

**MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
AIR QUALITY DIVISION**

April 2, 2015

**PERMIT TO INSTALL**  
198-00H

**ISSUED TO**  
BASF Corporation

**LOCATED AT**  
13000 Levan Street  
Livonia, Michigan

**IN THE COUNTY OF**  
Wayne

**STATE REGISTRATION NUMBER**  
N1060

The Air Quality Division has approved this Permit to Install, pursuant to the delegation of authority from the Michigan Department of Environmental Quality. This permit is hereby issued in accordance with and subject to Section 5505(1) of Article II, Chapter I, Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Pursuant to Air Pollution Control Rule 336.1201(1), this permit constitutes the permittee's authority to install the identified emission unit(s) in accordance with all administrative rules of the Department and the attached conditions. Operation of the emission unit(s) identified in this Permit to Install is allowed pursuant to Rule 336.1201(6).

DATE OF RECEIPT OF ALL INFORMATION REQUIRED BY RULE 203:

**March 5, 2015**

DATE PERMIT TO INSTALL APPROVED:

**April 2, 2015**

SIGNATURE:

DATE PERMIT VOIDED:

SIGNATURE:

DATE PERMIT REVOKED:

SIGNATURE:

## PERMIT TO INSTALL

### Table of Contents

<b>Section</b>	<b>Page</b>
Alphabetical Listing of Common Abbreviations / Acronyms .....	2
General Conditions .....	3
Special Conditions .....	5
Emission Unit Summary Table.....	5
Flexible Group Summary Table .....	6
Special Conditions for FGISOCYANATE .....	7
Special Conditions for FGFACILITY .....	12
Appendices .....	14

### Common Abbreviations / Acronyms

Common Acronyms		Pollutant / Measurement Abbreviations	
AQD	Air Quality Division	BTU	British Thermal Unit
BACT	Best Available Control Technology	°C	Degrees Celsius
CAA	Clean Air Act	CO	Carbon Monoxide
CEM	Continuous Emission Monitoring	dscf	Dry standard cubic foot
CFR	Code of Federal Regulations	dscm	Dry standard cubic meter
CO <sub>2</sub> e	Carbon Dioxide Equivalent	°F	Degrees Fahrenheit
COM	Continuous Opacity Monitoring	gr	Grains
EPA	Environmental Protection Agency	Hg	Mercury
EU	Emission Unit	hr	Hour
FG	Flexible Group	H <sub>2</sub> S	Hydrogen Sulfide
GACS	Gallon of Applied Coating Solids	hp	Horsepower
GC	General Condition	lb	Pound
GHGs	Greenhouse Gases	kW	Kilowatt
HAP	Hazardous Air Pollutant	m	Meter
HVLP	High Volume Low Pressure *	mg	Milligram
ID	Identification	mm	Millimeter
LAER	Lowest Achievable Emission Rate	MM	Million
MACT	Maximum Achievable Control Technology	MW	Megawatts
MAERS	Michigan Air Emissions Reporting System	ng	Nanogram
MAP	Malfuction Abatement Plan	NO <sub>x</sub>	Oxides of Nitrogen
MDEQ	Michigan Department of Environmental Quality (Department)	PM	Particulate Matter
MSDS	Material Safety Data Sheet	PM10	PM with aerodynamic diameter ≤10 microns
NESHAP	National Emission Standard for Hazardous Air Pollutants	PM2.5	PM with aerodynamic diameter ≤ 2.5 microns
NSPS	New Source Performance Standards	pph	Pounds per hour
NSR	New Source Review	ppm	Parts per million
PS	Performance Specification	ppmv	Parts per million by volume
PSD	Prevention of Significant Deterioration	ppmw	Parts per million by weight
PTE	Permanent Total Enclosure	psia	Pounds per square inch absolute
PTI	Permit to Install	psig	Pounds per square inch gauge
RACT	Reasonably Available Control Technology	scf	Standard cubic feet
ROP	Renewable Operating Permit	sec	Seconds
SC	Special Condition	SO <sub>2</sub>	Sulfur Dioxide
SCR	Selective Catalytic Reduction	THC	Total Hydrocarbons
SRN	State Registration Number	tpy	Tons per year
TAC	Toxic Air Contaminant	µg	Microgram
TEQ	Toxicity Equivalence Quotient	VOC	Volatile Organic Compound
VE	Visible Emissions	yr	Year

\* For High Volume Low Pressure (HVLP) applicators, the pressure measured at the HVLP gun air cap shall not exceed ten (10) pounds per square inch gauge (psig).

