LANE REGIONAL AIR PROTECTION AGENCY
TITLE V OPERATING PERMIT
REVIEW REPORT

1010 Main Street
Springfield, OR 97477

Significant Permit Modification

Bakelite Chemicals LLC
2665 Highway 99 North
Eugene, Oregon 97402
Website: https://bakelite.com/

Permit No. 203129

Source Information:

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

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

Compliance and Emissions Monitoring Requirements:

Unassigned emissions	NA
Emission credits	NA
Compliance schedule	NA
Source test date(s)	See permit

COMS	NA
CEMS	NA
Ambient monitoring	NA

Reporting Requirements

Annual report (due date)	February 15
Semi-Annual Report (due date)	February 15
	August 15
Greenhouse Gas (due date)	March 31

Monthly report (due dates)	NA
Quarterly report (due dates)	NA
Excess emissions report	Immediately
Other reports	NA

Air Programs

NSPS (list subparts)	Dc
NESHAP (list subparts)	A, ZZZZ, DDDDD
CAM	N
Regional Haze (RH)	N
Synthetic Minor (SM)	N
SM-80	N
Part 68 Risk Management	Y
Title V	Y
Major FHAP source	N
Federal major source	N

New Source Review (NSR)	N
Prevention of Significant Deterioration (PSD)	N
Acid Rain	N
Clean Air Mercury Rule (CAMR)	N
TACT	N
>20 Megawatt	N
Cleaner Air Oregon (CAO)	N

TABLE OF CONTENTS

LIST OF ABBREVIATIONS THAT MAY BE USED IN THIS REVIEW REPORT

ACDP	Air Contaminant Discharge Permit
Act	Federal Clean Air Act
APPU	Amino/phenolic resin process
AQMA	Air Quality Management Area
ASTM	American Society of Testing and Materials
BER	Baseline Emission Rate
BH	Baghouse
Btu	British thermal unit
CAM	Compliance Assurance Monitoring
CEMs	Continuous emission monitoring system
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
CPMS	Continuous parameter monitoring system
DETA	Diethylenetriamine
DEQ	Department of Environmental Quality
DMG	Dimethyl Glutarate
dscf	Dry standard cubic feet
EF	Emission factor
EPA	US Environmental Protection Agency
ERC	Emission Reduction Credit
EU	Emissions Unit
F	Fahrenheit
FCAA	Federal Clean Air Act
GHG	Greenhouse Gas
gr/dscf	Grain per dry standard cubic foot (1 pound = 7,000 grains)
HAP	Hazardous Air Pollutant as defined by LRAPA title 12
ID	Identification number
I&M	Inspection and maintenance
IPA	Isopropyl Alcohol
kPa	kiloPascal
lb	Pound
LRAPA	Lane Regional Air Protection Agency
M	1,000
MM	1,000,000
MB	Material Balance
MSF	1,000 Square feet 3/8" basis
MSDS	Material Safety Data Sheets
NA	Not applicable
NCP	Notice of Civil Penalty
NO_X	Nitrogen oxides
NESHAP	National Emission Standard for Hazardous Air Pollutant
NON	Notice of Non-Compliance
NSPS	New Source Performance Standards
NSR	New Source Review
O_2	Oxygen
OAR	Oregon Administrative Rules
ORS	Oregon Revised Statutes
O&M	Operation and maintenance
Pa	Pascal
Pb	Lead
PCD	Pollution Control Device
PF	Phenol Formaldehyde
PM	Particulate matter
PM_{10}	Particulate matter less than 10 microns in size
$PM_{2.5}$	Particulate matter less than 2.5 microns in size
ppm	Parts per million
PSEL	Plant Site Emission Limit
psia	pounds per square inch, actual
RICE	Reciprocating Internal Combustion Engine
SI ICE	Spark Ignition Internal Combustion Engine
SIP	State Implementation Plan
SO_2	Sulfur dioxide
ST	Source test
TOC	Total Organic Compound
UF	Urea Formaldehyde
UFC	Urea Formaldehyde Concentrates
VE	Visible emissions
VHAP	Volatile Hazardous Air Pollutant
VMT	Vehicle miles traveled
VOC	Volatile organic compounds
VOL	Volatile organic liquids
WSR	Wet Strength Resin

INTRODUCTION

1. Bakelite Chemicals LLC ("Bakelite" or "the facility") is an existing facility applying for a significant permit modification of an existing Title V Operating Permit.

