



June 30, 1994

26005.F21.816

Mr. Willard Hanks
Bureau of Air Regulation
Florida Department of Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Foamex, L.P.
Application For Permit To Construct
Flexible Polyurethane Foam Manufacturing Facility
Application Number AC48-214902

Dear Willard:

Please find enclosed the revised Application For Permit To Construct the Foamex, L.P. Flexible Polyurethane Foam Manufacturing Facility in Orlando, Florida. This application has been revised to address the issues discussed during the meeting conducted on January 27, 1994 in Tallahassee.

Should you have any questions or comments regarding this application, please do not hesitate to contact me.

Yours very truly,

HARDING LAWSON ASSOCIATES

A handwritten signature in cursive script that reads 'Patricia Kay Rykowski'.

Patricia Kay Rykowski
Project Engineer

PKR/pkr
foamex8.doc/
Enclosure

cc: Mr. Charles Collins, P.E., FDEP - Central District
Mr. Dennis Nester, Orange County EPD
Mr. Arthur Pereira, Foamex, L.P.
Mr. Doug Terrill, Foamex, L.P.

**Application For Permit To
Construct Air Pollution Source
Volume I
Foamex, L.P.
Flexible Polyurethane Foam Manufacturing Facility
Orlando, Florida**

Prepared for

Foamex, L.P.

Regency Industrial Park
1351 Gemini Boulevard
Orlando, Florida 32821

HLA/CTA Project No. 26005 F21.816



Patricia Kay Rykowski
Project Engineer


Joseph L. Tessitore, P.E.
Managing Principal

June 30, 1994



Harding Lawson Associates - Cross/Tessitore & Associates
Engineering and Environmental Services
4763 South Conway Road
Orlando, Florida 32812 - (407) 851-1484

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- F MATERIAL SAFETY DATA SHEETS

DISTRIBUTION

NOTE

This document was prepared for the sole use of Foamex, L.P. and the regulatory agencies directly involved in this project, the only intended beneficiaries of our work. No other party should rely on the information contained herein without prior written consent of Harding Lawson Associates (HLA).

REGULATORY CHECKLIST

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SECTION II

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SECTION VI

Best Available Control Technology

Not Applicable

SECTION VII

Prevention of Significant Deterioration

Not Applicable

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION



APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Flexible Polyurethane Foam Manufacturing [] New¹ [X] Existing¹

APPLICATION TYPE: [X] Construction [] Operation [] Modification

COMPANY NAME: FOAMEX, L.P. COUNTY: Orange

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) See Table 2.1

SOURCE LOCATION: Street: 1351 Gemini Boulevard City: Orlando

UTM: East: 461,153 North: 3,141,862

Latitude: 28 ° 24 ' 15 " N Longitude 81 ° 23 ' 40 " W

APPLICANT NAME AND TITLE: Douglas L. Terrill, Plant Manager

APPLICANT ADDRESS: 1351 Gemini Boulevard, Orlando, Florida 32821

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative^{*} of Foamex, L.P.

I certify that the statements made in this application for a Construction permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provision of Chapter 403, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable and I will promptly notify the department upon sale or legal transfer of the permitted establishment.

* Attach letter of authorization

Signed: *Douglas L. Terrill*

Douglas L. Terrill, Plant Manager

Name and Title (Please Type)

Date: 6/30/94 Telephone No.: (407) 857 2510

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, that

¹ See Florida Administrative Code Rule 17-2.100(57) and (104)

the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signed: Joseph L. Tessitore

Joseph L. Tessitore, P.E.
Name (Please Type)

Harding Lawson Associates/Cross Tessitore & Associates
Company Name (Please Type)

4763 South Conway Road, Orlando, Florida 32812
Mailing Address (Please Type)

Florida Registration Number: 23374 Date: 6/28/94 Telephone No.: (407) 851-1484

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

See Section 2.1 and 2.2

B. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction: Original 1975/Modification 1994 Completion of Construction: Original 1976/Modification 1995

C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

Modified Exhaust/Dispersion System - \$200,000

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

Warning Letter April 13, 1992 Orange County EPD (John M. Bateman, P.E.)

Consent Order October 1, 1992 Orange County EPD (John M. Bateman)

E. Requested permitted equipment operating time: hrs/day _____; days/wk _____; wks/yr _____;
if power plant, hrs/yr _____; if seasonal, describe: See Section 2.3

F. If this is a new source or major modification, answer the following questions. (yes or no)

1. Is this source in a non-attainment area for a particular pollutant? No
a. If yes, has "offset" been applied? N/A
b. If yes, has "Lowest Achievable Emission Rate" been applied? N/A
c. If yes, list non-attainment pollutants. N/A

2. Does best available control technology (BACT) apply to this source? No (1)
(If Yes, See Section VI.)

3. Does the State "Prevention of Significant Deterioration" (PSD) requirement apply to this source? If yes, see Sections VI and VII. No (2)

4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source? No

5. Do "National Emissions Standards for Hazardous Air Pollutants" (NESHAP) apply to this source? No

H. Do "Reasonably Available Control Technology" (RACT) requirements apply to this source? No

a. If yes, for what pollutants? N/A

b. If yes, in addition to the information required in this form, any information requested in Rule 17-2.650 must be submitted.

Attach all supportive information related to any answer of "Yes". Attach any justification for any answer of "No" that might be considered questionable.

(1) Based on discussion with Mr. C.H. Fancy of FDEP during the meeting conducted in Tallahassee on January 27, 1994. (See Section 2.1)

(2) There are no PSD requirements for methylene chloride and by statute and Departmental Rule, methylene chloride is not considered a volatile organic compound (VOC). However, for purposes of this application, an air quality impact analysis was conducted based on the request included in the FDEP letter of June 26, 1992. The air quality impact analysis, presented as Volume II of this application, estimates the maximum 8-hour, 24-hour, and annual ambient air concentrations of methylene chloride. It also estimates the maximum 8-hour and 24-hour ambient air concentrations of toluene diisocyanate and 1,1,1-trichloroethane. The inclusion of this information does not indicate the applicant's agreement that PSD requirements are applicable to this source and the applicant reserves its rights to contest such a determination, should that be required.

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

A. Raw Material and Chemical Used in your Process, if applicable:

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		
SEE SECTION 3.1				

B. Process Rate, if applicable: (See Section V, Item I)

1. Total Process Input Rate (lbs/hr): SEE SECTION 3.1
2. Product Weight (lbs/hr): SEE SECTION 3.1

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

Name of Contaminant	Emission ¹		Allowed ² Emission Rate per Rule 17-2	Allowable ³ Emission lbs/hr	Potential ⁴ Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/hr	T/yr	
SEE TABLE 3.8							

1. See Section V, Item 2
2. Reference applicable emission standards and units (e.g. Rule 17-2.600(5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)
3. Calculated from operating rate and applicable standard.
4. Emission, if source operated without control (See Section V, Item 3).

D. Control Devices: (See Section V, Item 4) NOT APPLICABLE

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (if applicable)	Basis for Efficiency (Section V Item 5)

E. Fuels NOT APPLICABLE

Type (Be Specific)	Consumption *		Maximum Heat Input (MMBtu/hr)
	avg./hr	max./hr	

* Units: Natural Gas – MMCF/hr; Fuel Oils -- gallons/hr; Coal, wood, refuse, other -- lbs/hr.

Fuel Analysis;

Percent Sulfur: _____ Percent Ash: _____

Density: _____ lbs/gal Typical Percent Nitrogen: _____

Heat Capacity: _____ Btu/lb _____ Btu/gal

F. If applicable, indicate the percent of fuel used for space heating.

Annual Average: _____ Maximum: _____

G. Indicate liquid or solid wastes generated and method of disposal.

Liquid and/or solid waste generated by the plant are properly characterized as either hazardous or nonhazardous waste prior to disposal. Hazardous waste is disposed of in accordance with the RCRA regulations, for example, waste toluene diisocyanate is incinerated. Nonhazardous waste is disposed of in accordance with applicable federal, state and local requirements.

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack): SEE TABLE 3.9

Stack Height: _____ ft. Stack Diameter: _____ inches.

Gas Flow Rate _____ ACFM _____ DSCFM Gas Exit Temperature: _____ °F

Water Vapor Content: _____ % Velocity: _____ FPS

SECTION IV: INCINERATOR INFORMATION (Not Applicable)

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq. & Gas By-Products)	Type IV (Solid By-Products)
Actual lbs/hr Incinerated							
Uncontrolled (lbs/hr)							

Description of Waste: _____

Total Weight Incinerated (lbs/hr): _____ Design Capacity (lbs/hr): _____

Approximate Number of Hours of Operation per day: _____; day/wk _____; wks/yr _____

Manufacturer: _____

Date Constructed: _____ Model No.: _____

	Volume (ft) ³	Heat Release (Btu/hr)	Fuel		Temperature (°F)
			Type	Btu/hr	
Primary					
Secondary Chamber					

Stack Height: _____ ft. Stack Diameter: _____ Stack Temp. _____

Gas Flow Rate: _____ ACFM _____ DSCFM* Velocity: _____ FPS

* If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of pollution control device: Cyclone Wet scrubber Afterburner
 Other (specify): _____

Brief description of operating characteristics of control devices: NOT APPLICABLE

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, etc.): NOT APPLICABLE

NOTE: Items 2, 3, 4, 6, 7, 8, and 10 in Section V must be include where applicable.

SECTION V: SUPPLEMENTAL REQUIREMENTS

Please provide the following supplements where required for this application.

1. Total process input rate and product weight – show derivation [Rule 17-2.100(127)].
2. To a construction application, attach basis of emission estimate (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and attach proposed methods (e.g., FR Part 60 Methods 1, 2, 3, 4, 5) to show proof of compliance with applicable standards. To an operation application, attach test results or methods used to show proof of compliance. Information provided when applying for an operation permit from a construction permit shall be indicative of the time at which the test was made.
3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).
4. With construction permit application, include design details for all air pollution control systems (e.g., for baghouse include cloth to air ratio; for scrubber include cross-section sketch, design pressure drop, etc.).
5. With construction permit application, attach derivation of control device(s) efficiency. Include test or design data. Items 2, 3 and 5 should be consistent: actual emissions = potential (1-efficiency).
6. An 8 1/2" x 11" flow diagram which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.
7. An 8 1/2" x 11" plot plan showing the location of the establishment, and points of airborne emissions, in relation to the surrounding area, residences and other permanent structures and roadways (Example: Copy of relevant portion of USGS topographic map).
8. An 8 1/2" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.

9. The appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation.
10. With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construction permit.

**SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY
NOT APPLICABLE**

A. Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?

Yes No

Contaminant	Rate or Concentration
_____	_____
_____	_____
_____	_____
_____	_____

B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy)?

Yes No

Contaminant	Rate or Concentration
_____	_____
_____	_____
_____	_____
_____	_____

C. What emission levels do you propose as best available control technology?

Contaminant	Rate or Concentration
_____	_____
_____	_____
_____	_____
_____	_____

D. Describe the existing control and treatment technology (If any).

- | | |
|---------------------------|--------------------------|
| 1. Control Device/System: | 2. Operating Principles: |
| 3. Efficiency:* | 4. Capital Costs: |

* Explain method of determining

- 5. Useful Life:
- 7. Energy:
- 9. Emissions:

- 6. Operating Costs:
- 8. Maintenance Cost:

Contaminant	Rate or Concentration
_____	_____
_____	_____
_____	_____

10. Stack Parameters:

- a. Height: _____ ft.
- b. Diameter: _____ ft.
- c. Flow Rate: _____ ACFM
- d. Temperature: _____ °F
- e. Velocity: _____ FPS

E. Describe the control and treatment technology available (As many types as applicable, use additional pages if necessary).

1.

- a. Control Device:
- b. Operating Principles:
- c. Efficiency:¹
- d. Capital Cost:
- e. Useful Life:
- f. Operating Cost:
- g. Energy:²
- h. Maintenance Cost:
- i. Availability of construction materials and process chemicals:
- j. Applicability to manufacturing processes:
- k. Ability to construct with control device, install in available space, and operate within proposed levels:

2.

- a. Control Device:
- b. Operating Principles:
- c. Efficiency:¹
- d. Capital Cost:
- e. Useful Life:
- f. Operating Cost:
- g. Energy:²
- h. Maintenance Cost:
- i. Availability of construction materials and process chemicals:
- j. Applicability to manufacturing processes:
- k. Ability to construct with control device, install in available space, and operate within proposed levels:

¹ Explain method of determining efficiency.