### GENERAL CONDITIONS

1. The process or process equipment covered by this permit shall not be reconstructed, relocated, or modified, unless a Permit to Install authorizing such action is issued by the Department, except to the extent such action is exempt from the Permit to Install requirements by any applicable rule. **(R 336.1201(1))**
2. If the installation, construction, reconstruction, relocation, or modification of the equipment for which this permit has been approved has not commenced within 18 months, or has been interrupted for 18 months, this permit shall become void unless otherwise authorized by the Department. Furthermore, the permittee or the designated authorized agent shall notify the Department via the Supervisor, Permit Section, Air Quality Division, Michigan Department of Environmental Quality, P.O. Box 30260, Lansing, Michigan 48909-7760, if it is decided not to pursue the installation, construction, reconstruction, relocation, or modification of the equipment allowed by this Permit to Install. **(R 336.1201(4))**
3. If this Permit to Install is issued for a process or process equipment located at a stationary source that is not subject to the Renewable Operating Permit program requirements pursuant to R 336.1210, operation of the process or process equipment is allowed by this permit if the equipment performs in accordance with the terms and conditions of this Permit to Install. **(R 336.1201(6)(b))**
4. The Department may, after notice and opportunity for a hearing, revoke this Permit to Install if evidence indicates the process or process equipment is not performing in accordance with the terms and conditions of this permit or is violating the Department's rules or the Clean Air Act. **(R 336.1201(8), Section 5510 of Act 451, PA 1994)**
5. The terms and conditions of this Permit to Install shall apply to any person or legal entity that now or hereafter owns or operates the process or process equipment at the location authorized by this Permit to Install. If the new owner or operator submits a written request to the Department pursuant to R 336.1219 and the Department approves the request, this permit will be amended to reflect the change of ownership or operational control. The request must include all of the information required by subrules (1)(a), (b), and (c) of R 336.1219 and shall be sent to the District Supervisor, Air Quality Division, Michigan Department of Environmental Quality. **(R 336.1219)**
6. Operation of this equipment shall not result in the emission of an air contaminant which causes injurious effects to human health or safety, animal life, plant life of significant economic value, or property, or which causes unreasonable interference with the comfortable enjoyment of life and property. **(R 336.1901)**
7. The permittee shall provide notice of an abnormal condition, start-up, shutdown, or malfunction that results in emissions of a hazardous or toxic air pollutant which continue for more than one hour in excess of any applicable standard or limitation, or emissions of any air contaminant continuing for more than two hours in excess of an applicable standard or limitation, as required in Rule 912, to the Department. The notice shall be provided not later than two business days after start-up, shutdown, or discovery of the abnormal condition or malfunction. Written reports, if required, must be filed with the Department within 10 days after the start-up or shutdown occurred, within 10 days after the abnormal conditions or malfunction has been corrected, or within 30 days of discovery of the abnormal condition or malfunction, whichever is first. The written reports shall include all of the information required in Rule 912(5). **(R 336.1912)**
8. Approval of this permit does not exempt the permittee from complying with any future applicable requirements which may be promulgated under Part 55 of 1994 PA 451, as amended or the Federal Clean Air Act.
9. Approval of this permit does not obviate the necessity of obtaining such permits or approvals from other units of government as required by law.
10. Operation of this equipment may be subject to other requirements of Part 55 of 1994 PA 451, as amended and the rules promulgated thereunder.

11. Except as provided in subrules (2) and (3) or unless the special conditions of the Permit to Install include an alternate opacity limit established pursuant to subrule (4) of R 336.1301, the permittee shall not cause or permit to be discharged into the outer air from a process or process equipment a visible emission of density greater than the most stringent of the following. The grading of visible emissions shall be determined in accordance with R 336.1303. **(R 336.1301)**
  - a) A six-minute average of 20 percent opacity, except for one six-minute average per hour of not more than 27 percent opacity.
  - b) A visible emission limit specified by an applicable federal new source performance standard.
  - c) A visible emission limit specified as a condition of this Permit to Install.
  
12. Collected air contaminants shall be removed as necessary to maintain the equipment at the required operating efficiency. The collection and disposal of air contaminants shall be performed in a manner so as to minimize the introduction of contaminants to the outer air. Transport of collected air contaminants in Priority I and II areas requires the use of material handling methods specified in R 336.1370(2). **(R 336.1370)**
  
13. The Department may require the permittee to conduct acceptable performance tests, at the permittee's expense, in accordance with R 336.2001 and R 336.2003, under any of the conditions listed in R 336.2001. **(R 336.2001)**

**SPECIAL CONDITIONS**

**EMISSION UNIT SUMMARY TABLE**

The descriptions provided below are for informational purposes and do not constitute enforceable conditions.