    1.a. Information relied upon: The significant modification is based upon the modification application (No. 71365) received February 13, 2025.

2. The facility operates under the primary North American Industry Classification System (NAICS) code of 325211 – Plastics Material and Resin Manufacturing.

3. In accordance with OAR 340-218-0120(1)(f), this review report is intended to provide the legal and factual basis for the draft permit conditions. In most cases, the legal basis for a permit condition is included in the permit by citing the applicable regulation. In addition, the factual basis for the requirement may be the same as the legal basis. However, when the regulation is not specific and only provides general requirements, this review report is used to provide a more thorough explanation of the factual basis for the draft permit conditions.

REASON FOR PERMIT ACTION

4. The proposed permit action will reclassify the facility from a major source to an area source of federal HAPs (FHAPs) in accordance with EPA's 2020 reversal of the "once in, always in" policy. As an area source, the facility will no longer be subject to several previously applicable NESHAPs but has requested that all previously applicable NESHAP requirements be maintained in the modified permit as federally enforceable permit conditions to ensure there is no increase in HAP emissions due to the reclassification.

    This permitting action is concurrent with the issuance of a Construction Air Contaminant Discharge Permit (C-ACDP) (203129) which contains several facility-requested operating limitations to prevent backsliding for HAPs and to allow process gases from the facility's resin reactors (EU OX-1) to bypass the regenerative thermal oxidizer (RTO) for a limited number of hours annually. All requirements included in the C-ACDP are incorporated into this proposed modified TV permit.

FACILITY DESCRIPTION

5. Bakelite Chemicals LLC ("Bakelite" or "the facility") manufactures four (4) different liquid resins; urea-formaldehyde (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.

EMISSION UNIT AND POLLUTION CONTROL DEVICE IDENTIFICATION

6. The emission units regulated by the permit are the following. Emission units which have been modified as a part of this permitting action are in **bold.**

Emission Unit Description	EU ID	Pollution Control Device Description	PCD ID
Boiler – Cleaver Brooks 61.7 MMBtu/hr Water tube boiler constructed in 1972	B-1	None	NA
Manufacture of Wet Strength Resins: Reactor K1 and associated process equipment	**OX-1**	**Regenerative Thermal Oxidizer**	**RTO**
Manufacture of Amino/Phenolic Resins: Reactors K2 and K3 and associated process equipment	**OX-2**	**Regenerative Thermal Oxidizer**	**RTO**
Cooling Tower	CT-1	None	NA
Transfer Rack(s): UFC and Methanol Distillate Loading	LOAD-1	Methanol Distillate Loading: Vapor Balance System	Vbal-3
		UFC Loading: None	NA
Urea Transfer System	Urea	2 Baghouses (1 on Weigh Hopper, 1 on Storage Silo)	BH-1 BH-2
Resimixer	RESI-MIX®	Baghouse	BH-3
Dry Chemical Blower	Salt	Baghouse	BH-4 & BH-5
Dimethyl Glutarate (DMG) Storage Tank	301	None	NA
Polyamide Resin Tanks	Polyamide Resin Tanks	None	NA
Methanol Distillate Tanks 602 and 703	Methanol Distillate Tanks	None	NA
90% Formic Acid Storage Tank	305	None	NA
Acid Quench Storage Tank	AQ-1	None	NA
PF Resin Tanks	PF Resin Tanks	None	NA
UF Resin Tanks	UF Resin Tanks	None	NA
Phenol Storage Tanks 302, 303	Phenol Storage Tanks	None	NA
Formaldehyde Storage Tanks 304, 306	Formaldehyde Storage Tanks	None	NA
Diethylenetriamine (DETA) Storage Tank 701	DETA Storage Tank	None	NA
Prepolymer Storage Tank 298, 704, 705	Prepolymer Storage Tanks	None	NA
Isopropyl Alcohol Storage Tank 800	IPA Storage Tank	Vapor Balance System	Vbal-1
Epichlorohydrin Storage Tanks 801, 802	Epichlorohydrin Storage Tanks	Vapor Balance System	Vbal-2
Diesel Fuel Storage Tank	DF-1	None	NA
Precatalyst Storage Tank 309	Precatalyst Storage Tank	None	NA
Waste Resin Pile Emission	WRP	None	NA