² Energy to be reported in units of electrical power - KWH design rate.

3.

- a. Control Device:
- b. Operating Principles:
- c. Efficiency:¹
- d. Capital Cost:
- e. Useful Life:
- f. Operating Cost:
- g. Energy:²
- h. Maintenance Cost:
- i. Availability of construction materials and process chemicals:
- j. Applicability to manufacturing processes:
- k. Ability to construct with control device, install in available space, and operate within proposed levels:

4.

- a. Control Device:
- b. Operating Principles:
- c. Efficiency:¹
- d. Capital Cost:
- e. Useful Life:
- f. Operating Cost:
- g. Energy:²
- h. Maintenance Cost:
- i. Availability of construction materials and process chemicals:
- j. Applicability to manufacturing processes:
- k. Ability to construct with control device, install in available space, and operate within proposed levels:

F. Describe the control technology selected:

- 1. Control Device:
- 2. Efficiency:¹
- 3. Capital Cost:
- 4. Useful Life:
- 5. Operating Cost:
- 6. Energy:²
- 7. Maintenance Cost:
- 8. Manufacturer:
- 9. Other locations where employed on similar processes:
 - a.
 - (1) Company:
 - (2) Mailing Address:
 - (3) City:
 - (4) State:

¹ Explain method of determining efficiency.

² Energy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:¹

Contaminant	Rate or Concentration
_____	_____
_____	_____
_____	_____

(8) Process Rate:¹

b.

(1) Company:

(2) Mailing Address:

(3) City:

(4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:¹

Contaminant	Rate or Concentration
_____	_____
_____	_____
_____	_____

(8) Process Rate:¹

10. Reason for selection and description of systems:

¹ Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

**SECTION VII: PREVENTION OF SIGNIFICANT DETERIORATION
NOT APPLICABLE**

A. Company Monitored Data

1. _____ no. sites _____ TSP _____ SO₂ _____ Wind spd/dir

Period of Monitoring: _____ / _____ / _____ to _____ / _____ / _____
month day year month day year

Other data recorded: _____

Attach all data or statistical summaries to this application.

Specify bubbler (B) or continuous (C).

2. Instrumentation, Field and Laboratory

(a) Was instrumentation EPA referenced or its equivalent? Yes No

(b) Was instrumentation calibrated in accordance with Department procedures?

Yes No Unknown

B. Meteorological Data Used for Air Quality Modeling

1. ___ Year(s) of data from ___ / ___ / ___ to ___ / ___ / ___
month day Year month day year

2. Surface data obtained from (location): _____

3. Upper air (mixing height) data obtained from (location): _____

4. Stability wind rose (STAR) data obtained from (location): _____

C. Computer Models Used

1. _____ Modified? If yes, attach description.

2. _____ Modified? If yes, attach description.

3. _____ Modified? If yes, attach description.

4. _____ Modified? If yes, attach description.

Attach copies of all final model runs showing input data, receptor locations, and principal output tables.

D. Applicants Maximum Allowable Emission Data

Pollutant	Emission Rate
TSP	_____ grams/sec
SO ₂	_____ grams/sec

E. Emission Data Used in Modeling

Attach list of emission sources. Emission data required is source name, description of point source (on NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

F. Attach all other information supportive to the PSD review.

G. Discuss the social and economic impact of the selected technology versus other applicable technologies (i.e., jobs, payroll, production, taxes, energy, etc.). Include assessment of the environmental impact of the sources.

H. Attach scientific, engineering, and technical material, reports, publications, journals, and other competent relevant information describing the theory and application

2.0 GENERAL PROJECT INFORMATION

2.1 Project Description

The subject of this application is a flexible polyurethane foam manufacturing facility operated by Foamex, L.P. located at 1351 Gemini Boulevard in Orlando, Florida. The facility was constructed in 1975 and 1976 and has not previously been permitted by FDEP. The following paragraphs provide a synopsis of the permitting activities leading to the submittal of this application.

On May 29, 1992, an Application for Permit to Construct Air Pollution Source was submitted to FDEP. This initial application documented the facility as an existing source and did not include any proposed modifications. FDEP conducted a preliminary review of the submittal and issued a letter dated June 26, 1992 requesting additional information and requiring a BACT analysis to be conducted for proposed air pollution control systems. Subsequent to this activity, a Consent Order between Foamex, L.P. and the Orange County Environmental Protection Department (OCEPD) was executed on October 1, 1992. The order required Foamex to submit a revised permit application to FDEP in order to comply with the agreement. Thus, on December 3, 1992 a revised permit application was submitted to FDEP to fulfill the requirements of both the comments issued by FDEP on June 26, 1992, and the Consent Order issued by OCEPD on October 1, 1992. This application was submitted without prejudice to the applicant's belief that the PSD requirements do not apply to this source and, therefore, a BACT analysis is not required of this applicant.

FDEP reviewed the application; and, consequently, a meeting was held on June 9, 1993 between FDEP, Foamex, and HLA/CTA to discuss the application. Attending the meeting were Mr. Willard Hanks and Mr. Preston Lewis of FDEP; Mr. Arthur Pereira, Mr. Charles Eavenson and Mr. Joseph Lunderville of Foamex; and Mr. Joseph Tessitore of HLA/CTA. During the meeting, FDEP raised seven issues regarding the permit application and required a written response from Foamex. A document addressing each of these issues was prepared and submitted to FDEP on December 13, 1993.

On January 27, 1994 another meeting was held between FDEP, Foamex, and HLA/CTA to discuss the information in the December 13, 1993 submittal. In attendance at the meeting were Mr. Willard Hanks and Mr. Claire Fancy of FDEP, Mr. Arthur Pereira of Foamex, and Mr. Joseph Tessitore of HLA/CTA. As a result of the issues discussed at the meeting, the following permitting approach was agreed upon:

- 1) Foamex will withdraw the existing permit application and submit a revised application in the immediate future.
- 2) The revised application will address the construction of an improved ventilation system and stack configurations to provide enhanced collection and dispersion of emissions from the facility. The system will be designed such that emissions from the facility will comply with applicable FDEP Acceptable Ambient Air Concentrations (AAAC's).
- 3) FDEP requested that Foamex demonstrate that ambient air concentrations resulting from emissions from the facility be approximately 10% below the applicable FDEP AAAC's. Foamex agreed to this request.
- 4) A dispersion modeling methodology acceptable to Mr. Cleve Holladay of FDEP shall be used to determine the ambient air concentrations resulting from emissions from the facility.

- 5) Once the revised application has been completed, FDEP will issue an Intent to Permit and a Final Permit within 30 days of the Intent to Permit, assuming that no Administrative Hearing is required.
- 6) The permit, issued based on the revised application, will require Foamex to construct and install the subject enhanced collection and dispersion system within nine months of the date of permit issuance and to file semi-annual reports on the status of process changes, chemical substitutions, and emission controls in the Flexible Polyurethane Foam Manufacturing Industry.
- 7) The Operating Permit will be valid for a period of five years with the understanding that EPA Title III MACT Standards would ultimately supersede and/or replace the Operating Permit requirements.

This application is submitted to address the requirements set forth in the January 27, 1994 meeting, and includes a proposed modified exhaust system for enhanced capture and dispersion of air contaminants emitted at the facility.

On April 5, 1994 a dispersion modeling protocol document was submitted to Mr. Cleve Holladay of FDEP for review and comment. The protocol document presented the methodology, input parameters, and assumptions used in this dispersion modeling analysis. On April 25, 1994 FDEP approved the modeling protocol with certain comments. The dispersion modeling analysis, prepared based on the conditions approved in the protocol document and the comments issued by Mr. Cleve Holladay, is submitted as Volume II of this application under separate cover. The results of the dispersion modeling analysis show that the proposed exhaust system modifications will result in a maximum annual ambient concentration of methylene chloride which is approximately 10% below the FDEP Acceptable Ambient Air Concentrations. The results also show that the proposed exhaust system modifications will result in maximum 8-hour and 24-hour ambient concentrations of methylene chloride, 1,1,1 trichloroethane, and toluene diisocyanate which are less than one half of the the FDEP Acceptable Ambient Air Concentrations.

2.2 Process Description

Two basic processes are used at the Foamex facility to manufacture polyurethane foam product: Slabstock Polyurethane Foam Production and Rebond Polyurethane Foam Production. These processes are used to manufacture foam products of various density, color and thickness. While the basic processes remain the same, the proportions of raw materials are modified slightly for each batch to achieve the desired product specifications. In addition to the two manufacturing processes, support operations at the facility include tank storage of process chemicals, steam boiler operation, environmental heating, and foam fabrication operations. Table 2.1 provides a summary of the process emission sources and associated emission points at the facility.

2.2.1 Slabstock Polyurethane Foam Production

In the Slabstock process, a high pressure mixing head and metering pumps are used to mix the specific raw materials required for each product. These raw materials include toluene diisocyanate (TDI), polyol, water, catalysts, surfactants, additives (such as pigments or flame retardants), and methylene chloride, an auxiliary blowing agent. The mixed raw materials are discharged into a trough where the mixture begins to react and flows down a tunnel area. Heat generated by the exothermic reaction volatilizes the methylene chloride thus allowing the foam to reach a predetermined density. The foam begins releasing methylene chloride at this point. The methylene chloride serves to reduce the foam density, or soften it, and to provide cooling of the mixture as it discharges energy during the exothermic reaction. The foam slab travels through the tunnel via

a conveyor. After exiting the tunnel the foam slab is cut into sections, referred to as buns. The buns continue down the conveyor and enter the Long Bun Storage Room. The foam continues to release methylene chloride as it travels down the conveyor to the Long Bun Storage Room. The buns are then removed from the conveyor and placed in the room for temporary storage during completion of a twelve hour cure period, continuing to release methylene chloride at a diminishing rate.

Currently, the Slabstock process is equipped with an exhaust system and tunnel which covers part of the mixing head, trough and conveyor line to vent the emissions which occur during the initial stages of the process. This system maintains a negative pressure along the covered portion of the process and vents the methylene chloride emissions to the atmosphere through an existing stack. Emissions of methylene chloride which occur outside of the foam line tunnel, inside the Long Bun Storage Room, and throughout the rest of facility are currently released into the interior of the facility and discharged to the atmosphere through general ventilation fans (50,000 CFM each) located in the ceiling throughout the facility.

The proposed enhanced collection system requires the complete enclosure of the mixing head, trough, and conveyor line in a tunnel. The foam line enclosure will extend from the mixing head to the Long Bun Storage Room. The system will be designed to maintain negative pressure within the foam line enclosure. The foam line enclosure exhaust will be vented to the atmosphere by a 30,000 CFM exhaust fan, or combination of fans totaling 30,000 CFM, via an exhaust stack with a height of 125 feet above ground level. In addition to the foam line enclosure, the proposed enhanced collection system requires the Long Bun Storage Room to be maintained under negative pressure and the exhaust vented to the atmosphere by a 30,000 CFM exhaust fan, or combination of fans totaling 30,000 CFM, via an exhaust stack with a height of 125 feet above ground level. As part the proposed system, the existing ceiling exhaust fans in the Long Bun Storage Room will not be operational. Emissions which do not occur within the foam line enclosure or Long Bun Storage Room will be vented to the atmosphere through the seventeen 50,000 CFM general exhaust fans located in the ceiling throughout the remainder of the facility. To provide enhanced dispersion, these seventeen exhaust fans will be fitted with extensions to increase the their stack heights to 53 feet above ground level.

Based on industry and product information, it is assumed for this permit application, that 60% of the methylene chloride is released from the foam in the foam line enclosure before it reaches the Long Bun Storage Room and 35% is released during the twelve hour cure period in the Long Bun Storage Room. The remaining 5% of the methylene chloride is released during subsequent foam fabrication and processing operations throughout the rest of the facility before shipment of the final product. Also, all TDI emissions associated with the Slabstock production occur within the foam line enclosure and are emitted to the atmosphere via the foam line stack.

2.2.2 Rebond Polyurethane Foam Production

In the Rebond process, scrap polyurethane foam, either purchased or recovered from the slabstock manufacturing process, is granulated into small pieces approximately 3/4 to one inch in size. This granulated foam is stored by grade, density, and/or by composition in large storage bins. The scrap pieces of polyurethane foam are mixed with an adhesive binder in a blend tank. The binder is a mixture of TDI and polyol. The mixture of scrap foam and binder is then transferred from the blend tank to the mold where it is compressed under an air cylinder to a designated size. The product is steamed from the bottom of the mold, which cures the foam. The resulting cylinder of foam is referred to as a log. The foam log is then peeled into a continuous sheet with a thickness of 1/4 to 3/4 inch, per customer specifications. The foam sheet

product is then bonded to a polyethylene film. Finally the foam sheet product is cut to length and packaged into rolls, per customer order.