<b>Emission Unit ID</b>	<b>Emission Unit Description (Process Equipment &amp; Control Devices)</b>	<b>Flexible Group ID</b>
EUISOREACTORS	Reactor Vessels DVR100, DVR101, DVR102, DVR103, DVR104, DVR105, and DVR106 controlled by the Iso Vessel Vent Control System <sup>a</sup> or Iso Vessel Vacuum Control System <sup>b</sup> .	FGISOCYANATE
EUTK211	30,000 gallon fixed roof storage tank, uncontrolled.	FGISOCYANATE
EUTK212	30,000 gallon fixed roof storage tank, uncontrolled.	FGISOCYANATE
EUTK229	30,000 gallon fixed roof storage tank, uncontrolled.	FGISOCYANATE
EUISOTANKS	Fixed roof storage tanks DVTK203, DVTK206, DVTK207, and DVTK209, uncontrolled.	FGISOCYANATE
EUISOBULKLOAD	Isocyanate bulk loading, uncontrolled.	FGISOCYANATE
EUISODRUMMING1	BL137 A&B; non-bulk container filling, uncontrolled.	FGISOCYANATE
EUISODRUMMING2	Isocyanate drumming hood associated with SV00028 (i.e. packaging product into drums and intermediate bulk containers); uncontrolled.	FGISOCYANATE
EUISOSCRAPHOOD	BL138, uncontrolled	FGISOCYANATE
EUEXHAUSTVENT	BL139, uncontrolled	FGISOCYANATE
EUWASTEHOOD	BL140, uncontrolled	FGISOCYANATE
EUMIXINGBOOTH	EF14, uncontrolled	FGISOCYANATE
EURESINBLEND	Fixed Roof Resin Blend Tanks DVB100, DVB101, DVB102, DVB103, DVB104, DVB105, DVB106, DVB107, DVB108, DVB109, DVB110, DVB111, including fugitive emissions; uncontrolled.	FGRESIN
EUTANKTRUCK	Bulk transfer emptying and filling; uncontrolled.	FGRESIN
<sup>a</sup> consists of the following: DVT-304 (Mist Eliminator). <sup>b</sup> consists of the following: DVT-305B (Mist Eliminator), DVT-305C (Knockout Drum).		
Changes to the equipment described in this table are subject to the requirements of R 336.1201, except as allowed by R 336.1278 to R 336.1290.		

**FLEXIBLE GROUP SUMMARY TABLE**

The descriptions provided below are for informational purposes and do not constitute enforceable conditions.

Flexible Group ID	Flexible Group Description	Associated Emission Unit IDs
FGISOCYANATE	Equipment associated with the isocyanate side of the process, including reactors, storage tanks, loading and drumming operations, and various miscellaneous activities.	EUTK211, EUTK212, EUTK229, EUISOTANKS (specifically storage tanks DVTK203, DVTK206, DVTK207, and DVTK209), EUISOSCRAPHOOD, EUEXHAUSTVENT, EUWASTEHOOD, EUMIXINGBOOTH, EUISOREACTORS, EUIOBULKLOAD, EUISODRUMMING1, EUISODRUMMING2
FGRESIN	Equipment associated with the resin side operations of the process, including blenders, loading and drumming operations, and various miscellaneous activities.	EURESINBLEND, EUTANKTRUCK
FGFACILITY	All process equipment source-wide including equipment covered by other permits, grandfathered equipment and exempt equipment.	

**The following conditions apply to: FGISOCYANATE**

**DESCRIPTION:** Equipment associated with the isocyanate side of the process, including reactors, storage tanks, loading and drumming operations, and various miscellaneous activities.

**Emission Units:** EUTK211, EUTK212, EUTK229, EUISOTANKS, EUISOSCRAPHOOD, EUEXHAUSTVENT, EUWASTEHOOD, EUMIXINGBOOTH, EUISOREACTORS, EUISODRUMMING1, EUISODRUMMING2, and EUISOBULKLOAD

**POLLUTION CONTROL EQUIPMENT:**

- 1) Iso Vessel Vent Control System associated with EUISOREACTORS, consisting Mist Eliminator No. DVT- 304,
- 2) Iso Vessel Vacuum Control System associated with EUISOREACTORS, consisting of Knockout Drum No. DVT-305A, Mist Eliminator No. DVT-305B, Knockout Drum No. DVT-305C.

**I. EMISSION LIMITS**

<b>Pollutant</b>	<b>Limit</b>	<b>Time Period/ Operating Scenario</b>	<b>Equipment</b>	<b>Testing / Monitoring Method</b>	<b>Underlying Applicable Requirements</b>
1. MDI	95.1 pounds per year	12-month rolling time period as determined at the end of each calendar month	EUISODRUMMING1 and EUISODRUMMING2 (sum total of both)	SC VI.1 and SC VI.2	R 336.1225 R 336.1702(a)
2. MDI	115 pounds per year	12-month rolling time period as determined at the end of each calendar month	EUISOSCRAPHOOD	SC VI.1	R 336.1225 R 336.1702(a)
3. MDI	383.3 pounds per year	12-month rolling time period as determined at the end of each calendar month	EUEXHAUSTVENT	SC VI.1	R 336.1225 R 336.1702(a)
4. MDI	156.4 pounds per year	12-month rolling time period as determined at the end of each calendar month	EUWASTEHOOD	SC VI.1	R 336.1225 R 336.1702(a)
5. MDI	407.6 pounds per year	12-month rolling time period as determined at the end of each calendar month	EUMIXINGBOOTH	SC VI.1	R 336.1225 R 336.1702(a)