Emission Unit Description	EU ID	Pollution Control Device Description	PCD ID
Truck and Railcar Loading of Resin	LOAD-2	None	NA
Truck Washing Emission Estimates	TW-1	None	NA
Paved Roads	PR-1	None	NA
Aggregate Insignificant Emission Units			
• Thermal Oxidizer Supplement Burner (natural gas) • Cleaning and Degreasing Metal Parts	AI	None	NA
Categorically Insignificant Activities			
Emergency Generator: 749 hp, diesel-fired	EG-1	None	NA
• Ammonium Hydroxide Storage Tank 300 • Sulfuric Acid Storage Tank 601 • Caustic Storage Tank 702 • WSR Stormwater Storage Tank 900	CIA	None	NA

7. Boiler (B-1): One (1) Cleaver Brooks water tube natural gas boiler (no fuel oil back-up) 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.

8. Manufacture of Wet Strength Resins (OX-1): This emission unit includes resin reactor K1 and associated process equipment (piping, valves, pumps, etc.) used in the manufacture of wet strength resins. 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.

   Prior to this modification, OX-1 included all three of the facility's resin reactors. Because the resin production that occurs in K1 is subject to different requirements than the resin production that occurs in K2 and K3, the emission units has been split in order to better delineate the requirements that apply to each type of resin production, and to comply with LRAPA 12-005(66)(a)(A). In addition, the previous emission unit LDAR, which corresponded to the previously applicable 40 CFR 63 subpart H and 40 CFR 63 subpart UU requirements, has been removed. Emissions from process equipment used in the production of wet strength resins is now included in OX-1 and emissions from process equipment used in the production of amino/phenolic resins is now included in OX-2.

9. Manufacture of Amino/Phenolic Resins (OX-2): This emission unit includes resin reactors K2 and K3 and associated process equipment (piping, valves, pumps, etc.) used in the manufacture of amino and phenolic resins. Reactors K2 and K3 use steam and/or cooling coils and 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.

10. Transfer Racks (LOAD-1): The transfer racks in EU: LOAD-1 handle urea-formaldehyde concentrate (UFC) and methanol distillates. The vapor balancing system (Vbal-3) only controls the loading of methanol distillate, which includes off-loading into tanker trucks and railcars for shipment offsite.

11. Cooling Tower (CT-1): The cooling tower is used for temperature control in the resin manufacturing process.

12. Other emission units that support the resin manufacturing process include various above-ground storage tanks, material handling equipment (Urea, Resi-Mix, Salt), resin loading (LOAD-2), truck washing (TW-1), paved roads (PR-1) for receiving raw materials and delivering products, a holding location for polymerized resin waste (WRP), and an emergency generator (EG-1).

EMISSION LIMITS AND STANDARDS, TESTING, MONITORING, AND RECORDKEEPING

Facility-Requested Operating Limitations

13. The facility has requested throughput limitations for Emission Units Phenol Storage Tanks, Formaldehyde Storage Tanks, and Methanol Distillate Tanks to ensure HAP emissions do not increase above the major source thresholds. These limitations are included in the facility's C-ACDP, which is being processed concurrently with this permit modification, and have been incorporated into the proposed modified Title V Operating Permit. Compliance with the throughput limitations is demonstrated through monitoring and maintaining 12-month rolling records of each tank throughput.

14. The facility has requested a federally-enforceable permit condition to prohibit the use of fuel oil in the boiler in Emission Unit B-1 in order to maintain the facility's HAP PTE below the major source thresholds. This restriction is included in the facility's C-ACDP, which is being processed concurrently with this permit modification, and has been incorporated into the proposed modified Title V Operating Permit. Compliance is demonstrated through the reporting of semi-annual compliance certifications.

Facility-Requested Control Device Bypass Hours

15. With the issuance of this permitting action, the facility will be reclassified from a major source to an area source of FHAPs. As an area source, the facility will no longer be subject to 40 CFR Part 63 Subpart OOO – National Emission Standards for Hazardous Air Pollutant Emissions: Manufacture of Amino/Phenolic Resins which includes the requirement to vent all emissions from the facility's resin reactors to a control device. The facility has applied to change their method of operation to allow process gases from the reactors to bypass the RTO for a limited number of hours annually to allow for operational flexibility. The allowable bypass hours are included in the facility's C-ACDP, which is being processed concurrently with this permit modification, and have been incorporated into the proposed modified Title V Operating Permit. Compliance is demonstrated through monitoring of the bypass lines and keeping records of the date, time, and duration of all periods when the exhaust gas stream from each reactor bypasses the RTO and is diverted to the atmosphere.