The TDI emissions from the Rebond process are currently vented to the atmosphere through two identical 1,000 CFM exhaust fans located in the ceiling directly above the process. These two exhaust fans will be increased in size to 15,000 CFM each and will be fitted with extensions to increase their stack heights to 53 feet above ground level.

2.2.3 Tank Storage

The Foamex facility includes eleven above ground storage tanks for receiving and holding of the various raw materials used in the foam production processes. Table 3.3 provides a summary of the tanks, dimensions and products stored. Only one tank, Tank 10, is used for storage of methylene chloride. Foamex proposes to install a pressure relief valve on Tank 10 to minimize standing losses of methylene chloride. No physical or operational changes to the remaining storage tanks are proposed.

2.2.4 Steam Boiler

Foamex operates a natural gas fired industrial boiler rated at 100 HP. This boiler is used to convert an average of 1,570 gallons of water to steam each day for use in the Rebond process. No changes to the operation of the steam boiler are proposed.

2.2.5 Environmental Heating

There are thirteen indirect natural gas fired heaters existing at the Foamex facility. Of these, nine are used as needed during the winter months for heating the manufacturing and administrative areas of the facility. It is estimated that these heaters operate less than 400 hours per year. The remaining four heaters are not operational. Table 3.4 provides a listing of the individual heaters and the rated capacity of each heater.

2.2.6 Foam Fabrication Operations

During foam fabrication operations, the foam buns manufactured during the Slabstock process are cut to size, assembled, and glued according to customer specifications. The fabrication operations take place throughout the facility, except for the long bun storage room. Approximately 3.1 lbs/hr of glue is used during these operations. Foamex primarily uses methylene chloride based glue in the foam fabrication operations, but may also occasionally use 1,1,1-trichloroethane based glue. The methylene chloride based glue has a maximum methylene chloride content of 70% by weight. The 1,1,1-trichloroethane based glue has a maximum concentration of 1,1,1-trichloroethane of 81% by weight. The emissions from the gluing process are vented to the atmosphere through the seventeen exhaust fans located in the ceiling throughout the facility, which will be modified as part of the proposed enhanced collection and dispersion system as described in Section 2.2.1.

2.3 Requested Permitted Operating Time

For the processes and supporting operations discussed above, the requested hours of operation in the permit application are as follows:

- Slabstock Polyurethane Foam Production: 3 hrs/day; 4 days/wk; 52 wks/yr;

- Rebond Polyurethane Foam Production: 12 hrs/day, 6 days/wk, 52 wks/yr;
- Tank Storage: 24 hrs/day, 7 days/wk, 52 wks/yr;
- Steam Boiler: 24 hrs/day, 7 days/wk, 52 wks/yr;
- Environmental Heating: 400 hrs/yr; and
- Foam Fabrication Operations: 12 hrs/day, 6 days/wk, 52 wks/yr.

**Table 2.1. Summary of Emission Sources
Foamex, L.P. - Orlando, Florida**

Process Emission Source	Emission Point Number	Description
Slabstock Polyurethane Foam Production	1	Foam Line Stack
Slabstock Polyurethane Foam Production	2	Long Bun Storage Room Stack
Slabstock Foam Production/Foam Fabrication Operations	3	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	4	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	5	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	6	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	7	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	8	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	9	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	10	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	11	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	12	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	13	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	14	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	15	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	16	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	17	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	18	Exhaust Fan
Slabstock Foam Production/Foam Fabrication Operations	19	Exhaust Fan
Rebond Polyurethane Foam Production	20	Rebond Exhaust Fan
Rebond Polyurethane Foam Production	21	Rebond Exhaust Fan
Tank Storage	22	Tank #10
Steam Boiler	23	Boiler Stack
Environmental Heating	24	Natural Gas Heaters

3.0 PROCESS RATE AND EMISSION CALCULATIONS

3.1 Process Input Rate/Product Weight

3.1.1 Slabstock Foam Production

The Slabstock process, as described in Section 2.2.1 of this application, involves the mixture of various raw materials, the exact proportions of which are determined according to the desired product specifications. This process is a batch operation; each batch is referred to as a "pour". Pours can be of various durations, ranging up to three hours each. A summary of the process input and production rates for a typical pour are provided in Table 3.1.

**Table 3.1. Slabstock Polyurethane Foam Production Process Rates
Foamex, L.P. - Orlando, Florida**

Substance	Process Input Rate (lbs/hr)	Production Rate (lbs/hr)
Process Chemicals:		
Polyol	24,000	0
TDI	13,420	0
Amine Catalyst	79	0
Tin Catalyst	58	0
Water	1,068	0
Surfactant	180	0
Blowing Agent:		
Methylene Chloride	1,320	1,320 *
Product:		
Foam Product	0	36,199
Other Emissions:		
Carbon Dioxide	0	2,606

* 95% emitted throughout pour and cure periods; remaining 5% is emitted after foam buns leave the Long Bun Storage Room during foam fabrication operations.

It is important to note that the process input rate of primary importance from a regulatory standpoint is that of methylene chloride. While the values stated above represent a typical pour, the following analysis provides the basis for the maximum short term (hourly) methylene chloride usage.

To calculate the maximum hourly usage rate of methylene chloride it is necessary to define the "worst case" pour conditions. First, the longest pour period for a day is three hours. The maximum quantity of methylene chloride which could be used during this period is as follows:

<u>Production Basis</u>	<u>Methylene Chloride Usage Rate (lbs/hr)</u>
Product P110021NO - 0.5 hours	2,958
Product P120032NO - 2.5 hours	1,320

The maximum hourly usage rate of methylene chloride is then calculated as follows:

$$\text{Maximum daily usage} = (2,958 \text{ lb/hr} \times 0.5 \text{ hr/day}) + (1,320 \text{ lb/hr} \times 2.5 \text{ hr/day}) = 4,779 \text{ lb/day}$$

$$\text{Maximum hourly usage} = 4,779 \text{ lb/day} \div 3 \text{ hr/day} = 1,593 \text{ lb/hr}$$

The maximum annual usage of methylene chloride at the facility will be limited to 513,090 lbs/yr.

3.1.2 Rebond Polyurethane Foam Production

A summary of the typical material input and production rates for the Rebond process are provided in Table 3.2.

**Table 3.2. Rebond Polyurethane Foam Production Process Rates
Foamex, L.P. - Orlando, Florida**

Substance	Process Input Rate (lbs/hr)	Production Rate (lbs/hr)
Raw Materials:		
Scrap Foam	5,608	0
Polyol	459	0
TDI	164	0
Product:		
Rebond Foam Product	0	6,231

3.1.3 Tank Storage

As stated previously in Section 2.2.3 of this application, the Foamex facility includes eleven above ground storage tanks. The current estimated maximum annual material throughput for each tank is shown in Table 3.3 below.

**Table 3.3. Tanks Storage Process Rates
Foamex, L.P. - Orlando, Florida**

Tank Number	Product	Height (feet)	Diameter (feet)	Throughput (lbs/yr)
1	Polyol	35	12	Note 1
2	Polyol	35	12	Note 1
3	TDI	35	12	Note 2
4	Polyol	35	12	Note 1
5	Polyol	35	12	Note 1
6	TDI	35	12	Note 2
7	Empty	16	10.5	0
8	Polymer	16	10.5	270,000
9	Empty	35	12	0
10	Methylene Chloride	37 (long)	7	513,090
11	Empty	30 (long)	7	0

Note 1: Total Polyol Throughput = 8,800,000 lbs/yr

Note 2: Total TDI Throughput = 4,650,000 lbs/yr

3.1.4 Steam Boiler

The industrial boiler used for steam production is rated at 100 hp and is fired by natural gas. The boiler is used to convert an average of 1,570 gallons of water to steam each day for the Rebond process. The maximum heat input for the boiler is 4.2 mmBtu/hr with a maximum natural gas consumption rate of 4,200 cf/hr. The maximum operating schedule for the boiler is 8760 hrs/yr.

3.1.5 Environmental Heating

There are thirteen indirect natural gas fired heaters at the Foamex facility. Of these, nine are used as needed during the winter months for heating the manufacturing and administrative areas of the facility. It is estimated that these heaters operate less than 400 hours per year. The total maximum heat input for the heaters is 1.85 mmBtu/hr, with a maximum natural gas usage rate of 1850 cf/hr. On an average basis, the natural gas usage rate is 200 cf/hr. Table 3.4 provides a listing of the individual heaters and heat input rates.

**Table 3.4. Indirect Fired Heaters Process Rates
Foamex, L.P. - Orlando, Florida**

Heater Number	Manufacturer	Model Number	Operational?	Maximum Heat Input (Btu/hr)
1	Bryant	200-341	Yes	200,000
2	Bryant	200-341	No	200,000
3	Hastings	GF200XE	Yes	200,000
4	Hastings	GF200XE	No	200,000
5	Hastings	GF200XE	Yes	200,000
6	Hastings	GF200XE	Yes	200,000
7	Hastings	GF200XE	Yes	200,000
8	Hastings	GF200XE	Yes	200,000
9	Hastings	GF200XE	Yes	200,000
10	Hastings	GF200XE	Yes	200,000
11	Bryant	200-341	No	200,000
12	Bryant	200-341	No	200,000
13	Peereless	1067	Yes	250,000
TOTAL (operational heaters only)				1,850,000

3.1.6 Foam Fabrication Operations

During Foam Fabrication Operations, the foam buns manufactured during the Slabstock process are cut and glued according to customer specifications. Approximately 3.1 lbs/hr of glue is used during these operations. The maximum annual usage rate of glue at the facility is 4,600 lb/yr, or 2.3 tons/yr.

3.2 Emissions Calculations

3.2.1 Slabstock Polyurethane Foam Production

3.2.1.1 Methylene Chloride

As stated in Section 3.1.1 of this application, methylene chloride represents the only significant emissions associated with this process. Currently, it is the only blowing agent used. In this process, all of the blowing agent used is emitted to the atmosphere and does not end up in the foam product. Based on industry and product information, it is assumed for this permit application, that 60% of the methylene chloride is released from the foam in the foam line enclosure before it reaches the Long Bun Storage Room and 35% is released during the twelve hour cure period in the Long Bun Storage Room. The remaining 5% of the methylene chloride is released during subsequent foam fabrication and processing operations throughout the rest of the facility before shipment of the final product. The total uncontrolled process emissions of methylene chloride on an annual basis can, therefore, be estimated directly from the annual methylene chloride usage rate in Section 3.1.1.

$$\text{Maximum annual methylene chloride usage} = 513,090 \text{ lbs/yr}$$

$$\begin{aligned} \text{Maximum annual methylene chloride emissions} &= 513,090 \text{ lbs/yr} \div 2,000 \text{ lbs/ton} \\ &= 256.55 \text{ tons/yr} \end{aligned}$$

The values shown above represent the total methylene chloride emissions from the slabstock foam production process. However, these emissions are distributed between each of the two stacks serving the process, the Foam Line Stack and the Long Bun Storage Room Stack, and the seventeen exhaust ceiling fans serving the Foam Fabrication Operations area. Both short term and long term emission rates must be calculated for the Foam Line Stack and Long Bun Storage Room Stack. Emissions calculations for the Foam Fabrication Operations are included under that heading in Section 3.2.6. Long term or annual emissions from the Foam Line and Long Bun Storage Room can be calculated by multiplying the distribution factors for each (60% and 35%, respectively) by the total maximum annual emissions specified above.

