106-89-8	Epichlorohydrin	1.71	Y	Y
50-00-0	Formaldehyde	2.68	Y	Y
110-54-3	Hexane	0.48	Y	Y
7647-01-0	Hydrochloric Acid	6.56	Y	Y
7664-39-3	Hydrogen fluoride	0.01	Y	Y
67-63-0	Isopropyl alcohol	1.88	Y	N
7439-92-1	Lead compounds	1.33E-04	Y	Y
7439-96-5	Manganese Compounds	1.01E-04	Y	Y
7439-97-6	Mercury Compounds	6.91E-05	Y	Y
67-56-1	Methanol	2.91	Y	Y
91-20-3	Naphthalene	1.62E-04	Y	Y
7440-02-0	Nickel Compounds	5.60E-04	Y	Y
108-95-2	Phenol	2.31	Y	Y
401	Polycyclic Organic Matter	1.76E-04	Y	Y
108-88-3	Toluene	9.04E-04	Y	Y
		Total (tpy):	19.3	16.7

TOXIC RELEASE INVENTORY

31. The Toxics Release Inventory (TRI) is federal program that tracks the management of certain toxic chemicals that may pose a threat to human health and the environment, over which LRAPA has no regulatory authority. It is a resource for learning about toxic chemical releases and pollution prevention activities reported by certain industrial facilities. Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) created the TRI Program. In general, chemicals covered by the TRI Program are those that cause:

- Cancer or other chronic human health effects;
- Significant adverse acute human health effects; or

- Significant adverse environmental effects.

There are currently over 650 chemicals covered by the TRI Program. Facilities that manufacture, process or otherwise use these chemicals in amounts above established levels must submit annual TRI reports on each chemical. NOTE: The TRI Program is a federal program over which LRAPA has no regulatory authority. LRAPA does not guarantee the accuracy of any information copied from EPA's TRI website.

In order to report emissions to the TRI program, a facility must operate under a reportable NAICS code, meet a minimum employee threshold, and manufacture, process, or otherwise use chemicals in excess of the applicable reporting threshold for the chemical. Bakelite operates under a reportable NAICS code (325211 – Plastics Material and Resin Manufacturing). The facility has reported the following data for the 2023 reporting year.

Reporting Year	Pollutant	Cas No.	Total On- and Off- Site Disposal and Other Releases (lbs)
2023	Epichlorohydrin	106-89-8	1,380
	Ethylene glycol	107-21-1	0
	Formaldehyde	50-00-0	1,393
	Formic acid	64-18-6	61
	Methanol	67-56-1	2,050
	Phenol	108-95-2	1,771

COMPLIANCE HISTORY

32. This facility is regularly inspected by LRAPA. The following table indicates the inspection history of this facility since the issuance of the Title V operating permit in 2003:

Type of Inspection	Date	Results
LRAPA - Full Compliance Evaluation	9/30/2003	No evidence of non-compliance
LRAPA - Full Compliance Evaluation	9/26/2005	No evidence of non-compliance
LRAPA - Full Compliance Evaluation	9/30/2007	No evidence of non-compliance
LRAPA - Full Compliance Evaluation	9/30/2009	No evidence of non-compliance
LRAPA - Full Compliance Evaluation	8/31/2011	No evidence of non-compliance
LRAPA - Full Compliance Evaluation	9/19/2013	No evidence of non-compliance
LRAPA - Full Compliance Evaluation	9/21/2015	No evidence of non-compliance
LRAPA - Full Compliance Evaluation	9/21/2017	No evidence of non-compliance
LRAPA - Full Compliance Evaluation	10/23/2019	No evidence of non-compliance
LRAPA - Full Compliance Evaluation	9/7/2021	No evidence of non-compliance
LRAPA - Full Compliance Evaluation	8/7/2023	No evidence of non-compliance

SOURCE TESTING HISTORY

33. The facility conducted a source test in April 2003 on the Regenerative Thermal Oxidizer (RTO) which serves as a control device for the facility's resin reactors (Emission Unit OX-1). The test was conducted to demonstrate that the RTO had a destruction removal efficiency of at least 95% for VOCs. In addition, the facility had to demonstrate a destruction removal efficiency of 83% by weight or greater for HAPs at normal or greater operating conditions per 40 CFR 63 subpart OOO requirements. The only tested pollutant that returned results that were below detection level (BDL) was phenol. The test results from the April 2003 test are included in the table below:

Emission Unit and Control Device		Test Date	Pollutant	Results		
				Inlet (lb/hr)	Outlet (lb/hr)	Destruction Efficiency (%)
EU: OX-1	RTO (Average test temperature: 1483 °F)	04/16/2003	VOC (as propane)	2.30	0.05	97.8
			Formaldehyde	0.0496	0.0033	93.4
			Methanol	0.7495	0.0189	97.5
			Epichlorohydrin	1.5042	0.0492	96.7
			Phenol	BDL	BDL	NA

In accordance with Condition 104 of the Title V Operating Permit, the facility is required to test the RTO in EU: OX-1 within one (1) year of the expiration date..