FEDERAL REQUIREMENTS

National Emission Standards for Hazardous Air Pollutants (NESHAP)

16. With the issuance of this permitting action, the facility will be reclassified from a major source to an area source of FHAPs. As an area source, the facility will no longer be subject to major source NESHAPs. In order to ensure there is no increase in FHAP emissions due to the reclassification, the facility has requested that all previously applicable NESHAP requirements be maintained in the modified permit as federally enforceable permit conditions. Per LRAPA 32-009(4), LRAPA may establish additional control requirements if requested by the owner or operator of a source. All previously applicable requirements under the following NESHAPs have been maintained in the proposed TV operating permit, under the authority of LRAPA 32-009(4):

    16.a. 40 CFR Part 63 Subpart W – National Emission Standards for Hazardous Air Pollutants for Epoxy Resins Production and Non-Nylon Polyamides Production.
    16.b. 40 CFR 63 subpart H – National Emission Standards for Organic Hazardous Air Pollutants for Equipment Leaks
    16.c. 40 CFR Part 63 Subpart EEEE – National Emission Standards for Hazardous Air Pollutants: Organic Liquids Distribution (Non-Gasoline)
    16.d. 40 CFR Part 63 Subpart OOO – National Emission Standards for Hazardous Air Pollutant Emissions: Manufacture of Amino/Phenolic Resins
    16.e. 40 CFR Part 63 Subpart SS – National Emission Standards for Closed Vent Systems, Control Devices, Recovery Devices and Routing to a Fuel Gas System or a Process
    16.f. 40 CFR Part 63 Subpart UU – National Emission Standards for Equipment Leaks - Control Level 2 Standards

New Source Performance Standards (NSPS)

17. There are no changes to the NSPS applicability as a result of this modification.

Compliance Assurance Monitoring (CAM)

18. Title 40, part 64 of the Code of Federal Regulations (CFR) contains Compliance Assurance Monitoring (CAM) requirements. These regulations are also codified in LRAPA 35-0200 through 35-0280. CAM requirements apply to any Pollutant Specific Emissions Unit (PSEU) at a part 70 source that meets the following criteria:

    18.a. The unit is subject to an emission limitation or standard for a regulated air pollutant;
    18.b. The unit uses a control device to achieve compliance with that emission limitation or standard;

18.c. The unit, by itself, has potential pre-control emissions of the regulated air pollutant that would make it a major source (i.e. greater than 100 tons per year for criteria pollutants; greater than 10 tons per year for individual Federal HAPs); and

18.d. The exemptions in 40 CFR 64.2(b) and LRAPA 35-0200(2) do not apply. The exemptions include:

18.d.i. Emission limitations or standards proposed by EPA after November 15, 1990 under section 111 (NSPS) or section 112 (NESHAPs);
18.d.ii. Stratospheric ozone protection requirements under Title VI;
18.d.iii. Acid Rain Program requirements;
18.d.iv. Emission limitations or standards or other applicable requirements that apply solely under an emissions trading program approved or promulgated by US EPA;
18.d.v. An emissions cap that meets the requirements in 40 CFR 70.4(b)(12);
18.d.vi. Emission limitations or standards for which a part 70 permit specifies a continuous compliance demonstration method, as defined in 40 CFR 64.1 and LRAPA title 12; and
18.d.vii. Municipally-owned backup utility emission units meeting the requirements under 40 CFR 64.2(b)(2)

19. The following table evaluates CAM applicability for the resin reactors in OX-1 and OX-2, which were previously exempt from CAM due to being subject to emission limitations or standards proposed by EPA after November 15, 1990 under section 111 (NSPS) or section 112 (NESHAPs).