Foam Line Stack:

$$\begin{aligned} \text{Maximum annual methylene chloride emissions} &= 513,090 \text{ lbs/yr} \times 0.60 \\ &= 307,854 \text{ lb/yr} \end{aligned}$$

$$\begin{aligned} \text{Maximum annual methylene chloride emissions} &= 307,854 \text{ lbs/yr} \div 2,000 \text{ lbs/ton} \\ &= 153.93 \text{ tons/yr} \end{aligned}$$

Long Bun Storage Room Stack:

$$\begin{aligned} \text{Maximum annual methylene chloride emissions} &= 513,090 \text{ lbs/yr} \times 0.35 \\ &= 179,581.5 \text{ lb/yr} \end{aligned}$$

$$\begin{aligned} \text{Maximum annual methylene chloride emissions} &= 179,581.5 \text{ lbs/yr} \div 2,000 \text{ lbs/ton} \\ &= 89.79 \text{ tons/yr} \end{aligned}$$

The first step in developing an estimate of the maximum hourly emission rate for the Foam Line and Long Bun Storage Room is to define a methylene chloride mass balance for the "worst case" pour. For this purpose, the "worst case" pour, as defined in Section 3.1.1 of this application, has methylene chloride usage rate of 1,593 lbs/hr for a period of 3 hours. Therefore, a total of 4,779 pounds of methylene chloride is used during the "worst case" pour. Assuming that 60% of this quantity is released during the pour period in the foam line enclosure as the foam travels along the process line conveyor before it reaches the Long Bun Storage Room, the Foam Line Stack emits a total of 2,867.4 pounds of methylene chloride over the three hour pour period. As the buns enter the Long Bun Storage Room, the remaining methylene chloride which is contained in the foam material begins to be released. Assuming that 35% of the methylene chloride used during the pour is released in the Long Bun Storage Room during the cure period, a total of 1,672.65 pounds of methylene chloride is emitted from the Long Bun Storage Room Stack. The 5% (238.95 pounds) of the methylene chloride remaining after the cure period in the foam product after it is removed from the Long Bun Storage Room is emitted seventeen exhaust fans located throughout the rest of the facility during the foam fabrication operations.

As stated previously, the Long Bun Storage Room emissions decay at an exponential rate over the foam cure period. Appendix A provides a detailed analysis of the actual emission rate profile for the Long Bun Storage Room. However, for emission calculation purposes, a more simple approach representing a worst case scenario is used. This approach ignores the decay profile and the foam cure period and instead assumes that the total quantity of emissions is released at a steady rate during the pour period only. Because the length of the pour period is shorter than the cure period, the resulting maximum short term emission rate is higher.

Thus, this approach represents a worst case scenario. The following provides a simple summary of this mass balance.

Maximum methylene chloride usage	= 4,779 lbs
Maximum Foam Line Stack methylene chloride emissions	= 2,867.4 lbs
Maximum Long Bun Storage Room Stack methylene chloride emissions	= 1,672.65 lbs
Maximum methylene chloride emissions from seventeen exhaust fans	= 238.95 lbs
Maximum Total methylene chloride emissions	= 4,779 lbs

Using the worst case assumption that the total emissions for both the Foam Line Stack and Long Bun Storage Room Stack occur during the three hour pour period, the maximum hourly emission rates are calculated as follows:

Foam Line Stack:

$$\begin{aligned} \text{Maximum hourly methylene chloride emissions} &= 2,867.4 \text{ lbs} \div 3 \text{ hrs} \\ &= 955.8 \text{ lb/hr} \end{aligned}$$

Long Bun Storage Room Stack:

$$\begin{aligned} \text{Maximum hourly methylene chloride emissions} &= 1,672.65 \text{ lbs} \div 3 \text{ hrs} \\ &= 557.55 \text{ lb/hr} \end{aligned}$$

As stated above, emissions from the seventeen exhaust fans during foam fabrication operations are included under the heading Foam Fabrication Operations in Section 3.2.6.

3.2.1.2 Toluene Diisocyanate

As stated above, the Slabstock process involves the mixture of various process chemicals along with an auxiliary blowing agent to produce polyurethane foam. The calculations presented above provide an estimate of the emissions of the auxiliary blowing agent, methylene chloride. All of the methylene chloride used is volatilized and thus emitted from the process. The remaining process chemicals listed in the mass balance, shown in Section 3.1.1, combine to form the foam product. In 1991, Foamex conducted a stack test for emissions of methylene chloride and toluene diisocyanate (TDI). The test results, included in Appendix B, revealed that a small quantity of TDI is emitted from the process. Table 3.5 provides a summary of the test results.

**Table 3.5. TDI Emissions Test Summary
Foamex, L.P. - Orlando, Florida**

	TDI Isomer Emissions (lb/hr)		
	2,4-TDI	2,6-TDI	Total
Run 1	0.10	0.27	0.37
Run 2	0.04	0.10	0.14
Run 3	0.07	0.15	0.22
Average	0.07	0.17	0.24

Based on the highest results for a single run, the maximum TDI emissions are 0.37 lbs/hr. The maximum operating schedule of the Slabstock process is specified in Section 2.3 of this application as 3 hrs/day, 4 days/wk, 52 wks/yr. Therefore, the maximum annual hours during which TDI emissions occur based on the hours of operation is 624 hrs/yr. Therefore, the annual emissions of TDI are be calculated as follows:

$$\begin{aligned} \text{Maximum hourly emission rate} &= 0.37 \text{ lbs/hr} \\ \text{Maximum annual emissions} &= (0.37 \text{ lbs/hr}) \times (624 \text{ hrs/yr}) \div (2000 \text{ lbs/ton}) \\ &= 0.12 \text{ tons/yr} \end{aligned}$$

3.2.2 Rebond Polyurethane Foam Production

The TDI emissions estimated above for the Slabstock process are due to due evaporation of the chemical during its use. Although no testing has been conducted, it is assumed that similar emissions are generated from the Rebond process. To estimate the quantity of TDI emissions from the Rebond process, an emission factor was developed based on the maximum hourly emission rate and the typical TDI usage rate specified in section 3.2.1 for the Slabstock process. This emission factor can then be applied to the TDI usage rate for the Rebond process to obtain the emission rate. This emission rate is calculated as follows:

$$\begin{aligned} \text{TDI emission factor} &= (0.37 \text{ lbs/hr emissions}) \div (13,420 \text{ lbs/hr usage}) \\ &= 0.000028 \text{ lbs/lb} \\ \text{Maximum hourly Rebond process TDI emission rate} &= 0.000028 \text{ lbs/lb} \times 164 \text{ lbs/hr} \\ &= 0.0046 \text{ lbs/hr} \end{aligned}$$

Using the maximum operating schedule for the Rebond process of 12 hrs/day, 6 days/wk, 52 wks/yr (3,744 hrs/yr), the maximum annual emissions are calculated as follows:

$$\begin{aligned} \text{Maximum annual Rebond process TDI emissions} &= 0.0046 \text{ lbs/hr} \times 3,744 \text{ hrs/yr} \\ &= 17.2 \text{ lbs/yr} \\ &= 0.009 \text{ tons/yr} \end{aligned}$$

3.2.3 Tank Storage

Appendix C provides detailed reports of emissions calculations for Tank 10, the methylene chloride storage tank. These reports were generated using EPA's TANKS Storage Tank Emissions Calculation Software,

version 1.0, which is based on the calculation procedures specified in AP-42 section 12. The calculations were conducted based on the maximum annual methylene chloride throughput for the facility of 513,090 lb/yr. The calculations represented in Appendix C were conducted based on the existing tank design, which includes a breather vent with no pressure setting. Thus breathing losses, also referred to as standing losses, are not limited in any way. The following provides a summary of the results of the calculations. However Foamex proposes to install a pressure relief vent for this tank such that standing losses would be minimized.

Total standing losses	=	4992.73 lbs/yr
Total working losses	=	844.16 lbs/yr
Maximum annual emissions	=	(4992.73 lbs/yr) + (844.16 lbs/yr)
	=	5836.89 lbs/yr
	=	(5836.89 lbs/yr) ÷ (2000 lbs/ton)
	=	2.9 tons/yr
Annual average emission rate	=	(5836.89 lbs/yr) ÷ (8760 hrs/yr)
	=	0.66 lbs/hr

3.2.4 Steam Boiler

Emissions from the Steam Boiler are generated through natural gas combustion. Appendix D provides calculations of the fuel combustion emissions based on the procedures specified in AP-42 section 1.4. A copy of this AP-42 section is also included in Appendix D. Table 3.6 provides a summary of the results of these calculations.

**Table 3.6. Steam Boiler Emission Rates
Foamex, L.P. - Orlando, Florida**

Compound	Maximum Hourly Emission Rate (lbs/hr)	Maximum Annual Emissions (tons/yr)
Particulate	0.021	0.092
Sulfur dioxide	0.0025	0.011
Nitrogen oxide	0.59	2.58
Carbon monoxide	0.147	0.64
Total hydrocarbons	0.013	0.055

3.2.5 Environmental Heating

Emissions from Environmental Heating are generated through natural gas combustion. Appendix E provides calculations of the fuel combustion emissions based on the procedures specified in AP-42 section 1.4. A copy of this AP-42 section is also included in Appendix D. Table 3.7 provides a summary of the results of these calculations.

**Table 3.7. Environmental Heating Emission Rates
Foamex, L.P. - Orlando, Florida**

Compound	Maximum Hourly Emission Rate (lbs/hr)	Maximum Annual Emissions (tons/yr)
Particulate	0.00925	0.00185
Sulfur dioxide	0.00111	0.000222
Nitrogen oxide	0.259	0.0518
Carbon monoxide	0.06475	0.01295
Total hydrocarbons	0.00555	0.00111

3.2.6 Foam Fabrication Operations

3.2.6.1 Methylene Chloride

As stated above, after the foam bun cure period ends 5% of the total methylene chloride used is still retained in the foam buns. This quantity is not released until the buns leave the Long Bun Storage Room and are cut or processed during Foam Fabrication operations. This remaining 5% is emitted from the foam into the facility room environment and discharged to the atmosphere through the seventeen ceiling exhaust fans located throughout the rest of the facility. Further, since an inventory of foam product is always present at the facility, these fugitive emissions are released at a constant rate throughout the year. The maximum annual emissions and maximum hourly emission rates for these emissions from the exhaust fans are calculated as follows.

$$\begin{aligned} \text{Maximum annual emissions} &= 513,090 \text{ lbs/yr} \times 0.05 \\ &= 25,654.5 \text{ lbs/yr} \\ &= 12.8 \text{ tons/yr} \end{aligned}$$

$$\begin{aligned} \text{Maximum hourly emissions} &= 25,654.5 \text{ lbs/yr} \div 8,760 \text{ hr/yr} \\ &= 2.93 \text{ lb/hr} \end{aligned}$$

In the gluing process Foamex uses a methylene chloride based glue, therefore, methylene chloride emissions must be calculated for the gluing process. In section 3.1.6, the annual and hourly usage rates of glue used in these operations are presented. Based on the Material Safety Data Sheet (MSDS) for this glue, the maximum methylene chloride content of the glue is 70% by weight. Copies of relevant MSDS are provided in Appendix F. Using the glue usage rates of 3.1 lbs/hr and 4,600 lb/yr the methylene chloride emissions are calculated as follows:

$$\begin{aligned} \text{Maximum hourly emissions} &= 3.1 \text{ lbs/hr} \times 0.70 \\ &= 2.17 \text{ lbs/hr} \end{aligned}$$

$$\begin{aligned} \text{Maximum annual emissions} &= 4,600 \text{ lbs/yr} \times 0.70 \div 2,000 \text{ lbs/ton} \\ &= 1.61 \text{ tons/yr} \end{aligned}$$

The total methylene chloride emissions from the foam fabrication operations are calculated as follows:

$$\text{Maximum hourly emissions} = 2.93 \text{ lb/hr} + 2.17 \text{ lbs/hr}$$

$$\begin{aligned}
 &= 5.1 \text{ lbs/hr} \\
 \text{Maximum annual emissions} &= 12.8 \text{ tons/yr} + 1.61 \text{ tons/yr} \\
 &= 14.41 \text{ tons/yr}
 \end{aligned}$$

3.2.6.2 1,1,1-Trichloroethane

In the gluing process Foamex may also use a 1,1,1-trichloroethane based glue, therefore, 1,1,1-trichloroethane emissions must be calculated for the gluing process. In section 3.1.6, the annual and hourly usage rates of glue used in these operations are presented. Based on the Material Safety Data Sheet (MSDS) for this glue, the maximum 1,1,1-trichloroethane content of the glue is 81% by weight. Copies of relevant MSDS are provided in Appendix F. Using the glue usage rates of 3.1 lbs/hr and 4,600 lb/yr the 1,1,1-trichloroethane emissions are calculated as follows:

$$\begin{aligned}
 \text{Maximum hourly emissions} &= 3.1 \text{ lbs/hr} \times 0.81 \\
 &= 2.5 \text{ lbs/hr} \\
 \text{Maximum annual emissions} &= 4,600 \text{ lbs/yr} \times 0.81 \div 2,000 \text{ lbs/ton} \\
 &= 1.86 \text{ tons/yr}
 \end{aligned}$$

3.2.7 Emissions Summary

A summary of the maximum hourly and annual emission rates for each process is provided in Table 3.8. Emission rates calculated on an 8-hour average and 24-hour average are also provided in Volume II of this application, the Dispersion Modeling Analysis, which is submitted under separate cover.