RECORDKEEPING REQUIREMENTS

34. In order to demonstrate compliance with the 12-month rolling RTO bypass hour operating limit, the permittee must maintain records of the dates, times, and durations of all periods when the exhaust gas stream from each Resin Reactor (K-1, K-2, K-3) in Emission Unit OX-1 bypasses the RTO control device and is diverted to the atmosphere. These records must be retained for a period of at least five (5) years from the date of the monitoring sample, measurement, report, or application.

REPORTING REQUIREMENTS

35. The permittee must include the following process parameter records with the annual report:

Process Parameter	Units	Pollutants	Measurement Technique	Measurement Frequency
RTO bypass hours for Resin Reactor K-1	Hours	VOC and HAPs	Recordkeeping	Monthly
RTO bypass hours for Resin Reactor K-2 and K-3	Hours	VOC and HAPs	Recordkeeping	Monthly

PUBLIC NOTICE

36. Pursuant to paragraph 37-0052(5)(a), issuance of a Construction ACDP requires a Category III public notice under title 31. In accordance with paragraph 31-0033(3)(c), LRAPA will provide public notice of the proposed permit action and a minimum of 35 days for interested persons to submit written comments.

The draft permit will be on public notice from January 13, 2026 to February 17, 2026. Written comments may be submitted during this public comment period. If requested by at least ten (10) persons or an organization representing at least ten (10) persons, LRAPA will schedule a public hearing on the proposed permit action. LRAPA will provide a minimum of 30 days notice for a public hearing. After the public comment period and public hearing, if requested, LRAPA will respond to comments received and then take final action to issue or deny the permit.

EMISSION DETAIL SHEETS

Plant Site Emission Limits:

PLANT SITE EMISSION LIMITS										
Emission Units	PM	PM_{10}	$PM_{2.5}$	CO	NO_x	SO_2	VOC	Single HAP[1]	Aggregate HAP	GHG (CO_2e)
	tpy	tpy	tpy	tpy	tpy	tpy	tpy	tpy	tpy	tpy
B-1: Boiler	0.66	0.66	0.66	22.11	26.33	0.45	1.45	0.01	0.53	31630.42
OX-1: Resin Reactors	0.01	0.01	0.01	10.08	1.16	0.00	1.00	6.55	7.53	340.41
Urea	6.21E-06	6.21E-06	6.21E-06	-	-	-	-	-	-	-
RESI-MIX	9.00E-05	9.00E-05	9.00E-05	-	-	-	-	-	-	-
Salt	9.00E-05	9.00E-05	9.00E-05	-	-	-	-	-	-	-
WRP: Waste Resin Pile	-	-	-	-	-	-	4.20E-03	-	4.20E-03	-
CT-1: Cooling Tower	0.10	0.10	0.10	-	-	-	1.07	-	-	-
LOAD-1: UFC and MeOH Lading	-	-	-	-	-	-	0.04	-	0.04	-
LOAD-2: Truck and Railcar Loading	-	-	-	-	-	-	0.52	-	0.38	-
Tanks	-	-	-	-	-	-	3.12	-	3.02	-
TW-1: Truck Washing	-	-	-	-	-	-	0.56	-	0.26	-
LDAR: Process Piping and Component Leaks	-	-	-	-	-	-	6.64	-	4.92	-
PR-1: Paved Roads	0.34	0.07	0.02	-	-	-	-	-	-	-
Potential to Emit (PTE)	**1.11**	**0.83**	**0.78**	**32.19**	**27.49**	**0.45**	**14.40**	**6.56**	**16.69**	**31970.83**
PSELs	**24**	**14**	**9**	**99**	**39**	**39**	**39**	**9.00**	**24.00**	**74000**

1. Single highest HAP for facility is Hydrochloric Acid.

HAP/TAC Summary:

Facility-Wide Hap & TAC Summary												
Compound	CAS	HAP	TAC	Boiler	OX-1	Tanks	WRP	LOAD-1	LOAD-2	TW-1	LDAR	tpy
Ammonia	7664-41-7	N	Y	0.013	-	0.764	2.48E-03	-	-	-	-	0.78
Arsenic	7440-38-2	Y	Y	5.27E-05	5.67E-07	-	-	-	-	-	-	5.32E-05
Benzene	71-43-2	Y	Y	5.54E-04	5.96E-06	-	-	-	-	-	-	5.60E-04
Cadmium	7440-43-9	Y	Y	2.89E-04	3.11E-06	-	-	-	-	-	-	2.92E-04
Chromium	18540-29-9	Y	Y	3.67E-04	3.95E-06	-	-	-	-	-	-	3.71E-04
Cobalt	7440-48-4	Y	Y	2.21E-05	2.38E-07	-	-	-	-	-	-	2.24E-05
Dichlorobenzene	95-50-1	N	Y	3.16E-04	3.40E-06	-	-	-	-	-	-	3.19E-04
Epichlorohydrin	106-89-8	Y	Y	-	0.543	0.057	-	-	-	-	1.111	1.71
Formaldehyde	50-00-0	Y	Y	0.020	0.031	0.977	2.71E-03	0.016	0.038	0.026	1.573	2.68
Hexane	110-54-3	Y	Y	0.473	5.09E-03	-	-	-	-	-	-	0.48
Hydrochloric Acid	7647-01-0	Y	Y	0.014	6.550	-	-	-	-	-	-	6.56
Hydrogen fluoride	7664-39-3	Y	Y	0.011	-	-	-	-	-	-	-	0.01
Isopropyl alcohol	67-63-0	N	Y	-	-	0.115	-	-	0.045		1.719	1.88
Lead compounds	7439-92-1	Y	Y	1.32E-04	1.42E-06	-	-	-	-	-	-	1.33E-04
Manganese Compounds	7439-96-5	Y	Y	9.99E-05	1.08E-06	-	-	-	-	-	-	1.01E-04
Mercury Compounds	7439-97-6	Y	Y	6.83E-05	7.35E-07	-	-	-	-	-	-	6.91E-05
Methanol	67-56-1	Y	Y	-	0.397	1.121	1.38E-03	0.020	0.344	0.233	0.798	2.91
Naphthalene	91-20-3	Y	Y	1.61E-04	1.73E-06	-	-	-	-	-	-	1.62E-04
Nickel Compounds	7440-02-0	Y	Y	5.54E-04	5.96E-06	-	-	-	-	-	-	5.60E-04
Phenol	108-95-2	Y	Y	-	5.38E-03	0.870	1.14E-04	-	1.10E-03	4.04E-04	1.438	2.31
Polycyclic Organic Matter	401	Y	Y	1.74E-04	1.88E-06	-	-	-	-	-	-	1.76E-04
Toluene	108-88-3	Y	Y	8.94E-04	9.62E-06	-	-	-	-	-	-	9.04E-04
											Total HAP:	**16.7**
											Total TAC:	**19.3**
											Single HAP (HCl):	**6.6**

Boiler (B-1):

Boiler B-1						
Pollutant	Emission Factors		Emission Factors		Reference	Annual Emissions (tons)
	Factors	Units	Factors	Units		
PM	2.5	lb/MMscf	2.44E-03	lb/MMBtu	1	0.66
PM10	2.5	lb/MMscf	2.44E-03	lb/MMBtu	1	0.66
PM2.5	2.5	lb/MMscf	2.44E-03	lb/MMBtu	1	0.66
SO2	1.7	lb/MMscf	1.66E-03	lb/MMBtu	1	0.45
NOx	100	lb/MMscf	9.75E-02	lb/MMBtu	1	26.3
CO	84	lb/MMscf	8.19E-02	lb/MMBtu	1	22.1
VOC	5.5	lb/MMscf	5.36E-03	lb/MMBtu	1	1.45
GHG (CO2e)	-	-	117.1	lb/MMBtu	2	31630

1. ODEQ AQ-EF05, converted to lb/MMBtu using the higher heating value of 1,026 Btu/scf.
2. EPA's Mandatory Reporting Rule for Greenhouse Gases, 40 CFR Part 98, Subpart C, Tables C-1 and C-2.

Resin Reactors (OX-1):

Resin Reactors OX-1, CONTROLLED					
Pollutant	NG Combustion EF	Process Related Resin Plant	Reference	Emission rate	
	lb/MMBtu	(lb/hr)		lb/hr	tpy
PM	2.44E-03	-	1	1.83E-03	7.08E-03
PM10	2.44E-03	-	1	1.83E-03	7.08E-03
PM2.5	2.44E-03	-	1	1.83E-03	7.08E-03
SO2	1.66E-03	-	1	1.24E-03	4.82E-03
NOx	-	0.3	2	0.3	1.16
CO	-	2.6	2	2.6	10.08
VOC	-	0.12	3	0.12	0.47
Lead	4.87E-07	-	1	3.65E-07	1.42E-06
GHG (CO2e)	117.1	-	4	87.8	340.41

1. ODEQ AQ-EF05, converted to lb/MMBtu using the higher heating value of 1,026 Btu/scf.
2. Emission factors based on source specific stack test data from similar operations at GP facilities. The selected emission factor is the maximum of either the average plus a safety factor of 10% or the maximum individual test run.
3. Emission factor based on source specific stack test data from April 2003. The selected emission factor is based on an inlet VOC loading of 2.30 lb/hr during stack test, a RTO control efficiency of 95% plus emissions of 0.00039 lb/hr from Drumming Station operation.
4. GHGs from EPA's Mandatory Reporting Rule for Greenhouse Gases, 40 CFR Part 98, Subpart C, Tables C-1 and C-2.

Resin Reactors, OX-1, RTO Bypass						
Pollutant	Process Related, K1	Process Related, K2/3	Drum Filling	Reference	Emission Rate	
	lb/hr	lb/hr	lb/hr		lb/hr	tpy
VOC	1.50	0.85	0.01	1	2.36	0.54
1. Uncontrolled emission factor for Kettles 1, 2, and 3 are based on source specific stack test data from April 2003. The selected emission factor is based on an inlet VOC loading during stack test, a RTO control efficiency of 0% due to bypass plus maximum hourly emissions from Drumming Station operation (uncontrolled).						