## **II. MATERIAL LIMITS**

1. The EUISOREACTORS throughput shall not exceed 50,000 tons of MDI per 12-month rolling time period as determined at the end of each calendar month. **(R 336.1225, R 336.1702(a))**
2. The combined throughput for EUISODRUMMING1 and EUISODRUMMING2 shall not exceed 50,000 tons of processed and repackaged MDI per 12-month rolling time period, as determined at the end of each calendar month. **(R 336.1225, R 336.1702(a))**

## **III. PROCESS/OPERATIONAL RESTRICTIONS**

1. The permittee shall comply with all provisions of the federal Standards of Performance for New Stationary Sources as specified in 40 CFR Part 60 Subparts A and Kb, as they apply to EUTK211, EUTK212, and EUTK229. **(40 CFR Part 60 Subparts A and Kb)**

## **IV. DESIGN/EQUIPMENT PARAMETERS**

NA

## **V. TESTING/SAMPLING**

NA

## **VI. MONITORING/RECORDKEEPING**

1. The permittee shall keep, in a satisfactory manner, monthly and 12-month rolling time period, as determined at the end of each calendar month, calculations of the MDI emission rate for EUISODRUMMING1, EUISODRUMMING2, EUISOSCRAPHOOD, EUEXHAUSTVENT, EUWASTEHOOD, and EUMIXINGBOOTH, individually, using the method in Appendix A or an alternate method approved by the AQD District Supervisor. All records shall be kept on file and made available to the Department upon request. **(R 336.1225, R 336.1702(a))**
2. The permittee shall keep, in a satisfactory manner, monthly and 12-month rolling time period, as determined at the end of each calendar month, records of the MDI throughput for EUISOREACTORS, EUISODRUMMING1 and EUISODRUMMING2. All records shall be kept on file and made available to the Department upon request. **(R 336.1225, R 336.1702(a))**

## **VII. REPORTING**

NA

**VIII. STACK/VENT RESTRICTIONS**

The exhaust gases from the stacks listed in the table below shall be discharged unobstructed vertically upwards to the ambient air unless otherwise noted:

**EUISOREACTORS**

<b>Stack &amp; Vent ID</b>	<b>Maximum Exhaust Diameter/Dimensions (inches)</b>	<b>Minimum Height Above Ground (feet)</b>	<b>Underlying Applicable Requirements</b>
1. SV00010 (EUISOREACTORS)	4	36	R 336.1225
2. SV00023 (EUISOREACTORS)	3	35.5	R 336.1225
3. SV00024 (EUISOBULKLOAD)	3	36	R 336.1225
4. SV00014 (EUISODRUMMING1)	24	35	R 336.1225
5. SV00027 (EUISODRUMMING1)	24	43	R 336.1225
6. SV00013 (EUISOSCRAPHOOD)	24	43	R 336.1225
7. SV00012 (EUEXHAUSTVENT)	24	43	R 336.1225
8. SV00015 (EUWASTEHOOD)	24	35	R 336.1225
9. SV00003 (EUMIXINGBOOTH)	33	35	R 336.1225
10. SV00028 (EUISODRUMMING2)	24	35	R 336.1225
11. SVISOVESSELVENT	14	30.5	R 336.1225
12. SVISOSTORETANK	10	30.5	R 336.1225
The exhaust gases shall be discharged unobstructed vertically upwards to the ambient air with the exception of: <ul style="list-style-type: none"> <li>• SV00024 discharges downward</li> <li>• SVISOVESSELVENT has a rain cap</li> <li>• SVISOSTORETANK has a rain cap</li> </ul>			

**IX. OTHER REQUIREMENTS**

NA

**Footnotes:**

<sup>1</sup>This condition is state only enforceable and was established pursuant to Rule 201(1)(b).

**The following conditions apply to: FGRESIN**

**DESCRIPTION:** Fixed Roof Resin Blend Tanks DVB100, DVB101, DVB102, DVB103, DVB104, DVB105, DVB106, DVB107, DVB108, DVB109, DVB110, and DVB111, including fugitive emissions; and bulk tanker resin emptying and filling.