**Table 3.8. Emissions Summary
Foamex, L.P. - Orlando Facility**

Contaminant	Emission Source	Emissions ¹		Allowed ² Emission Rate per Rule 17-2	Allowable ³ Emissions (lbs/hr)	Potential ⁴ Emissions	
		Maximum (lbs/hr)	Actual (T/yr)			(lbs/hr)	(T/yr)
Methylene Chloride	Slabstock Process	1513.35	243.72	N/A	N/A	1513.35	243.72
	Tank Storage	0.66	2.9	N/A	N/A	0.69	3
	Foam Fabrication	5.1	14.41	N/A	N/A	5.1	14.41
	Subtotal	1519.11	261.03	N/A	N/A	1519.14	261.13
1,1,1 Trichloroethane	Foam Fabrication	2.5	1.86	N/A	N/A	2.5	1.86
	Subtotal	2.5	1.86	N/A	N/A	2.5	1.86
Toluene Diisocyanate	Slabstock Process	0.37	0.12	N/A	N/A	0.37	0.12
	Rebond Process	0.0046	0.009	N/A	N/A	0.0046	0.009
	Subtotal	0.3746	0.129	N/A	N/A	0.3746	0.129
Particulate	Steam Boiler	0.021	0.092	N/A	N/A	0.021	0.092
	Environmental Heating	0.00925	0.00185	N/A	N/A	0.00925	0.00185
	Subtotal	0.03025	0.09385	N/A	N/A	0.03025	0.09385
Sulfur Dioxide	Steam Boiler	0.0025	0.011	N/A	N/A	0.0025	0.011
	Environmental Heating	0.00111	0.000222	N/A	N/A	0.00111	0.000222
	Subtotal	0.00361	0.011222	N/A	N/A	0.00361	0.011222
Nitrogen Oxides	Steam Boiler	0.59	2.58	N/A	N/A	0.59	2.58
	Environmental Heating	0.259	0.0518	N/A	N/A	0.259	0.0518
	Subtotal	0.849	2.6318	N/A	N/A	0.849	2.6318
Carbon Monoxide	Steam Boiler	0.147	0.64	N/A	N/A	0.147	0.64
	Environmental Heating	0.06475	0.01295	N/A	N/A	0.06475	0.01295
	Subtotal	0.21175	0.65295	N/A	N/A	0.21175	0.65295
Total Hydrocarbons	Steam Boiler	0.013	0.055	N/A	N/A	0.013	0.055
	Environmental Heating	0.00555	0.00111	N/A	N/A	0.00555	0.00111
	Subtotal	0.01855	0.05611	N/A	N/A	0.01855	0.05611

1. See Section V, Item 2 (Application Section 3.2)
2. Reference applicable emission standards and units (e.g. Rule 17-2.600(5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)
3. Calculated from operating rate and applicable standard.
4. Emission, if source operated without control (See Section V, Item 3).

3.3 Emission Stack Data

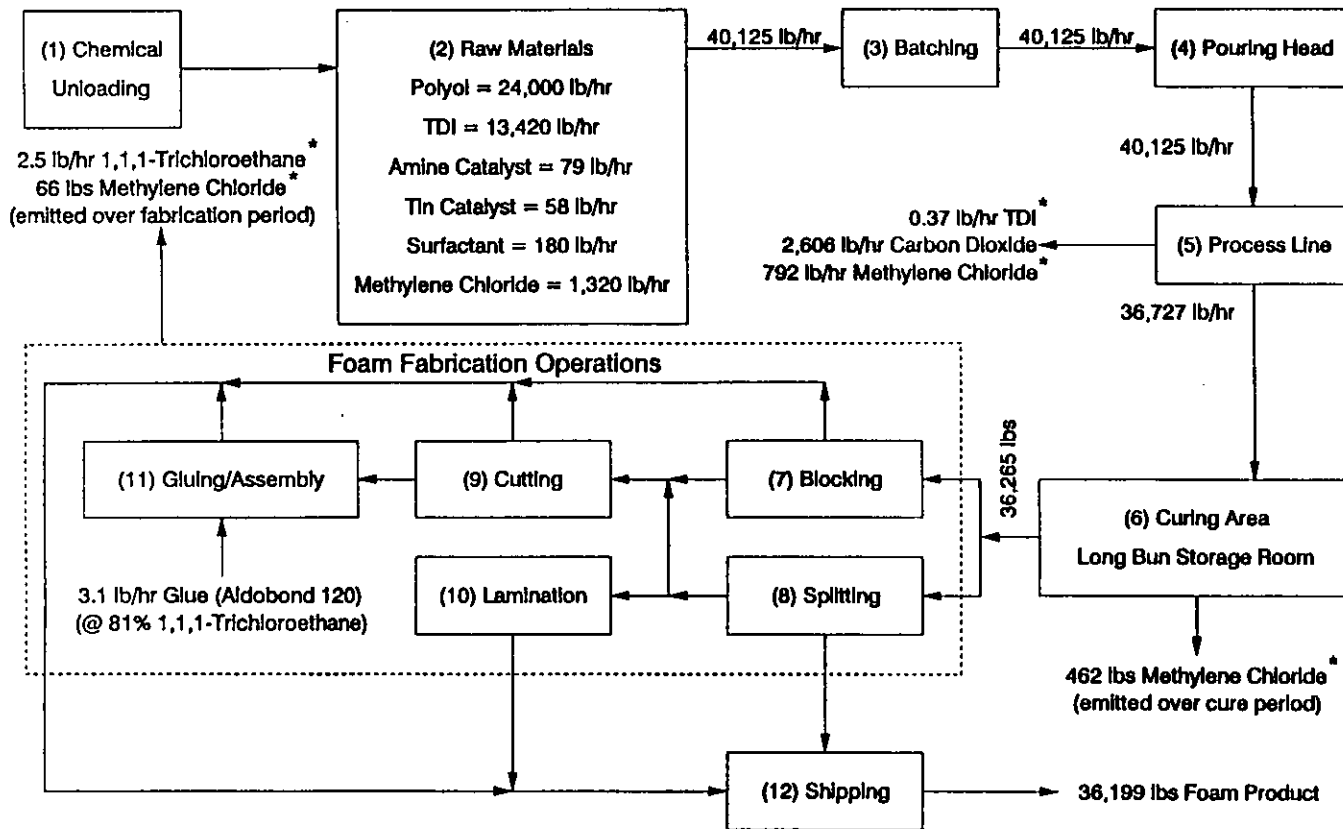
Table 3.9 provides a summary of the geometry and flow characteristics for each stack located at the Foamex, L.P. facility.

**Table 3.9. Stack and Exhaust Fan Stack Parameters
Foamex, L.P. - Orlando, Florida**

Source Number	Description	Stack Height ^a Above Ground Level (feet)	Stack Inside Diameter (inches)	Stack Gas Flow Rate (ACFM)	Stack Gas Exit Temp. (°F)	Stack Gas Exit Velocity (ft/sec)	Water Vapor Content
1	Foam Line Stack	125	33.75	30,000	80	80.481	Ambient
2	Long Bun Storage Room Stack	125	33.75	30,000	80	80.481	Ambient
3	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
4	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
5	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
6	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
7	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
8	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
9	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
10	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
11	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
12	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
13	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
14	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
15	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
16	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
17	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
18	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
19	Exhaust Fan	53	43.5	50,000	80	80.744	Ambient
20	Rebond Exhaust Fan	53	24	15,000	80	79.577	Ambient
21	Rebond Exhaust Fan	53	24	15,000	80	79.577	Ambient

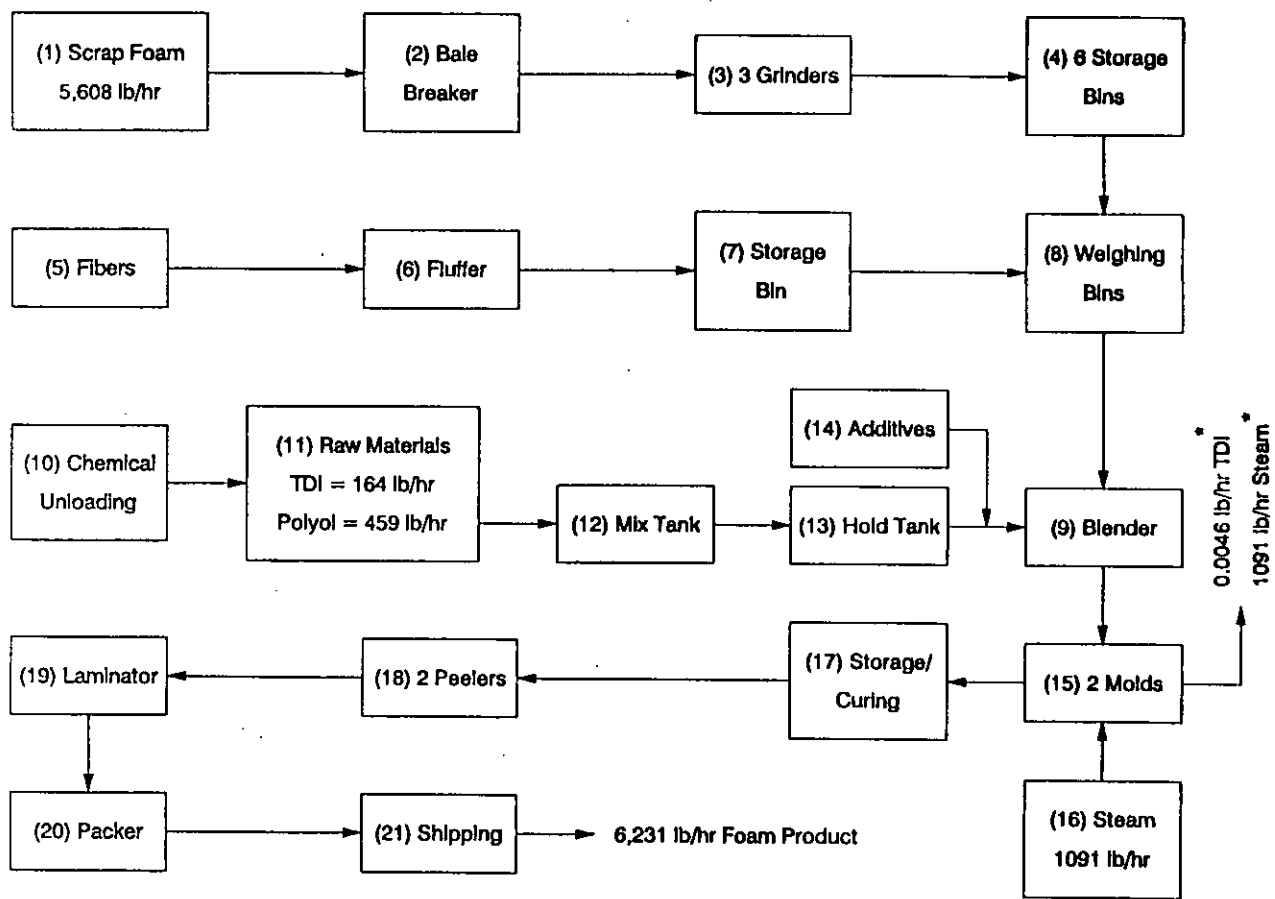
a. Elevation of top of stack above ground level. Stack base elevation = 0 feet.