Urea:

Urea Transfer System, Urea						
Pollutant	Source	Emission Factor	Control Efficiency	Reference	Emission Rates	
		lb/ton	%		lb/hr	tpy
PM/PM10/PM2.5	Urea Storage Silo	1.97E-05	99.9	1	4.72E-07	2.07E-06
	Urea Loading Hopper	3.94E-05	99.9	1	9.45E-07	4.14E-06
1. Emission factors based on an engineering estimate of weight of material emitted for a measured throughput. PM10 and PM2.5 emission factors assumed 100% of PM emission factor.						

Resi-Mix:

Resi-Mixer and Hopper, RESI-MIX						
Pollutant	Source	Emission Factor	Control Efficiency	Reference	Emission Rates	
		lb/ton	%		lb/hr	tpy
PM/PM10/PM2.5	Resi-Mixer and Hopper	2.00E-02	99.9	1	2.05E-05	9.00E-05
1. Emission factors based on an engineering estimate of 1% of material conveyed remains airborne. PM10 and PM2.5 emission factors assumed 100% of PM emission factor.						

Salt:

Misc. Dry Material Unloading, Salt						
Pollutant	Source	Emission Factor	Control Efficiency	Reference	Emission Rates	
		lb/ton	%		lb/hr	tpy
PM/PM10/P	Misc. dry material unloading[2]	2.00E-02	99.9	1	2.05E-05	9.00E-05
1. Emission factors based on an engineering estimate of 1% of material conveyed remains airborne. PM10 and PM2.5 emission factors assumed 100% of PM emission factor.						
2. Baghouses (BH-4 and BH-5) operate in series on the Miscellaneous Dry Material Unloading operation. The listed emission factor is at the BH-5 outlet.						

Waste Resin Pile (WRP):

Waste Resin Pile - WRP						
Pollutant	Emission Factor	Compound % per resin	Volatilization Rate[2]	Adjustment for % Liquid	Emission Rates	
	lb/lb Liquid Resin[1]	waste[2]	%	(10%/63%)[3]	lb/hr	tpy
Methanol	2.31E-03	5%	30%	16%	3.14E-04	1.38E-03
Formaldehyde	3.90E-04	70%	25%	16%	6.19E-04	2.71E-03
Phenol	4.11E-05	70%	10%	16%	2.61E-05	1.14E-04
Ammonia	3.12E-04	20%	100%	16%	5.65E-04	2.48E-03
Total VOC					9.59E-04	4.20E-03
Total HAP					9.59E-04	4.20E-03

1. Emission factors based on spray dry test results at other GP chemical facilities.
2. Based on engineering estimates.
3. Resin solids on the pad are generated from fully or partially reacted resin. The emission factors are based on liquid based resin (typically ~37% solids & 63% liquid). Resin solids on the drying pad will typically be less than 10% liquid (90% solids).

Cooling Tower (CT-1):

Cooling Tower, CT-1				
Pollutant	Emission Factor	Reference	Emission Rates	
	(lb/Mgal)		lb/hr	tpy
PM	6.67E-05	1	0.023	0.102
PM_{10}	6.67E-05	2	0.023	0.102
$PM_{2.5}$	6.67E-05	2	0.023	0.102
VOC	7.00E-04	3	0.244	1.067

1. Total liquid drift factor (lb/Mgal) is calculated from Drift Eliminator (%) * Water Density
2. PM_{10} and $PM_{2.5}$ emission factors assumed 100% of PM emission factor.
3. AP-42 Section 5.1, *Petroleum Refining (April 2015)*, Table 5.1-3.

Urea Formaldehyde and Methanol Distillate Loading into Trucks (LOAD-1):

Load-1 VOC and HAPs[1]

	UFC Truck Loading		Methanol Distillate Truck Loading	Methanol Distillate Rail Car Loading		
Parameter	HCHO	Methanol	Methanol	Methanol	Total VOC[3]	Total HAP
S, Saturation Factor =	1.45	1.45	0.6	0.6	-	
Material Temperature (°F) =	113	113	55	55	-	
Material Temperature (°R) =	573	573	515	515	-	
Material Temperature (°C) =	45.0	45.0	12.8	12.8		
Substance Concentration (wt%) =	30.0%	1.5%	98.0%	98.0%	-	
Substance Vapor Pressure (psia) =	0.096	0.097	1.237	1.237	-	
Molecular Weight =	30	32	32	32	-	
L_L, Loading Loss (lb/mgal) =	9.08E-02	9.79E-02	5.8E-01	5.8E-01	-	
Filling Rate per Loading Rack (gal/hr) =	40	40	3,000	3,000	-	
Number of Loading Racks =	1	1	1	1	-	
Annual Filling Rate (gal/yr) =	346,812	346,812	480,000	480,000	-	
Product Density (lb/gal)	10.84	10.84	10.00	10.00		
Emission Rate (lb/hr)-Uncontrolled =	3.60E-03	3.87E-03	1.73	1.73	1.73	1.73
Emission Rate (lb/hr)-Controlled[2] =	3.60E-03	3.87E-03	3.45E-02	3.45E-02	0.04	0.04
Emission Rate (tpy)-Uncontrolled =	1.58E-02	1.70E-02	1.38E-01	1.38E-01	0.17	0.17
Emission Rate (tpy)-Controlled[2] =	**1.58E-02**	**1.70E-02**	**2.76E-03**	**2.76E-03**	**0.04**	**0.04**
Emission Factor (lb/lb product) =	8.38E-06	9.03E-06	5.75E-05	5.75E-05	7.49E-05	7.49E-05