Emission Unit	Uses a Control Device for a Regulated Pollutant	Pollutant	Uncontrolled Potential Emissions Exceed Major Source Threshold	Emission Limitation or Standard Applies for this Pollutant	Subject to CAM for the Pollutant
OX-1	Yes	VOC	No	No	No
OX-1	Yes	HAP	No	No	No
OX-2	Yes	VOC	No	No	No
OX-2	Yes	HAP	No	No	No

PLANT SITE EMISSION LIMIT (PSEL) INFORMATION

20. Below is a summary of the baseline emission rate, netting basis, plant site emission limit, and emissions capacity.

Pollutant	**Baseline Emission Rate (TPY)**	**Netting Basis**		**Plant Site Emission Limit (PSEL)**		**PTE (TPY)**	**SER (TPY)**
		Previous (TPY)	**Proposed (TPY)**	**Previous PSEL (TPY)**	**Proposed PSEL (TPY)**		
PM	1.9	1.9	1.9	24	3.7	3.65	25
PM_{10}	1.9	1.9	1.9	14	3.4	3.38	15
$PM_{2.5}$	NA	1.9	1.9	9	3.3	3.33	10
CO	4.5	4.5	4.5	99	33	33.2	100
NO_X	17.8	17.8	17.8	39	28	28.5	40
SO_2	9.1	9.1	9.1	39	1.2	1.2	40
VOC	2.7	2.7	2.7	39	15	15.4	40
GHG(CO_2e)	2862	2862	2862	74000	31972	31972	75,000

21. The baseline emission rates and netting basis for all pollutants were established in prior permitting actions. No changes have been made as a result of this modification.

22. The PSELs for all pollutants have been reset to the potential emission rate from the significant emission units as required by subsection 42-0041(3). The previous PSELs were based on generic PSELs that are no longer allowed by rule.

SIGNIFICANT EMISSION RATE

23. There are no proposed increases to the PSELs as a result of this permitting action.

HAZARDOUS AIR POLLUTANTS (HAPS)

24. 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.

25. The facility is currently permitted as a major source of HAPs, however the current HAP PTE for the facility is below the major source thresholds of 10 tpy for any single HAP and 25 tpy for any combination of HAPs. With this permitting action, the facility will be reclassified from a major source to an area source of FHAPs.

26. 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

RECORDKEEPING REQUIREMENTS

27. The permit includes requirements for maintaining records of all testing, monitoring, and production information necessary for assuring compliance with the standards and calculating plant site emissions. The records of all monitoring specified in the Title V Operation Permit must be kept at the plant site for at least five (5) years.

REPORTING REQUIREMENTS

28. The permit includes a requirement for submitting semi-annual and annual monitoring reports that include semi-annual compliance certifications. Excess emissions are required to be reported to LRAPA immediately as well as in a logbook attached to the annual report. Emissions fees reports are required annually.

PUBLIC NOTICE

29. The proposed permit will be on public notice from January 13, 2026 to February 17, 2026. Comments may be submitted in writing during the comment period. LRAPA will hold a public hearing if requested by ten (10) or more individuals or one person representing a group of ten (10) or more individuals. After the comment period and hearing, if requested, LRAPA will review the comments and modify the permit as may be appropriate.

EPA REVIEW

30. The proposed permit will be sent to EPA for a 45-day review period after the public comment period. LRAPA may request and EPA may agree to an expedited review if there are no substantive or adverse comments during the comment period. If the EPA does not object in writing, any person may petition the EPA within 60 days after the expiration of EPA's 45-day review period to make such objection. Any such petition must be based only on objections to the permit that were raised with reasonable specificity during the public comment period provided for in OAR 340-218-0210, unless the petitioner demonstrates that it was impracticable to raise such objections within such period, or unless the grounds for such objection arose after such period.

AD 1/12/2026

EMISSIONS DETAIL SHEETS

PSELs:

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	2.00	2.00	2.00	22.11	26.33	0.16	1.45	0.01	0.52	31630.42
OX-1 & OX-2:Resin Reactors	0.02	0.02	0.02	10.08	1.16	1.70E-03	1.0	6.55	7.53	340.41
OX-1 & OX-2: Process Piping and Component Leaks	-	-	-	-	-	-	6.64	-	4.92	-
Urea	0.01	0.01	0.01	-	-	-	-	-	-	-
RESI-MIX	0.09	0.09	0.09	-	-	-	-	-	-	-
Salt	0.09	0.09	0.09	-	-	-	-	-	-	-
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	-
PR-1: Paved Roads	0.34	0.07	0.02	-	-	-	-	-	-	-
AI: Aggregate Insignificant Activities	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Potential to Emit (PTE)	**3.65**	**3.38**	**3.33**	**33.19**	**28.49**	**1.16**	**15.40**	**7.56**	**17.68**	**31971.83**
PSELs	**3.7**	**3.4**	**3.3**	**33**	**28**	**1.2**	**15**	**7.6**	**18**	**31972**
1. Single highest HAP for facility is Hydrochloric Acid.										