**Figure 1. Slabstock Polyurethane Foam Production/
Foam Fabrication Operations
Process Flow Diagram
Foamex, L.P. - Orlando Facility**



* See Emission Calculations

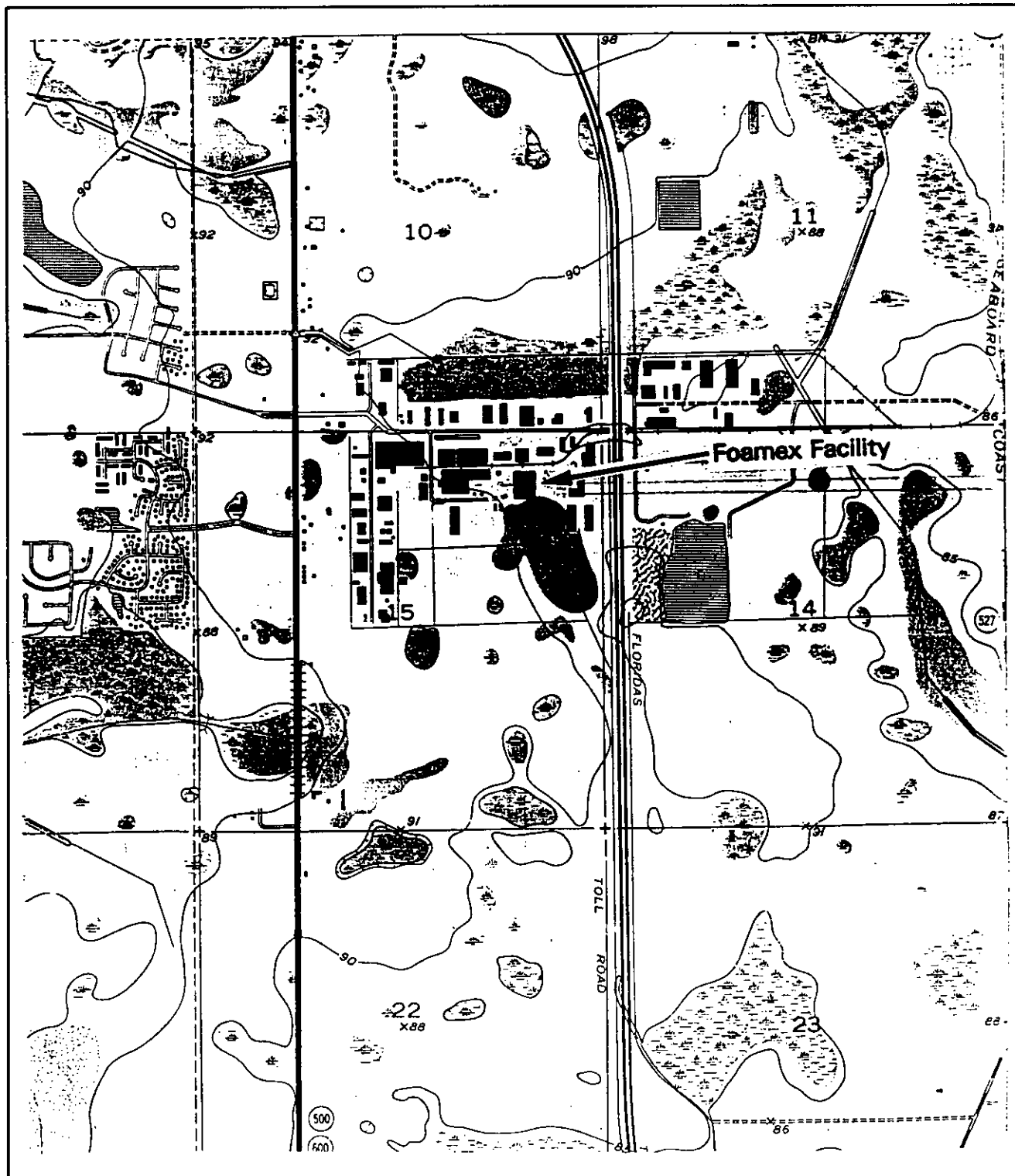
**Figure 2. Rebond Polyurethane Foam Production
Process Flow Diagram
Foamex, L.P. - Orlando Facility**



* See Emission Calculations

**Figure 3. Proposed Exhaust System
Foamex, L.P. - Orlando, Florida**

**Figure 4. Facility Location
Foamex, L.P. - Orlando, Florida
(USGS Topographical Map - Lake Jessamine, Florida Quadrangle)**



**Figure 5. Facility Plot Plan
Equipment Layout
Foamex, L.P. - Orlando Facility**

**Figure 6. Facility Plot Plan
Foamex, L.P. - Orlando Facility**

APPENDIX A

**DETAILED ANALYSIS OF BLOWING AGENT
EMISSIONS PROFILE**

Detailed Analysis of Slabstock Process Blowing Agent Emissions Profile

For the purpose of this analysis, the following assumptions have been made. The foam line emissions are released at a constant rate over the pour period. The storage room emissions are not released at a constant rate but can be characterized based on an exponential decay profile over the cure period of twelve hours. This decay profile specifies the rate at which the quantity of methylene chloride retained in the foam material decreases over time. Beginning twenty minutes after initiation of the pour period, the quantity of foam entering the storage room increases at a steady rate equivalent to the foam production rate from the process line. As each portion of foam enters the room, the methylene chloride remaining in the foam is released according to the decay profile until, after twelve hours, the equilibrium point is reached. Thus during the initial 3 hours and 20 minutes, two phenomena occur: 1) The total quantity of methylene chloride introduced to the storage room increases as the foam buns enter the Long Bun Storage Room, and 2) The quantity of methylene chloride contained in the foam buns decreases as it is released to the atmosphere according to the decay profile.

During the pour and cure periods, the quantity of methylene chloride contained in the foam inside the storage room at any given time can be approximated by a series of decay profile curves as shown in Figure 5-7. Using graphical methods to sum this series of profiles, Figure 5-8 was developed. Represented as C_t , this curve is shown again in Figure 5-9, along with a plot of M_t which indicates the total methylene chloride existing in the Long Bun Storage Room (including the quantity retained in the foam product and the quantity released to the room atmosphere) at any given time. By subtracting C_t from M_t , a plot of E_t is obtained, representing the quantity of methylene chloride emitted to the room atmosphere at any time over the pour and cure periods.

It should be noted that after the cure period ends, at time = 15 hours, 5% of the total methylene chloride used is still retained in the foam buns. As stated previously, this quantity is not released until the buns leave the Long Bun Storage Room and are cut or processed during Foam Fabrication Operations. Calculation of these emissions is thus included under Foam Fabrication Operations later in this section.

The analysis summarized in this Appendix was developed to approximate the actual conditions characteristic of the Slabstock process. For purposes of calculating emissions and conducting an air quality impact analysis, the more simple method included under Items 2,3 and 5 in Supplemental Information: Section V was used. This method represents a worst case approach which ignores the decay profile of the Long Bun Storage Room emissions and instead assumes that the total quantity of blowing agent from the Long Bun Storage Room is emitted during the pour period (3 hours).