**Emission Units:** EURESINBLEND and EUTANKTRUCK

**POLLUTION CONTROL EQUIPMENT:** NA

**I. EMISSION LIMITS**

NA

**II. MATERIAL LIMITS**

<b>Material</b>	<b>Limit</b>	<b>Time Period / Operating Scenario</b>	<b>Equipment</b>	<b>Testing / Monitoring Method</b>	<b>Underlying Applicable Requirements</b>
1. polyol resin	130,000 tpy	12-month rolling time period as determined at the end of each calendar month	FGRESIN	SC VI.1	R 336.1205(3), R 336.1224, R 336.225, R 336.1702(a)
2. triethylamine	3,179 pounds per calendar month	calendar month	FGRESIN	SC VI.1	R 336.1205(3), R 336.1224, R 336.225, R 336.1702(a)

**III. PROCESS/OPERATIONAL RESTRICTIONS**

NA

**IV. DESIGN/EQUIPMENT PARAMETERS**

1. The permittee shall not operate any EURESINBLEND resin blend tank unless the fixed roof is installed, maintained, and operated in a satisfactory manner. **(R 336.1224, R 336.1225, R 336.1702(a))**
2. The permittee shall not operate the blowing agent operations at EURESINBLEND (that is the permittee shall not add blowing agent to any EURESINBLEND resin blend tank) unless a pressure blanket of no less than 10 psig has been applied to the resin blend tank. **(R 336.1224, R 336.1225, R 336.1702(a))**
3. The permittee shall not load expanded resins at EUTANKTRUCK (that is the permittee shall not load resins to which blowing agents were previously added in any EURESINBLEND blend tank) unless a pressure blanket of no less than 10 psig has been applied to the bulk tanker. **(R 336.1224, R 336.1225, R 336.1702(a))**

**V. TESTING/SAMPLING**

NA

**VI. MONITORING/RECORDKEEPING**

1. The permittee shall keep, in a satisfactory manner, monthly and 12-month rolling time period, as determined at the end of each calendar month, records of the polyol resin and triethylamine throughput for FGRESIN. All records shall be kept on file for a period of at least five years and made available to the Department upon request. **(R 336.1205(3), R 336.1224, R 336.1225, R 336.1702(a))**

**VII. REPORTING**

NA

**VIII. STACK/VENT RESTRICTIONS**

The exhaust gases from the stacks listed in the table below shall be discharged unobstructed to the ambient air unless otherwise noted:

<b>Stack &amp; Vent ID</b>	<b>Maximum Exhaust Diameter/Dimensions (inches)</b>	<b>Minimum Height Above Ground (feet)</b>	<b>Underlying Applicable Requirements</b>
1. SV00002	2	36	R 336.1225
2. SV00004	2	36	R 336.1225
3. SV00005	2	36	R 336.1225
4. SV00006	3	40	R 336.1225
5. SV00007	3	40	R 336.1225
6. SV00008	3	36	R 336.1225
7. SV00009	2	36	R 336.1225
8. SV00020	2	36	R 336.1225
9. SV00021	2	36	R 336.1225
10. SV00022	2	36	R 336.1225
11. SV00025	3	36	R 336.1225
12. SV00026	3	36	R 336.1225

The exhaust gases shall be discharged unobstructed to the ambient air.

**IX. OTHER REQUIREMENTS**

NA

**Footnotes:**

<sup>1</sup>This condition is state only enforceable and was established pursuant to Rule 201(1)(b).

**The following conditions apply Source-Wide to: FGFACILITY**

**POLLUTION CONTROL EQUIPMENT: NA**

**I. EMISSION LIMITS**

<b>Pollutant</b>	<b>Limit</b>	<b>Time Period / Operating Scenario</b>	<b>Equipment</b>	<b>Testing / Monitoring Method</b>	<b>Underlying Applicable Requirements</b>
1. VOC	Less than 90 tpy	12-month rolling time period as determined at the end of each calendar month	FGFACILITY	SC VI.1	R 336.1205(3)
2. Individual HAPs	Less than 9 tpy	12-month rolling time period as determined at the end of each calendar month	FGFACILITY	SC VI.1	R 336.1205(3)
3. Total HAPs	Less than 22.5 tpy	12-month rolling time period as determined at the end of each calendar month	FGFACILITY	SC VI.1	R 336.1205(3)