1. Calculations are performed using Equation 1 of AP-42 Section 5.2, Transportation and Marketing of Petroleum Liquids (June 2008):
2. Vapor Recovery Control Efficiency= 98% for Methanol Loading
3. To avoid double counting, the maximum emissions between the existing MeOH distillate truck and rail car loading are included in the total emissions.

Truck or Railcar Loading of Resin (LOAD-2):

Load-2, VOC and HAPs

	UF Resin Truck Loading		PF Resin Truck Loading			Methanol Solvated PF Resin Truck Loading		
Parameter	HCHO	Methanol	HCHO	Methanol	Phenol	HCHO	Methanol	Phenol
S, Saturation Factor =	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
Material Temperature (°F) =	55	55	55	55	55	77	77	77
Material Temperature (°R) =	515	515	515	515	515	537	537	537
Material Temperature (°C) =	12.8	12.8	12.8	12.8	12.8	25.0	25.0	25.0
Substance Concentration (wt%) =	1.0%	1.0%	1.0%	1.0%	0.6%	1.0%	4.9%	0.7%
Substance Vapor Pressure (psia) =	0.0015	0.0126	0.0015	0.0126	0.00001	0.0039	0.1204	0.00005
Molecular Weight =	30.0	32.0	30.0	32.0	94.1	30.0	32.0	94.1
L_L, Loading Loss (lb/mgal) =	1.58E-03	1.42E-02	1.6E-03	1.4E-02	4.3E-05	4.0E-03	1.3E-01	1.5E-04
Filling Rate per Loading Rack (gal/hr) =	21,000	21,000	10,500	10,500	10,500	10,000	10,000	10,000
Number of Loading Racks =	2	2	4	4	4	1	1	1
Emission Rate (lb/hr) =	0.07	0.60	0.07	0.60	0.00	0.04	1.30	0.00
Annual Filling Rate (gal/yr) =	20,174,545	20,174,545	27,413,647	27,413,647	27,413,647	100,000	100,000	100,000
Product Density (lb/gal)	10	10	10	10	10	10	10	10
Emission Rate (tpy) =	0.02	0.14	0.02	0.19	5.86E-04	1.98E-04	0.01	7.48E-06
Emission Factor (lb/lb resin) =	1.58E-07	1.42E-06	1.58E-07	1.42E-06	4.28E-09	3.95E-07	1.30E-05	1.50E-08

1. Calculations are performed using Equation 1 of AP-42 Section 5.2, Transportation and Marketing of Petroleum Liquids (June 2008):

Load-2, VOC and HAPs Continued						
	Polyamide Resin Railcar/Truck Loading	0313G Resin w/IPA Truck Loading				
Parameter	1,2-dichloro-2-propanol	HCHO	Phenol	IPA	Total VOC	Total HAP
S, Saturation Factor =	1.45	1.45	1.45	1.45	-	
Material Temperature (°F) =	55	72	72	72	-	
Material Temperature (°R) =	515	532	532	532	-	
Material Temperature (°C) =	12.8	22.2	22.2	22.2		
Substance Concentration (wt%) =	4.0%	1.0%	18.5%	34.2%	-	
Substance Vapor Pressure (psia) =	0.00210	0.0032	0.00098	0.136	-	
Molecular Weight =	129.0	30.0	94.1	60.1	-	
L_L, Loading Loss (lb/mgal) =	9.50E-03	0.0032	0.0031	0.2773	-	
Filling Rate per Loading Rack (gal/hr) =	10,500	12,000	12,000	12,000	-	
Number of Loading Racks =	2	1	1	1	-	
Emission Rate (lb/hr) =	0.20	0.04	0.04	3.33	6.27	
Annual Filling Rate (gal/yr) =	20,000,000	327,273	327,273	327,273	-	
Product Density (lb/gal)	10	10	10	10		
Emission Rate (tpy) =	0.10	0.00053	0.00051	0.04538	**0.52**	**0.38**
Emission Factor (lb/lb resin) =	9.50E-07	3.23E-07	3.12E-07	2.77E-05	4.59E-05	1.72E-05
1. Calculations are performed using Equation 1 of AP-42 Section 5.2, Transportation and Marketing of Petroleum Liquids (June 2008):						

Tanks:

Tanks VOC/HAP Emissions								
Tank #		**300**	**301**	**302 and 303**	**304 and 306**		**305**	**AQ-1**
Tank Description:	**AP-42 Section 7.1 Reference**	**Ammonium Hydroxide Storage Tank**	**Dimethyl Glutamate (DMG)Storage Tank**	**Phenol Storage Tanks**	**Formaldehyde Storage Tanks**		**Formic Acid Storage Tank**	**Formic Acid Storage Tank**
Tank Data:								
Tank Contents =	-	Ammonia	DMG	Phenol	HCHO	Methanol	Formic Acid	Formic Acid
Constituent Concentration =	-	30.0%	100.0%	100.0%	51.0%	0.8%	90.0%	60.0%
V, Tank Volume (gal) =	-	8,460	15,227	27,917	25,379	25,379	9,400	2,303
HAP?		N	N	Y	Y	Y	N	N
Annual Throughput (gal/yr) =	-	400,000	4,000,000	20,000,000	18,450,000	18,450,000	90,000	200,000
Number of Tanks in Group =	-	1	1	2	2	2	1	1
L_T, Total Controlled Losses (lb/yr) = $= (L_{W,\ Controlled} + L_{S,\ Controlled})$ * No. of Tanks =	Eq 1-1	1,528.51	6.73	1,735.13	1,890.26	629.80	80.38	38.14
VOC Emissions (tpy) =	-	0.76	3.37E-03	0.87	0.95	0.31	0.04	0.02
HAP Emissions (tpy)		**0.00E+00**	**0.00E+00**	**8.68E-01**	**9.45E-01**	**3.15E-01**	**0.00E+00**	**0.00E+00**
Tank VOC EF (lb/gal throughput)		NA	1.68E-06	8.68E-05	1.37E-04		8.93E-04	1.91E-04
Total HAP EF (lb/gal throughput)		NA	NA	8.68E-05	1.37E-04		NA	NA
Total VOC Emissions (tpy)[1]	**3.12**							
Total HAP Emissions (tpy)	**3.02**							

Tanks VOC/HAP Emissions								
Tank #		**402 and 603**			**406, 407, 409, 410-413, 606, 607, 609, 610, I-3-I-6, SW-1, SW-2, WT-1, WT-3, RM4, RM7, RM8, 803**			**501-509, 706, 707, and WT-4**
Tank Description:	**AP-42 Section 7.1 Reference**	**Urea-Formaldehyde/ Phenol-Formaldehyde Resin Chill Tanks**			**Urea-Formaldehyde/ Phenol-Formaldehyde Resin Storage Tanks**			**Polyamide Resin Tanks**
Tank Data:								
Tank Contents =	-	HCHO	Methanol	Phenol	HCHO	Methanol	Phenol	3-dichloro-2-propar
Constituent Concentration =	-	0.6%	0.8%	0.6%	0.6%	0.8%	0.6%	4.0%
V, Tank Volume (gal) =	-	19,827	19,827	19,827	184,157	184,157	184,157	37,998
HAP?		Y	Y	Y	Y	Y	Y	N
Annual Throughput (gal/yr) =	-	27,413,647	27,413,647	27,413,647	2,069,052	2,069,052	2,069,052	1,818,182
Number of Tanks in Group =	-	2	2	2	23	23	23	11
L_T, Total Controlled Losses (lb/yr) =								
= ($L_{W,\ Controlled}$ + $L_{S,\ Controlled}$) * No. of Tanks =	Eq 1-1	7.28	85.86	0.33	55.66	655.05	2.54	125.66
VOC Emissions (tpy) =	-	3.64E-03	4.29E-02	1.66E-04	0.03	0.33	1.27E-03	0.06
HAP Emissions (tpy)		**3.64E-03**	**4.29E-02**	**1.66E-04**	**2.78E-02**	**3.28E-01**	**1.27E-03**	**0.00E+00**
Tank VOC EF (lb/gal throughput)			3.41E-06			3.45E-04		6.91E-05
Total HAP EF (lb/gal throughput)			3.41E-06			3.45E-04		NA
Total VOC Emissions (tpy)[1]	**3.12**							
Total HAP Emissions (tpy)	**3.02**							

Tanks VOC/HAP Emissions									
Tank #		**604**	**608**			**703**	**800**	**801**	**802**
Tank Description:	**AP-42 Section 7.1 Reference**	**Process Water Storage Tank**	**Flammable Resin Storage Tank**			**Methanol Distillate Storage Tank**	**IPA Storage Tank**	**Epichlorohydrin (EPI) Storage Tank**	**Epichlorohydrin (EPI) Storage Tank**
Tank Data:									
Tank Contents =	-	Methanol	HCHO	Phenol	IPA	Methanol	IPA	EPI	EPI
Constituent Concentration =	-	7.0%	0.6%	18.5%	34.2%	100.0%	100.0%	100.0%	100.0%
V, Tank Volume (gal) =	-	11,566	10,152	10,152	10,152	5,875	37,011	18,611	12,690
HAP?		Y	Y	Y	N	Y	N	Y	Y
Annual Throughput (gal/yr) =	-	1,000,000	650,000	650,000	650,000	360,000	363,000	2,500,000	2,500,000
Number of Tanks in Group =	-	1	1	1	1	1	1	1	1
L_T, Total Controlled Losses (lb/yr) =									
= ($L_{W,\ Controlled}$ + $L_{S,\ Controlled}$) * No. of Tanks =	Eq 1-1	42.76	1.02	1.79E+00	82.58	290.87	146.99	68.87	45.59
VOC Emissions (tpy) =	-	0.02	5.08E-04	8.96E-04	4.13E-02	0.15	0.07	0.03	0.02
HAP Emissions (tpy)		**2.14E-02**	**5.08E-04**	**8.96E-04**	**0.00E+00**	**1.45E-01**	**0.00E+00**	**3.44E-02**	**2.28E-02**
Tank VOC EF (lb/gal throughput)		4.28E-05		1.31E-04		8.08E-04	4.05E-04	2.75E-05	1.82E-05
Total HAP EF (lb/gal throughput)		4.28E-05		4.32E-06		8.08E-04	NA	2.75E-05	1.82E-05
Total VOC Emissions (tpy)[1]	**3.12**								
Total HAP Emissions (tpy)	**3.02**								