FIGURE 5-7

Sample Foam Methylene Chloride Content Decay Profile

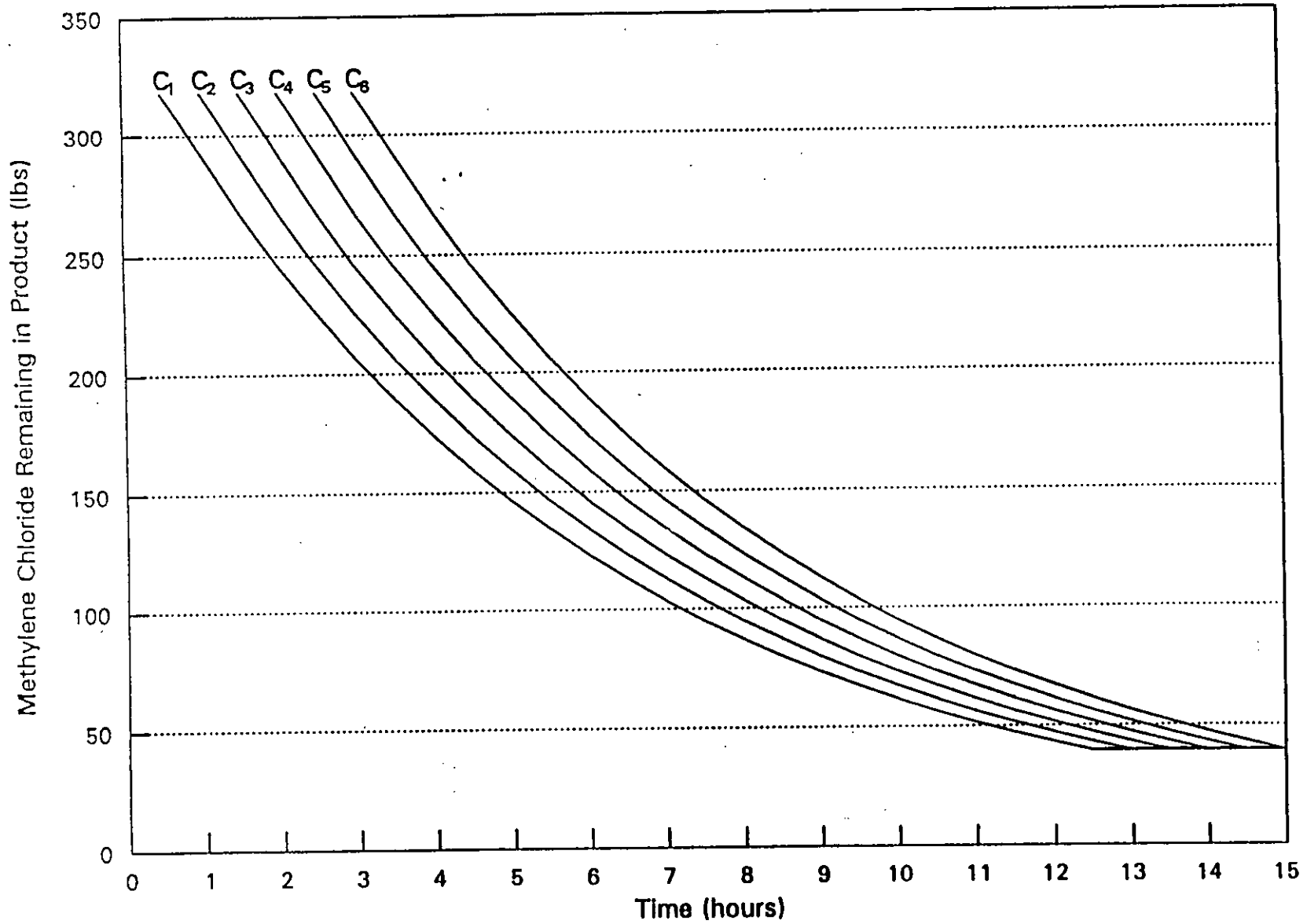


FIGURE 5-8

Sample Foam Methylene Chloride Content Decay Profile

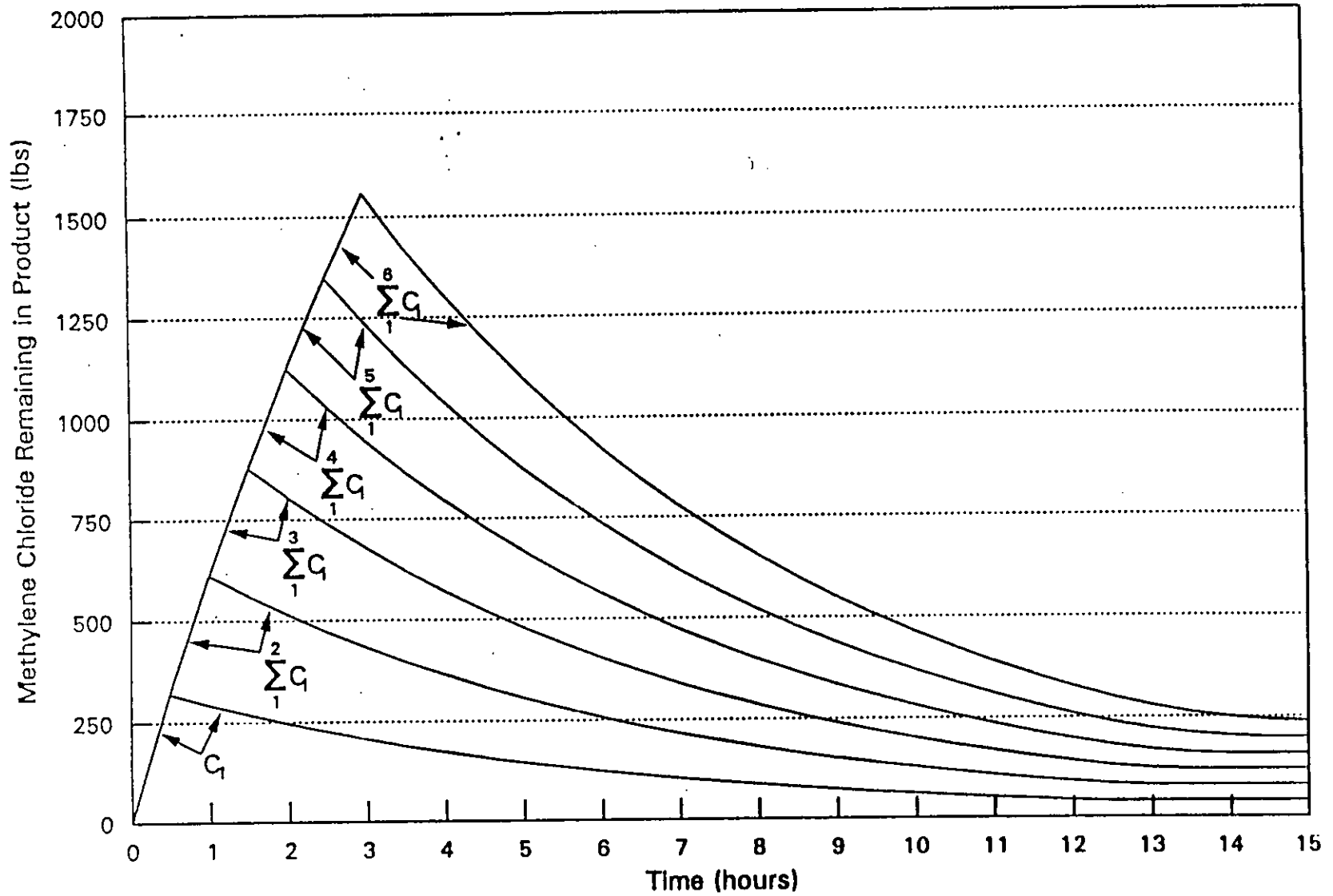
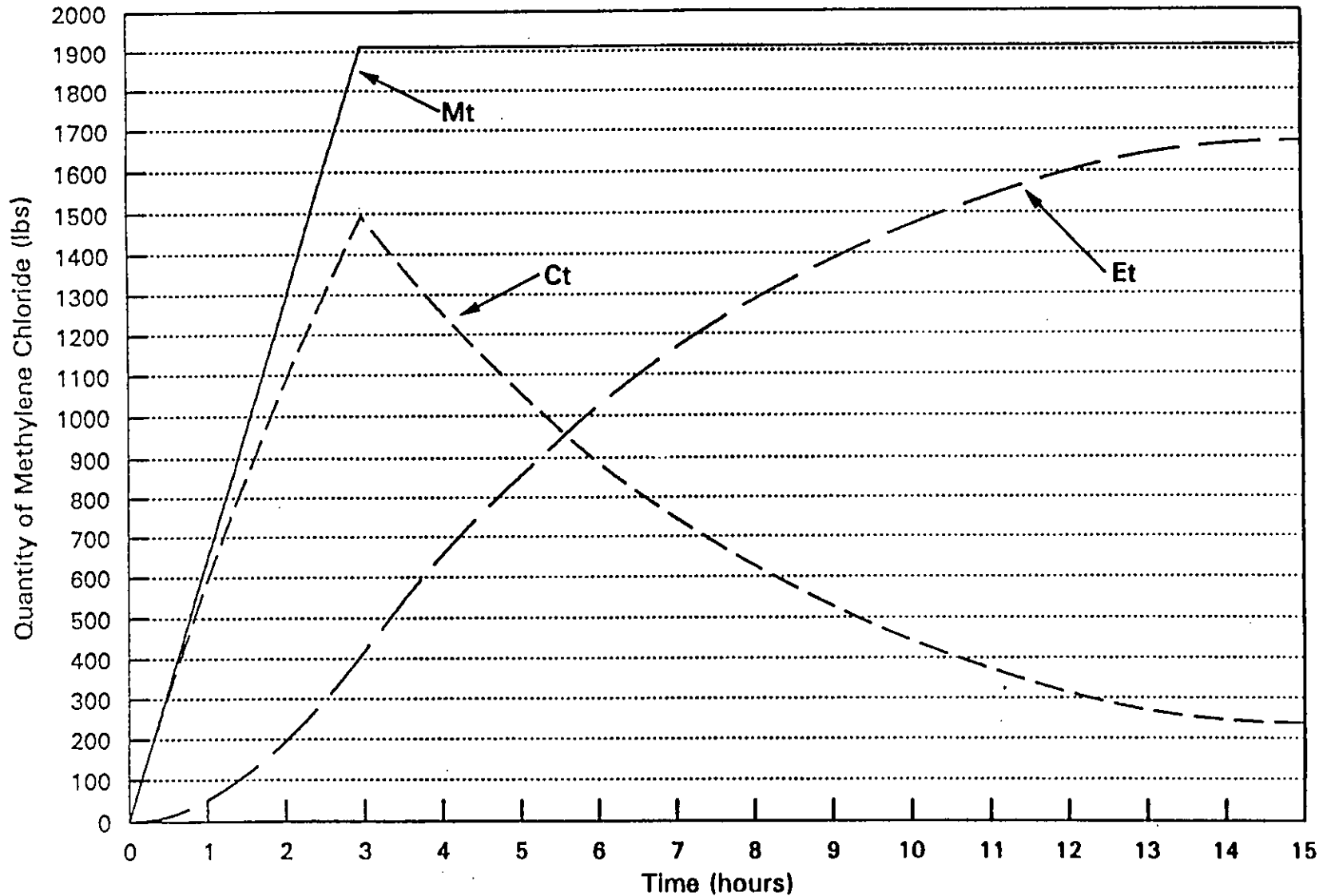


FIGURE 5-9

**Long Bun Storage Room Methylene Chloride Mass Balance
During 3 Hour Foam Production Pour and 12 Hour Cure Period**



— Mt = Total Methylene Chloride in Long Bun Storage Room (In Product and Air)
- - - Ct = Methylene Chloride Remaining in Product in Long Bun Storage Room
- - - Et = Methylene Chloride Emitted to Air in Long Bun Storage Room

APPENDIX B
STACK TEST REPORT -
TOLUENE DIISOCYANATE (TDI)
PROCESS EMISSIONS

CTA#
11.816



The Dow Chemical Company

DATE
April 8, 1992

INDUSTRIAL HYGIENE REPORT

TITLE
EVALUATION OF EXHAUST STACK EMISSIONS FOR TOLUENE DIISOCYANATE (TDI) AND METHYLENE CHLORIDE DURING FLEXIBLE POLYURETHANE FOAM PRODUCTION AT FOAMEX LP, ORLANDO, FLORIDA, OCTOBER 10, 1991

AUTHOR
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Health and Environmental Sciences

DISTRIBUTION
D. J. Scott, Dow Chemical USA, Saddlebrook, NJ

SUMMARY

An emission survey was conducted on October 10, 1991, at Foamex LP, Orlando, Florida, during the production of flexible polyurethane foam. Toluene diisocyanate (TDI; both 2,4- and 2,6-isomers) and methylene chloride emissions from one stack ventilating the production line were evaluated. A series of samples was collected from this stack during the manufacture of polyurethane foam over a 2.5 hour time period. Three distinct runs were monitored.

The exhaust air flow rate from one stack venting the production line (several stacks had been manifolded together to form a single emission point) was approximately 14,600 cfm. Average stack temperature was approximately 81°F and relative humidity was approximately 69%. The differences between actual and standard conditions were within the acceptable ranges established by the American Conference of Governmental Industrial Hygienists (ACGIH); therefore the volumetric flow rates were not corrected.

Run 1 was a 21-minute production period for Foam Grade 100-35. Estimated emissions were: 2,4-TDI - 0.10 lbs/hr; 2,6-TDI - 0.27 lbs/hr; methylene chloride - 278 lbs/hr.

Run 2 was a 19-minute period for Foam Grade 120-32. Estimated emissions were: 2,4-TDI - 0.04 lbs/hr; 2,6-TDI - 0.10 lbs/hr; methylene chloride - 405 lbs/hr.

Run 3 was a 110-minute period for Foam Grade 120-32 but with a different dimension than in Run 2. During this run, there were seven separate monitoring periods to minimize sampling breakthrough. Estimated emissions were: 2,4-TDI - 0.07 lbs/hr; 2,6-TDI - 0.15 lbs/hr; methylene chloride - 451 lbs/hr.

RESTRICTED: for use within Foamex LP
and The Dow Chemical Company only

PURPOSE

An exhaust vent survey was conducted at Foamex LP, Orlando, Florida, on October 10, 1991, during the production of flexible polyurethane foam. The survey was conducted as a product stewardship service to estimate vent stack emissions of toluene diisocyanate (TDI; both 2,4- and 2,6-isomers) and methylene chloride. Measurements were taken over three distinct production periods (Runs) and segregated by grades or dimensions.

CONCLUSIONS

The following conclusions are based on conditions that existed the day of this survey, October 10, 1991. Changes in equipment, procedures, ventilation or other conditions may alter or invalidate these conclusions.

1. The exhaust air velocity was measured in the single foam line exhaust stack and the calculated volumetric flow rate was approximately 14,600 cubic feet per minute (cfm). The temperature of the exhaust air was approximately 81°F and the relative humidity was approximately 69%. The differences between actual conditions and standard conditions were within American Conference of Governmental Industrial Hygienist guidelines and therefore volumetric flow rates were not corrected to standard conditions.
2. Run 1 was a 21-minute production period for Foam Grade 100-35. Estimated emissions were: 2,4-TDI - 0.10 lbs/hr; 2,6-TDI - 0.27 lbs/hr; methylene chloride - 278 lbs/hr.
3. Run 2 was a 19-minute period for Foam Grade 120-32. Estimated emissions were: 2,4-TDI - 0.04 lbs/hr; 2,6-TDI - 0.10 lbs/hr; methylene chloride - 405 lbs/hr.
4. Run 3 was a 110-minute period for Foam Grade 120-32 but with a different dimension than in Run 2. During this run, there were seven separate monitoring periods to minimize sampling breakthrough. Estimated emissions were: 2,4-TDI - 0.07 lbs/hr; 2,6-TDI - 0.15 lbs/hr; methylene chloride - 451 lbs/hr.

EMISSION AIR FLOW MEASUREMENTS

Air velocities in the exhaust ventilation stack were measured using a standard pitot tube (Air Nerotronics Ltd. Extendable pitot-Static Tube Type 50-4) and an inclined manometer with a sensitivity of 0.01 inches of water pressure gauge. Ideally, the measurements made inside a round duct should be obtained approximately 8 duct diameter lengths downstream from a disturbance to airflow (such as a branch entry, elbow, etc.), and about 4 diameters away from the next upstream point of turbulence. In this round duct, two perpendicular 10 point traverses were made as close to ideal

location along the duct as judged to be possible. This point was 11 feet above roof line which was reached with the use of a machine lift. Average face velocities measured in feet per minute (fpm) were multiplied by the appropriate cross-sectional area (ft²) of the duct to yield the flow rate in cubic foot per minute (cfm) as described in Appendix 1.

The American Conference of Governmental Industrial Hygienists (ACGIH) Industrial Ventilation Manual (Section 5.13 in the 20th and 21st Editions or Chapter 9 in the 19th or earlier editions) recommends that air velocity measurements be corrected for temperature only if the temperature is greater than 30°F of the standard condition of 70°F. The stack exit temperature was approximately 81°F, therefore no correction was made.

The ACGIH also recommends that moisture corrections be made only when the dry bulb temperature exceeds 100°F and the specific humidity of the air was greater than 0.02 pounds of water per pound of dry air. The temperature did not exceed 100°F and the specific humidity, a function of the wet and dry bulb temperatures of air, did not exceed 0.02 pounds of water per pound of air. Therefore, corrections for moisture were not made.

SAMPLING, ANALYTICAL, AND QUALITY ASSURANCE METHODS

TDI

Average stack concentrations of TDI were evaluated using a modification of the OSHA Analytical Method No. 42. Airborne concentrations of TDI were measured by drawing air through 37-mm glass fiber filters coated with approximately 10 mg of 1-(2-pyridyl) piperazine (1-2 PP) and approximately 30 mg of diethyl phthalate (DEP). Two filters were placed in series in cassettes and connected by flexible tubing to small battery-operated air monitoring vacuum pumps, MSA Flow-Lite Portable Pump Model P/N 479680. The pumps were operated at a flow rate of approximately 1 liter per minute. Mean flow rates were determined before and after sampling either by a calibrated rotameter or by a bubble flow meter. Following the survey, the filters were returned to The Dow Chemical Company, Corporate Industrial Hygiene, Midland, Michigan, for analysis. Any TDI which reacted with the reagent to form the derivative was extracted with acetonitrile. The extract solution was then analyzed using high performance liquid chromatography (HPLC) with ultraviolet (UV) detection at 254 nm.