HAP Summary:

Facility-Wide Hap & TAC Summary														
Compound	CAS	HAP	TAC	B-1	OX-1 & OX-2: Reactors	OX-1 & OX-2: RTO Bypass	OX-1 & OX-2: Process piping and component leaks	EG-1	Tanks	WRP	LOAD-1	LOAD-2	TW-1	tpy
Acetaldehyde	75-07-0	Y	Y					3.30E-05						3.301E-05
Acrolein	107-02-8	Y	Y					1.03E-05						1.03E-05
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			1.02E-03						1.58E-03
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		0.291	0.252	1.111		0.057					1.71
Formaldehyde	50-00-0	Y	Y	0.020	0.014	0.017	1.573	0.000	0.977	2.71E-03	0.016	0.038	0.026	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				1.719		0.115			0.045		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		0.145	0.252	0.798		1.121	1.38E-03	0.020	0.344	0.233	2.91
Naphthalene	91-20-3	Y	Y	1.61E-04	1.73E-06			1.70E-04						3.33E-04
Nickel Compounds	7440-02-0	Y	Y	5.54E-04	5.96E-06									5.60E-04
Phenol	108-95-2	Y	Y		1.97E-03	3.41E-03	1.438		0.870	1.14E-04		1.10E-03	4.04E-04	2.31
Polycyclic Organic Matter	401	Y	Y	1.74E-04	1.88E-06			2.78E-04						4.54E-04
Toluene	108-88-3	Y	Y	8.94E-04	9.62E-06			3.68E-04						1.27E-03
Xylene	1330-20-7	Y	Y					2.53E-04						2.53E-04
EU Totals:				**0.53**	**7.01**	**0.52**	**4.92**	**2.23E-03**	**3.02**	**4.20E-03**	**0.04**	**0.38**	**0.26**	
													Total HAP:	**16.7**
													Total TAC:	**19.3**
													Single HAP (HCl):	**6.6**

B-1 (Boiler):

Boiler B-1		
Mfg:	Cleaver Brooks	
Fuel Fired:	Natural gas	
Maximum Hourly Heat Input:	61.67	MMBtu/hr
HHV of Natural gas:	1,026	Btu/scf
Annual Hours of Operation:	8,760	hours/year
NG Rate:	540229.2	MMBtu/yr

Boiler B-1 Emissions						
Pollutant	Emission Factors		Emission Factors		Reference	Annual Emissions (tons)
	Factors	Units	Factors	Units		
PM	7.6	lb/MMscf	7.41E-03	lb/MMBtu	1	2.00
PM10	7.6	lb/MMscf	7.41E-03	lb/MMBtu	1	2.00
PM2.5	7.6	lb/MMscf	7.41E-03	lb/MMBtu	1	2.00
SO2	0.6	lb/MMscf	5.85E-04	lb/MMBtu	1	0.16
NOx	100	lb/MMscf	0.097	lb/MMBtu	2	26.3
CO	84	lb/MMscf	0.082	lb/MMBtu	2	22.1
VOC	5.5	lb/MMscf	5.36E-03	lb/MMBtu	1	1.45
GHG (CO2e)	-	-	117.1	lb/MMBtu	3	31630
1.AP-42, Section 1.4, Natural Gas Combustion (July 1998), Table 1.4-2, converted from lb/MMscf to lb/MMBtu using the higher heating value of 1,026 Btu/scf.						
2. AP-42, Section 1.4, Natural Gas Combustion (July 1998), Table 1.4-1, converted from lb/MMscf to lb/MMBtu using the higher heating value of 1,026 Btu/scf.						
3. EPA's Mandatory Reporting Rule for Greenhouse Gases, 40 CFR Part 98, Subpart C, Tables C-1 and C-2.						