**II. MATERIAL LIMITS**

NA

**III. PROCESS/OPERATIONAL RESTRICTIONS**

1. The permittee shall ensure that residual or spilled material shall be immediately contained and stored in closed containers capable of preventing the escape of MDI vapors to the ambient air. **(R 336.1225, R 336.1702(a))**
2. The permittee shall ensure that railcars delivering materials to the facility shall be sealed to United States Department of Transportation (DOT) specifications. **(R 336.1225, R 336.1702(a))**
3. The permittee shall not operate EUISOREACTORS, EUISOBULKLOAD, EUTK211, EUTK212, EUTK229, or EUISOTANKS unless the approved malfunction abatement plan (MAP), or an alternate plan approved by the AQD District Supervisor, is implemented and maintained. If the malfunction abatement plan fails to address or inadequately addresses an event that meets the characteristics of a malfunction at the time the plan is initially developed, the owner or operator shall revise the malfunction abatement plan within 45 days after such an event occurs and submit the revised plan to the AQD District Supervisor. The revised plan shall include procedures for maintaining and operating in a satisfactory manner: EUISOREACTORS; EUISOBULKLOAD; EUTK211; EUTK212; EUTK229, EUISOTANKS; add-on air pollution control devices; the containment, neutralization, and storage of residual or spilled material; or monitoring equipment during malfunction events; and a program for corrective action for such events. **(R 336.1205(3), R 336.1224, R 336.1225, R 336.1702(a), R 336.1910, R 336.1911)**

**IV. DESIGN/EQUIPMENT PARAMETERS**

NA

**V. TESTING/SAMPLING**

NA

**VI. MONITORING/RECORDKEEPING**

1. The permittee shall keep, in a satisfactory manner, monthly and 12-month rolling time period, as determined at the end of each calendar month, calculations of the VOC and HAPs emission rates for FGFACILITY using the method in Appendix A or an alternate method approved by the AQD District Supervisor. All records shall be kept on file for a period of at least five years and made available to the Department upon request. **(R 336.1205(3))**

**VII. REPORTING**

NA

**VIII. STACK/VENT RESTRICTIONS**

NA

**IX. OTHER REQUIREMENTS**

NA

**Footnotes:**

<sup>1</sup>This condition is state only enforceable and was established pursuant to Rule 201(1)(b).

**APPENDIX A**  
**Emission Calculations Methodology**

**I. ISOCYANATE MIXING PROCESS**

**Table 1 – Relevant data for the Isocyanate Process Emission Calculations**

Property	MDI
Avg. Vapor Pressure	0.00001 mmHg @ 25°C
Avg. Vapor Pressure	0.00005 mmHg @ 100°C
Density	10.0 lbs/gal
Avg. Molecular Weight	252 lbs/lb-mole

***EUIOREACTORS***

Actual Controlled Emissions

$$\text{lbsMDI/yr} = \frac{\sum_{k=1}^{k=12} (U_k)_{Rct}}{D} \times \frac{1 \text{ ft}^3}{7.481 \text{ gal}} \times \frac{\text{MW}}{359 \text{ ft}^3/\text{lb-mol}} \times \left[ \frac{(VP_T)}{760 \text{ mmHg}} \right]$$

MDI:

$$\therefore \text{lbsMDI/yr} = 6.2 \cdot 10^{-10} \times \sum_{k=1}^{k=12} U_k$$

where:

- $(U_k)_{Rct}$  = Actual monthly throughput for reactors (lbs/yr)
- $k$  = varies from 1 to 12 representing the most recent 12 months
- $D$  = 10.0 lbs/gal
- $(VP_T)_i$  = Material Vapor Pressure (mmHg) at Temperature T varying between 25°C and 100°C for MDI - See Table 1 above
- $MW$  = Material Molecular Weight (lbs/lb-mole) - 252 lbs/lb-mole

Actual HAP and VOC Controlled Emissions

$$\text{HAP/VOC: } \text{lbsHAPorVOC} / \text{yr} = \frac{\sum_{k=1}^{k=12} (W_k)_{Rct}}{D_i} \times \frac{1 \text{ ft}^3}{7.481 \text{ gal}} \times \frac{MW_i}{359 \text{ ft}^3 / \text{lbmol}} \times \left[ \frac{(VP_T)_i}{760 \text{ mmHg}} \right]$$

$$\text{Total HAP}_i: \text{lbs HAP} / \text{yr} = \sum_{k=1}^{k=12} \frac{\text{lbs HAP}_i}{\text{yr}}$$

where:

- $(W_k)_{Rct}$  = Actual HAP or VOC monthly throughput for reactors (lbs/yr)
- $k$  = Varies from 1 to 12 representing the most recent 12 months
- $D_i$  = HAP or VOC Material Density (lbs/gal)
- $(VP_T)_i$  = Material Vapor Pressure (mmHg) at Temperature T varying between 25°C and 100°C for MDI batches
- $MW_i$  = HAP or VOC Material Molecular Weight (lbs/lb-mole)
- $i$  = HAP or VOC constituent

**The MDI Storage Tanks (specifically EUTK211, EUTK212, EUTK229, and EUISOTANKS)**

Actual Controlled Emissions

$$\text{lbsMDI/yr} = \frac{\sum_{k=1}^{k=12} (U_k)_{\text{Tanks}}}{D} \times \frac{1 \text{ ft}^3}{7.481 \text{ gal}} \times \frac{\text{MW}}{359 \text{ ft}^3 / \text{lb-mol}} \times \left[ \frac{(VP_T)}{760 \text{ mmHg}} \right]$$