Truck Washing TW-1:

Truck Washing, TW-1 VOC and HAP Emissions										
Truck Type	Material Throughput	Material Content	Product Concentration	Temperature (°R)	MW (lb/lb-mol)	Substance Vapor	Truck Volume (gal)	Number of Trucks per year	VOC EF lb/truck	HAP EF lb/truck	Emission Rate (tpy)[1]
UF Resin	20,174,545	Formaldehyde	1.0%	515	30	1.50E-03	5,000	4,035	5.44E-02	5.44E-02	0.01
		Methanol	1.0%	515	32.04	1.26E-02					0.10
PF Resin	27,413,647	Formaldehyde	1.0%	515	30	1.50E-03	5,000	5,483	5.45E-02	5.45E-02	0.01
		Methanol	1.0%	515	32.04	1.26E-02					0.13
		Phenol	0.6%	515	94.1	1.30E-05					4.04E-04
Polyamide Resin	20,000,000	1,2-dichloro-2-propanol	4.0%	515	129	9.50E-03	5,000	4,000	1.48E-01	NA	0.30
							Total VOC Emissions (tpy)				**0.56**
							Total HAP Emissions (tpy)				**0.26**
1. Emission rate calculations are based on m=PV(MW)/RT*Number of trucks per year											
Universal Gas Cons	10.73	ft^3-psia/lb-mole °R									
Conversion Factor	7.48	gal/ft^3									

Paved Roads (PR-1):

Paved Roads, PR-1 PM Emissions

Material	Material Throughput lb/yr	Truck Weight[1] Unloaded tons	Truck Weight[1] Loaded tons	Average Truck Weight Tons	Number of Trucks[2]	Road Segment Miles	Emission Rate[3] PM (lb/hr)	PM (tpy)	PM_{10} (lb/hr)	PM_{10} (tpy)	$PM_{2.5}$ (lb/hr)	$PM_{2.5}$ (tpy)
Formaldehyde	160,000,000	15	40	27.5	3,200	0.45	2.28E-02	8.87E-02	4.57E-03	1.77E-02	1.12E-03	4.35E-03
Phenol	5,000,000	15	40	27.5	100	0.45	7.13E-04	2.77E-03	1.43E-04	5.54E-04	3.50E-05	1.36E-04
Caustic	22,000,000	15	40	27.5	440	0.30	2.11E-03	8.20E-03	4.22E-04	1.64E-03	1.04E-04	4.02E-04
DETA	24,000,000	15	40	27.5	480	0.30	2.30E-03	8.94E-03	4.60E-04	1.79E-03	1.13E-04	4.39E-04
Ammonia(30%)	4,000,000	15	40	27.5	80	0.41	5.20E-04	2.02E-03	1.04E-04	4.04E-04	2.55E-05	9.91E-05
Misc	7,800,000	15	40	27.5	156	0.41	1.01E-03	3.94E-03	2.03E-04	7.87E-04	4.97E-05	1.93E-04
MeOH Distillate	4,420,000	15	40	27.5	88	0.41	5.81E-04	2.26E-03	1.16E-04	4.51E-04	2.85E-05	1.11E-04
EPI	49,250,000	15	40	27.5	985	0.41	6.47E-03	2.51E-02	1.29E-03	5.03E-03	3.18E-04	1.23E-03
Adipic Acid	4,000,000	15	40	27.5	80	0.41	5.20E-04	2.02E-03	1.04E-04	4.04E-04	2.55E-05	9.91E-05
Wash Water	12,000,000	15	40	27.5	240	0.41	1.56E-03	6.06E-03	3.12E-04	1.21E-03	7.65E-05	2.97E-04
Salt/Sodium Sulfite	2,000,000	15	40	27.5	40	0.41	2.60E-04	1.01E-03	5.20E-05	2.02E-04	1.28E-05	4.96E-05
Urea	45,000,000	15	40	27.5	900	0.39	5.57E-03	2.17E-02	1.11E-03	4.33E-03	2.74E-04	1.06E-03
Final Product	350,000,000	15	40	27.5	7,000	0.38	4.27E-02	1.66E-01	8.54E-03	3.32E-02	2.10E-03	8.15E-03
					Emission Factors (lb/VMT):		**0.12**		**0.02**		**0.01**	
					Total:		**8.72E-02**	**3.39E-01**	**1.74E-02**	**6.77E-02**	**4.28E-03**	**1.66E-02**