OX-1 & OX-2 (Resin Reactors):

Resin Reactors, OX-1 & OX-2, CONTROLLED			
Resin Reactors:		K1, K2, K3	
		Seal Water Tanks (VS-1)	
Ancillary Activities:		Drum Station Filling	
Control device:		Regenerative thermal oxidizer	
Fuels fired:		Natural gas	
Max hourly heat input:		0.75	MMBtu/hr
NG HHV		1026	Btu/scf
Annual hours of operation		7752	hr/yr

OX-1 & OX-2, CONTROLLED Emissions					
Pollutant	NG Combustion EF	Process Related Resin Plant	Reference	Emission rate	
	lb/MMBtu	(lb/hr)		lb/hr	tpy
PM	7.41E-03	-	1	5.56E-03	0.02
PM10	7.41E-03	-	1	5.56E-03	0.02
PM2.5	7.41E-03	-	1	5.56E-03	0.02
SO2	5.85E-04	-	1	4.39E-04	1.70E-03
NOx	-	0.3	2	0.30	1.16
CO	-	2.6	2	2.60	10.1
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	340.4

1. AP-42 Section 1.4, Natural Gas Combustion (July 1998), Table 1.4-2, converted from lb/MMscf 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.

OX-1 & OX-2 CONTROLLED HAPs					
	NG Combustion EF	Process Related Resin Plant	Reference	Emission rate	
Pollutant	lb/MMBtu	(lb/hr)		lb/hr	tpy
Benzene	2.05E-06	-	1	1.54E-06	5.96E-06
Dichlorobenzene	1.17E-06	-	1	8.78E-07	3.40E-06
Epichlorohydrin	-	7.52E-02	2	7.52E-02	0.29
Formaldehyde	-	3.62E-03	2	3.62E-03	0.01
Hexane	1.75E-03	-	1	1.31E-03	5.09E-03
Hydrochloric Acid	-	1.69	3	1.69	6.55
Methanol		3.75E-02	2	0.04	0.15
Naphthalene	5.95E-07	-	1	4.46E-07	1.73E-06
Phenol	-	5.08E-04	2	5.08E-04	1.97E-03
Polycyclic Organic Matter	6.45E-07	-	1	4.84E-07	1.88E-06
Toluene	3.31E-06	-	1	2.48E-06	9.62E-06
Arsenic Compounds	1.95E-07	-	4	1.46E-07	5.67E-07
Cadmium Compounds	1.07E-06	-	4	8.03E-07	3.11E-06
Chromium Compounds	1.36E-06	-	4	1.02E-06	3.95E-06
Cobalt Compounds	8.19E-08	-	4	6.14E-08	2.38E-07
Lead Compounds	4.87E-07	-	5	3.65E-07	1.42E-06
Manganese Compounds	3.70E-07	-	4	2.78E-07	1.08E-06
Mercury Compounds	2.53E-07	-	4	1.90E-07	7.35E-07
Nickel Compounds	2.05E-06	-	4	1.54E-06	5.96E-06
TOTAL				**1.81**	**7.01**

1. AP-42 Section 1.4, Natural Gas Combustion (July 1998), Table 1.4-3, converted from lb/MMscf to lb/MMBtu using the higher heating value of 1,026 Btu/scf.

2. Emission factor based on source specific stack test data from April 2003. The selected emission factor is based on an inlet loading during the stack test and a RTO control efficiency of 95% plus emissions from Drumming Station operation. Formaldehyde emission factor is based on stack test result plus a safety factor of 10% as a control efficiency of 93.4% observed during stack test.

3. HCl emissions are as a result of EPI destruction. Emission rate is based on the molecular weights. HCl (lb)= lb EPI Destructed * 36.5/92.5 HCl emissions are based on Thermal Oxidizer Stack Test from April 2003 plus safety

4. AP-42 Section 1.4, Natural Gas Combustion (July 1998), Table 1.4-4, converted from lb/MMscf to lb/MMBtu using the higher heating value of 1,026 Btu/scf.

5. AP-42 Section 1.4, Natural Gas Combustion (July 1998), Table 1.4-2, converted from lb/MMscf to lb/MMBtu using the higher heating value of 1,026 Btu/scf.

6. Polycyclic Organic Matter (POM) emission factor includes naphthalene. To avoid double counting, naphthalene emissions were subtracted from Total HAP.

OX-1 & OX-2, RTO Bypass		
Resin Reactors:	K1, K2, K3	
	Seal Water Tanks (VS-1)	
Ancillary Activities:	Drum Station Filling	
Control device:	NA - Bypass hours	
Annual Bypass hrs, OX-1 (K1)	336	hr/yr
Annual Bypass hrs, OX-2 (K2, K3)	672	hr/yr
Annual Bypass hrs, drum filling[1]	672	hr/yr

1. Drum filling for resins produced in K3. Drum station for K3 resins is routed to the RTO. Therefore, bypass hours for drum filling are assumed equal to the allowable bypass hours for K2/K3 (672/ hr/yr)

OX-1 & OX-2, RTO Bypass Emissions						
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).						