MDI:

$$\therefore \text{lbsMDI/yr} = 6.2 \cdot 10^{-10} \times \sum_{k=1}^{k=12} U_k$$

where:

- $(U_k)_{\text{Tanks}}$  = Actual monthly throughput for storage tanks (lbs/yr)
- $k$  = Varies from 1 to 12 representing the most recent 12 months
- $D$  = 10.0 lbs/gal
- $(VP_T)$  = Material Vapor Pressure (mmHg) at Temperature T varying between 25°C and 100°C for MDI - See Table 1 above
- $\text{MW}$  = Material Molecular Weight (lbs/lb-mole) - 252 lbs/lb-mole

Actual HAP and VOC Controlled Emissions

$$\text{HAP/VOC: } \text{lbsHAPorVOC} / \text{yr} = \frac{\sum_{k=1}^{k=12} (W_k)_{\text{Tanks}}}{D_i} \times \frac{1 \text{ ft}^3}{7.481 \text{ gal}} \times \frac{\text{MW}_i}{359 \text{ ft}^3 / \text{lbmol}} \times \left[ \frac{(VP_T)_i}{760 \text{ mmHg}} \right]$$

$$\text{Total HAP}_i: \text{lbs HAP} / \text{yr} = \sum_{k=1}^{k=12} \frac{\text{lbs HAP}_i}{\text{yr}}$$

where:

- $(W_k)_{\text{Tanks}}$  = Actual HAP or VOC monthly throughput for storage tanks (lbs/yr)
- $k$  = Varies from 1 to 12 representing the most recent 12 months
- $D_i$  = HAP or VOC Material Density (lbs/gal)
- $(VP_T)_i$  = Material Vapor Pressure (mmHg) at Temperature T varying between 25°C and 100°C for MDI
- $\text{MW}_i$  = HAP or VOC Material Molecular Weight (lbs/lb-mole)
- $i$  = HAP or VOC constituent

***EUISOBULKLOAD, EUISODRUMMING1, and EUISODRUMMING2***

Actual Controlled Emissions

$$\text{lbs MDI/yr} = \frac{\sum_{k=1}^{k=12} (U_k)_{\text{Bulk or Drum}}}{D} \times \frac{1 \text{ ft}^3}{7.481 \text{ gal}} \times \frac{MW}{359 \text{ ft}^3/\text{lb-mol}} \times \left[ \frac{(VP_{25C})}{760 \text{ mmHg}} \right] \times LF$$

MDI:

∴ EUISOBULKLOAD:  $\text{lbs MDI/yr} = 1.23 \cdot 10^{-10} \times \sum_{k=1}^{k=12} U_k \times LF_{\text{bulk load}}$

∴ EUISODRUMMING:  $\text{lbs MDI/yr} = 1.23 \cdot 10^{-10} \times \sum_{k=1}^{k=12} U_k \times LF_{\text{drummed}}$

where:

$(U_k)_{\text{Bulk or Drum}} =$  Actual monthly throughput for bulk or drum (lbs/yr)  
 $k =$  Varies from 1 to 12 representing the most recent 12 months  
 $D =$  Material Density (lbs/gal) – 10.0 lbs/gal  
 $(VP_{25C}) =$  Material Vapor Pressure (mmHg) at T = 25°C - See Table 1 above  
 $MW_i =$  Material Molecular Weight (lbs/lb-mole) – 252 lbs/lb-mole  
 $LF =$  Loading factor and is equal to % loaded in trucks ( $LF_{\text{bulk load}}$ ) or % loaded in drums ( $LF_{\text{drummed}}$ ) (i.e. In the absence of specific data for LF, assume  $LF_{\text{bulk load}} = LF_{\text{drummed}} = 1$  for conservatism)

Actual HAP and VOC Controlled Emissions

HAP/VOC:

$$\text{lbs HAP or VOC / yr} = \frac{\sum_{k=1}^{k=12} (W_k)_{\text{Bulk or Drum}}}{D_i} \times \frac{1 \text{ ft}^3}{7.481 \text{ gal}} \times \frac{MW_i}{359 \text{ ft}^3 / \text{lbmol}} \times \left[ \frac{(VP_T)_i}{760 \text{ mmHg}} \right] \times LF$$

Total HAP<sub>i</sub>:  $\text{lbs HAP / yr} = \sum_{k=1}^{k=12} \frac{\text{lbs HAP}_i}{\text{yr}}$

where:

$(W_k)_{\text{Bulk or Drum}} =$  Actual HAP or VOC monthly throughput for bulk or drum (lbs/yr)  
 $k =$  Varies from 1 to 12 representing the most recent 12 months  
 $D_i =$  HAP or VOC Material Density (lbs/gal)  
 $(VP_T)_i =$  Material Vapor Pressure (mmHg) at Temperature T varying between 25°C and 100°C for MDI batches  
 $MW_i =$  HAP or VOC Material Molecular Weight (lbs/lb-mole)  
 $i =$  HAP or VOC constituent  
 $LF =$  Loading factor and is equal to % loaded in trucks ( $LF_{\text{Bulk Load}}$ ) or % loaded in drums ( $LF_{\text{Drummed}}$ ) (i.e., In the absence of specific data for LF, assume  $LF_{\text{Bulk Load}} = LF_{\text{Drummed}} = 1$  for conservatism)

***EUISOSCRAPHOOD, EUEXHAUSTVENT, EUWASTEHOOD, and EUMIXINGBOOTH***

Emissions from these emission units are equal to 5 percent of the total emissions from EUISOREACTORS, EUISOBULKLOAD, EUISODRUMMING1, EUISODRUMMING2, and FGISOTANKS.

MDI:

$$\begin{aligned} \text{lbs MDI/yr}_{\text{EUISOSCRAPHOOD}} &= \text{lbs MDI/yr}_{\text{EUEXHAUSTVENT}} = \text{lbs MDI/yr}_{\text{EUWASTEHOOD}} = \text{lbs MDI/yr}_{\text{EUMIXINGBOOTH}} \\ &= (\text{lbs MDI/yr}_{\text{EUISOREACTORS}} + \text{lbs MDI/yr}_{\text{EUISOBULKLOAD}} + \text{lbs MDI/yr}_{\text{EUISODRUMMING}} + \text{lbs MDI/yr}_{\text{FGISOTANKS}}) \times 0.05/4 \end{aligned}$$

HAP and VOC:

$$\begin{aligned} \text{lbs HAP/yr}_{\text{EUISOSCRAPHOOD}} &= \text{lbs HAP/yr}_{\text{EUEXHAUSTVENT}} = \text{lbs HAP/yr}_{\text{EUWASTEHOOD}} = \text{lbs HAP/yr}_{\text{EUMIXINGBOOTH}} \\ &= (\text{lbs HAP/yr}_{\text{EUISOREACTORS}} + \text{lbs HAP/yr}_{\text{EUISOBULKLOAD}} + \text{lbs HAP/yr}_{\text{EUISODRUMMING}} + \text{lbs HAP/yr}_{\text{FGISOTANKS}}) \times 0.05/4 \end{aligned}$$

$$\begin{aligned} \text{lbs VOC/yr}_{\text{EUISOSCRAPHOOD}} &= \text{lbs VOC/yr}_{\text{EUEXHAUSTVENT}} = \text{lbs VOC/yr}_{\text{EUWASTEHOOD}} = \text{lbs VOC/yr}_{\text{EUMIXINGBOOTH}} \\ &= (\text{lbs VOC/yr}_{\text{EUISOREACTORS}} + \text{lbs VOC/yr}_{\text{EUISOBULKLOAD}} + \text{lbs VOC/yr}_{\text{EUISODRUMMING}} + \text{lbs VOC/yr}_{\text{FGISOTANKS}}) \times 0.05/4 \end{aligned}$$

**II. RESIN BLENDING PROCESS**

***ACTUAL HAP and VOC UNCONTROLLED EMISSIONS***

$$\text{HAP/VOC: } \text{lbs HAP or VOC / yr} = \frac{\sum_{k=1}^{k=12} (W_k)_{Tt}}{D_i} \times \frac{1 \text{ ft}^3}{7.481 \text{ gal}} \times \frac{MW_i}{359 \text{ ft}^3 / \text{lbmol}} \times \left[ \frac{(VP_T)_i}{760 \text{ mmHg}} \right]$$

$$\text{Total HAP}_i: \text{ lbs HAP / yr} = \sum_{k=1}^{k=12} \frac{\text{lbs HAP}_i}{\text{yr}}$$

where:

$(W_k)_{Tt}$  = Actual HAP or VOC monthly throughput for tanker trucks (lbs/yr)

k = varies from 1 to 12 representing the most recent 12 months

$D_i$  = HAP or VOC Material Density (lbs/gal)

$(VP_T)_i$  = Material Vapor Pressure (mmHg) at Temperature T

$MW_i$  = HAP or VOC Material Molecular Weight (lbs/lb-mole)

i = HAP or VOC constituent

**Polyol:** The HAP/VOC equation above will be used to calculate HAP and VOC emissions for polyol transfer to storage tanks, blending vessels, and product tanker trucks.

**Catalyst:** The HAP/VOC equation above will be used to calculate the HAP and VOC emissions for catalyst transfer to blending vessels and product tanker trucks.

**Additives:** The HAP/VOC equation above will be used to calculate HAP and VOC emissions for additives transfer to storage tanks, blending vessels, and product tanker trucks.