1. Truck weight based on engineering estimates.
2. Number of trucks based on material throughput divided by haul weight.
3. Emission Rate (tpy) = Emission Rate (lb/VMT)* Number of Trucks* Length of Road Segment (Miles)

Hourly emissions calculated from annual emissions (tpy) / 8760 hours/year / [1 - (P/4N)], since rain correction factor applies only to annual emissions.

Process Piping and Component Leak Emission Estimates- Raw Material Handling (LDAR):

Process Piping and Component Leak Emission Factors

Component Type	Emission Factor[1] (lb/hr/source)	Control Efficiency (%)
Agitators (LL/GV)	0.0386	75%
Connectors (LL)	0.0005	75%
Connectors (GV)	0.0029	75%
Connectors (HL)	0.00007	30%
PRD (GV)	0.2293	75%
Pumps (LL)	0.0386	75%
Pumps (HL)	0.0161	0%
Valves (LL)	0.0035	75%
Valves (GV)	0.0089	75%
Valves (HL)	0.0007	0%

1. Emission factors and control efficiencies are taken from the TCEQ " Air Permit Technical Guidance for Chemical Sources Fugitive Guidance" (June 2018). Factors based on SOCMI without C2.

VOC/HAP Emissions from Individual Liquid Streams

Liquid Stream	Component	Emission Factor[2] (lb/hr/source)	Control Efficiency (%)	Concentration (%)	Component Count	Emission Rate (lb/hr)	Emission Rate (tpy)
Methanol Distillate	Valve (LL)	0.0035	75%	93%	151	0.12	0.54
	Connector (LL)	0.0005	75%	93%	511	0.06	0.26
IPA (800 to K3)	Pump (LL)	0.0386	0%	100%	2	0.08	0.34
	Valve (LL)	0.0035	0%	100%	44	0.15	0.67
	Connector (LL)	0.0005	30%	100%	172	0.06	0.26
IPA (K3 to 608 or 800 to 608))	Valve (LL)	0.0035	0%	100%	9	3.15E-02	0.14
	Connector (LL)	0.0005	30%	100%	23	8.05E-03	0.04
Formaldehyde	Pump (HL)	0.0161	0%	50%	3	0.02	0.11
	Valves (HL)	0.0007	0%	50%	66	0.02	0.10
	Connectors (HL)	0.00007	30%	50%	188	4.61E-03	0.02
Phenol	Pump (HL)	0.0161	0%	100%	2	0.03	0.14
	Valve (HL)	0.0007	0%	100%	58	0.04	0.18
	Connector (HL)	0.00007	30%	100%	197	9.65E-03	0.04
Epichlorohydrin	Pump (LL)	0.0386	75%	100%	2	0.02	0.08
	Valve (LL)	0.0035	75%	100%	102	0.09	0.39
	Valve (GV)	0.0089	75%	100%	24	0.05	0.23
	Connector (LL)	0.0005	75%	100%	218	0.03	0.12
	Connector (GV)	0.0029	75%	100%	89	0.06	0.28

VOC/HAP Emissions from Mixed Liquid Stream

Liquid Stream	Component	Emission Factor[2] (lb/hr/source)	Control Efficiency (%)	Component Count	Concentration (%) IPA	Concentration (%) Formaldehyde	Concentration (%) Phenol	IPA Emission Rate (lb/hr)	IPA Emission Rate (tpy)	Formaldehyde Emission Rate (lb/hr)	Formaldehyde Emission Rate (tpy)	Phenol Emission Rate (lb/hr)	Phenol Emission Rate (tpy)
Reactors (K1, K2, and K3)	Agitators (LL/GV)	0.0386	75%	3	10%	50%	40%	2.9E-03	1.3E-02	1.4E-02	6.3E-02	1.2E-02	5.1E-02
	Connectors (GV)	0.0029	75%	258	10%	50%	40%	1.9E-02	8.2E-02	9.4E-02	4.1E-01	7.5E-02	3.3E-01
	PRD (GV)	0.2293	75%	4	10%	50%	40%	2.3E-02	1.0E-01	1.1E-01	5.0E-01	9.2E-02	4.0E-01
	Valves (GV)	0.0089	75%	76	10%	50%	40%	1.7E-02	7.4E-02	8.5E-02	3.7E-01	6.8E-02	3.0E-01

LDAR Total VOC/HAP Emissions

Compound	Emission Rate lb/hr	Emission Rate tpy
Methanol	0.18	0.80
IPA	0.39	1.72
Formaldehyde	0.36	1.57
Phenol	0.33	1.44
Epichlorohydrin	0.25	1.11
Total VOC	1.52	6.64
Total HAP	1.12	4.92