OX-1 & OX-2, RTO Bypass HAPs							
Pollutant	Cas No.	Process Related, K1	Process Related, K2/3	Drum Filling	Reference	Emission Rate	
		lb/hr	lb/hr	lb/hr		lb/hr	tpy
Epichlorohydrin		1.50	-	-	1	1.50	0.25
Formaldehyde		-	0.05	3.24E-04	1	0.05	0.02
Methanol		-	0.75	4.11E-04	1	0.75	0.25
Phenol		-	0.01	1.51E-04	1	0.01	3.41E-03
TOTAL		1.5	0.8096	8.86E-04		**2.31**	**0.52**
1.Uncontrolled HAP emission factors for Kettle 1 (Wet Strength Resin production) based on source specific stack test data from April 2003. The selected emission factor EPI is based on an inlet EPI loading during stack test and a RTO control efficiency of 0%. The selected emission factor for formaldehyde, methanol and phenol is based on maximum hourly emissions from Drumming Station Operation (uncontrolled). Uncontrolled HAP emission factors for Kettles 2 & 3 (UF/PF Resins production) based on source specific stack test data from April 2003. The selected emission factors are based on inlet HAP loading during stack test, a RTO control efficiency of 0% due to bypass plus maximum hourly emissions from Drumming Station operation (uncontrolled).							

OX-1 & OX-2 Process Piping and Component Leaks

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

EU: Urea:

Urea Transfer System, Urea		
	Control Device:	
Urea Storage Silo	Baghouse (BH-1)	
Urea Loading Hopper	Baghouse (BH-2)	
Hours of Operation	8760	hr/yr
Throughput	210000	tpy

Urea Transfer System Emissions					
Pollutant	Source	Emission Factor lb/ton	Reference	Emission Rates lb/hr	Emission Rates tpy
PM/PM10/PM2.5	Urea Storage Silo	1.97E-05	1	4.72E-04	2.07E-03
	Urea Loading Hopper	3.94E-05	1	9.45E-04	4.14E-03
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.					

EU: RESI-MIX

Resi-Mixer and Hopper, RESI-MIX		
	Control Device:	
Resi-Mizer and Hopper	Baghouse (BH-3)	
Hours of Operation	8760	hr/yr
Throughput	9000	tpy

Resi-Mixer and Hopper, RESI-MIX Emissions					
Pollutant	Source	Emission Factor lb/ton	Reference	Emission Rates lb/hr	Emission Rates tpy
PM/PM10/PM2.5	Resi-Mixer and Hopper	2.00E-02	1	2.05E-02	9.00E-02
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.					

EU: Salt:

Misc. Dry Material Unloading - Salt		
	Control Device:	
Misc. dry material unloading	Baghouse (BH-4, BH-5)	
Hours of Operation	8760	hr/yr
Throughput	9000	tpy

Misc. Dry Material Unloading, Salt - Criteria Pollutants					
Pollutant	Source	Emission Factor lb/ton	Reference	Emission Rates lb/hr	Emission Rates tpy
PM/PM10/PM2.5	Misc. dry material unloading[2]	2.00E-02	1	2.05E-02	9.00E-02
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.					

EU: WRP:

Waste Resin Pile - WRP		
Hours of Operation	8760	hr/yr
Throughput	500000	lb/yr

Waste Resin Pile - WRP - HAPs

Pollutant	Cas-No	HAP	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	67-56-1	Y	2.31E-03	5%	30%	16%	3.14E-04	1.38E-03
Formaldehyde	50-00-0	Y	3.90E-04	70%	25%	16%	6.19E-04	2.71E-03
Phenol	108-95-2	Y	4.11E-05	70%	10%	16%	2.61E-05	1.14E-04
Ammonia	7664-41-7	N	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).

EU: CT-1:

Cooling Tower, CT-1		
Circulating Water Rate	5,800	gpm
Drift Eliminator	0.0005%	
Water Density	8.34	lb/gal
Total Dissolved Solids (TDS)	1,600	ppm
Annual hours of operation	8,760	hr/yr

Cooling Tower, CT-1 Emissions

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.

EU: 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.						

EU: 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-**			**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-propan
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**								

EU: 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

EU: 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.