Methylene Chloride

Vapors of methylene chloride were collected on commercially available adsorption tubes containing 2.0 gram of activated carbon. The carbon in each tube was separated into two sections with the second section used to detect breakthrough. Air samples were collected through the adsorption tubes by connecting them with small

battery powered vacuum pumps, Sipin Personal Sampler Pumps Model SP-13S and SP-103, operated at approximately 0.2 liters per minute. Each pump was calibrated before and after the survey. The sample tubes were labeled and returned to Corporate Industrial Hygiene of The Dow Chemical Company, Midland, Michigan, for analysis. The tubes were desorbed with carbon disulfide and the desorbing solution analyzed by gas chromatography using a flame ionization detector.

The results of 2,4-TDI and 2,6-TDI spiked samples had overall mean recoveries of $83\% \pm 0.707\%$ and $83\% \pm 5.5\%$ at a 4.88 microgram level. The results of methylene chloride spiked samples had a mean recovery of 92% at the 15920 μg level and a mean $114\% \pm 1.7\%$ at the 66330 μg level. The samples were submitted blind (not identified as spikes) and no corrections were made to sample results. These results are summarized under the Quality Assurance section of this report and in Appendices 6 and 7.

QUALITY ASSURANCE

Three 37-mm glass fiber filters coated with approximately 10 mg of 1-(2-pyridyl) piperazine (1-2 PP) and approximately 30 mg of diethyl phthalate (DEP) were spiked with known amounts of 2,4- and 2,6-isomers of TDI. Two 37-mm glass fiber filters coated in the same manner but not spiked were submitted as blanks. Eight methylene chloride spikes were prepared by adding known amounts of methylene chloride to adsorption tubes containing 2.0 grams of activated carbon. Two blank adsorption tubes were transported, stored and analyzed in a similar manner to the field samples. Neither isomer of toluene diisocyanate, 2,4-TDI or 2,6-TDI, nor methylene chloride were detected in the blank samples submitted for analysis. The analytical detection limits for 2,4-TDI, 2,6-TDI and methylene chloride were 0.6 μg , 0.3 μg , and 20 μg , respectively. Spike results shown in Appendices VI and VII are summarized below:

Methylene Chloride

Number of samples spiked:	4
Spiking levels:	15920 μg
% Recovery Range:	92%
% Recovery Mean:	$92\% \pm 0\%$

Number of samples spiked:	4
Spiking level:	66330 μg
% Recovery Range:	112% - 116%
% Recovery Mean:	$114\% \pm 1.7\%$

Methylene chloride concentrations were not corrected for the mean % recovery.

2,4-TDI

Number of samples spiked:	3
Spiking level:	4.88 μ g
% Recovery Range:	0%* - 84%
% Recovery Mean:	83% \pm 0.707%

2,4-TDI concentrations were not corrected for the mean % recovery.

2,6-TDI

Number of samples spiked:	3
Spiking level:	4.88 μ g
% Recovery Range:	78% - 89%
% Recovery Mean:	83% \pm 5.5%

2,6-TDI concentrations were not corrected for the mean % recovery.

The amount of 2,4-TDI and 2,6-TDI and methylene chloride found in the backup section of the treated filters or the adsorbent charcoal was less than the analytical detection limit or 10% of that found in the front section, indicating that 2,4-TDI and 2,6-TDI and methylene chloride were not breaking through the collection medium in significant quantities.

PROCESS DESCRIPTION

The Foamex LP facility located in Orlando, Florida, produces slabstock flexible polyurethane foam from a flat block conveyor production line (Veri-Max machine). Two formulations were manufactured on the day of the survey. Raw materials including polyols, TDI, and methylene chloride were introduced at the head of the line and introduced at an overflow trough located at the head of the conveyor. The mix reacted quickly, heated up, and expanded to full size in approximately the first 30 feet of the conveyor. A continuous sheet of paper or plastic was being removed at the side take-off rolls. Following expansion, the foam was conveyed downstream on the line to a cut-off saw where the continuous foam bun of rectangular cross section was cut into specified lengths for transport to storage and further fabrication.

As the primary method of controlling the escape of TDI and blowing agent vapor into the work area, a ventilated tunnel covered the production line over the expansion tunnel. This tunnel had a roof and sides, and was almost completely enclosed. To capture process emissions, a series of five exhaust stacks were located over the tunnel and a portion of the production line following the cut-off saw station. The five vents were manifolded together to form a single exhaust stack and the exhaust fan was located below the roof line.

* The recovery of the low spike level for 2,4-TDI was below the limit of detection and was not computed in the recovery mean. See Appendix VII.

RESULTS AND DISCUSSION

The single exhaust stack measured 40 inches in diameter and was equipped with a butterfly cap. Air monitoring (pitot tube measurements and air sampling) was conducted inside the exhaust stack at a point 11 feet above the roof line.

The estimated exhaust flow rate was approximately 14,600 cfm on the monitoring day, as shown in Table 1. Calculation methods are presented in the Appendices. The average stack temperature of the exhaust air was approximately 81°F and the relative humidity was approximately 69%. The differences between actual conditions and standard conditions were within American Conference of Governmental Industrial Hygienist guidelines and therefore volumetric flow rates were not corrected to standard conditions.

Monitoring was conducted for 2,4-TDI, 2,6-TDI, and methylene chloride over 2.5 hours of total production time. Run 1 produced Foam Grade 100-35 over a 21-minute period starting at 08:47. Run 2, producing Grade 120-32, started at 10:40 and finished 19 minutes later. There was a delay of 1.5 hours and the last and largest run (Run 3) started at 10:59 and lasted 110 minutes. Run 3 produced Grade 120-32 (the same as Run 2) but with a different bun dimension. Appendix V shows the details of the foam grade produced on this monitoring day.

Data generated for this survey are shown in Appendix I. Calculated emission rates are summarized in Table 2. Analytical and calculation results for the three materials are detailed in Tables 3, 4, and 5.

During Run 1, estimated emissions for Foam Grade 100-35 were: 2,4-TDI - 0.10 lbs/hr; 2,6-TDI - 0.27 lbs/hr; methylene chloride - 278 lbs/hr.

During Run 2, Foam Grade 120-32 estimated emissions were: 2,4-TDI - 0.04 lbs/hr; 2,6-TDI - 0.10 lbs/hr; methylene chloride - 405 lbs/hr.


For the final run, Run 3, Foam Grade 120-32, the dimension of the buns were changed and the estimated emissions were: 2,4-TDI - 0.07 lbs/hr; 2,6-TDI - 0.15 lbs/hr; methylene chloride - 451 lbs/hr.

APPENDICES


Supplementary information may be found in Appendices I through VIII. The appendices contain additional information regarding measurements and calculations. The appendices are located after the data tables. The set of appendices include the stack calculation data sheets, an explanation of the flow rate and emission calculations, and the criteria and correction methods to convert data at actual conditions to standard conditions.

NOTICE

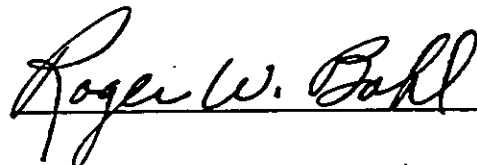
The information and any recommendations contained herein are presented in good faith. However, no guarantee of accuracy or completeness is given. Data presented are believed factual unless otherwise indicated, but conclusions based on such data will not be valid if observed operations change. No representation is made that all existing or potential problems have been identified, or that recommendations made will solve the problem, or that laws or regulations will be construed by government agencies consistent with our understanding of them.

Signature:  (Author)

Date: 4/7/92

Signature:  (Author)

Date: 4/7/92

Signature:  (Reviewer)

Date: April 8, 1992

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Table 1. AIR FLOW RATE MEASUREMENTS FROM A SINGLE EXHAUST STACK DURING FLEXIBLE POLYURETHANE FOAM PRODUCTION AT FOAMEX, ORLANDO, FLORIDA, ON OCTOBER 10, 1991

<u>Sample Location</u>	<u>Cross-Sectional Area (ft²)</u>	<u>Average Velocity (ft/min)</u>	<u>Calculated Flow Rate (ft³/min)</u>
Stack 1	8.73	1670	14,600

Table 2. ESTIMATED EMISSION RATES OF 2,4-TOLUENE DIISOCYANATE, 2,6-TOLUENE DIISOCYANATE, AND METHYLENE CHLORIDE DURING THREE DISTINCT PERIODS OF POLYURETHANE FOAM PRODUCTION, FOAMEX, ORLANDO, FLORIDA, OCTOBER 10, 1991

<u>Chemical</u>	<u>Approximate Emission Rate (lbs/hr)</u>		
	<u>Run 1</u>	<u>Run 2</u>	<u>Run 3</u>
2,4-Toluene Diisocyanate	0.10	0.04	0.07
2,6-Toluene Diisocyanate	0.27	0.10	0.15
Methylene Chloride	278	405	451

Note: Refer to Appendices I, III for emission calculations.

Table 3. ESTIMATED EMISSION RATES AND TOTAL EMISSION OF 2,4-TOLUENE DIISOCYANATE (TDI) FROM A SINGLE EXHAUST STACK, USING THE TREATED FILTER METHOD, DURING FLEXIBLE POLYURETHANE FOAM PRODUCTION AT FOAMEX, ORLANDO, FLORIDA, OCTOBER 10, 1991

Run #/ Foam Grade	Monitoring Period	Sample Duration (min)	2,4-TDI Concentration		Calculated 2,4-TDI Emission Rate Pounds		Total 2,4-TDI Emission (lbs)
			mg/m ³	lbs/ft ³	(lbs/hr)	(lbs)	
Run #1/ P100-35	8:49- 9:10	21	1.87	1.2x10 ⁻⁷	0.102	0.04	0.04
Run #2/ P120-32	10:40-10:59	19	0.78	4.9x10 ⁻⁸	0.042	0.01	0.01
Run #3/ P120-32	10:59-11:15	16	1.040	6.5x10 ⁻⁸	0.057	0.02	0.12
	11:15-11:30	15	0.900	5.6x10 ⁻⁸	0.049	0.01	
	11:30-11:46	16	0.960	6.0x10 ⁻⁸	0.053	0.01	
	11:46-12:00	14	0.850	5.3x10 ⁻⁸	0.046	0.01	
	12:00-12:15	15	1.370	8.5x10 ⁻⁸	0.075	0.02	
	12:15-12:30	15	1.910	1.2x10 ⁻⁷	0.104	0.03	
	12:30-12:49	19	1.150	7.2x10 ⁻⁸	0.063	0.02	

Average for Run #3 = 0.066

Table 4. ESTIMATED EMISSION RATES AND TOTAL EMISSION OF 2,6-TOLUENE DIISOCYANATE (TDI) FROM A SINGLE EXHAUST STACK, USING THE TREATED FILTER METHOD, DURING FLEXIBLE POLYURETHANE FOAM PRODUCTION AT FOAMEX, FLORIDA, OCTOBER 10, 1991

Run #/ Foam Grade	Monitoring Period	Sample Duration (min)	2,6-TDI Concentration		Calculated 2,6-TDI Emission		Total 2,6-TDI Emission (lbs)
			mg/m ³	lbs/ft ³	Rate (lbs/hr)	Pounds (lbs)	
Run #1/ P100-35	8:49- 9:10	21	4.89	3.1x10 ⁻⁷	0.270	0.09	0.09
Run #2/ P120-32	10:40-10:59	19	1.920	1.2x10 ⁻⁷	0.100	0.03	0.03
Run #3/ P120-32	10:59-11:15	16	2.340	1.5x10 ⁻⁷	0.130	0.03	0.27
	11:15-11:30	15	2.530	1.6x10 ⁻⁷	0.140	0.04	
	11:30-11:46	16	2.480	1.5x10 ⁻⁷	0.140	0.04	
	11:46-12:00	14	1.990	1.2x10 ⁻⁷	0.100	0.03	
	12:00-12:15	15	2.090	1.3x10 ⁻⁷	0.110	0.03	
	12:15-12:30	15	3.840	2.4x10 ⁻⁷	0.210	0.05	
	12:30-12:49	19	2.750	1.7x10 ⁻⁷	0.150	0.05	

Average for Run #3 = 0.150

Table 5. ESTIMATED EMISSION RATES AND TOTAL EMISSION OF METHYLENE CHLORIDE (MeCl_2) FROM A SINGLE EXHAUST STACK, USING THE CHARCOAL TUBE METHOD, DURING FLEXIBLE POLYURETHANE FOAM PRODUCTION AT FOAMEX, ORLANDO, FLORIDA, OCTOBER 10, 1991

Run #/ Foam Grade	Monitoring Period	Sample Duration (min)	MeCl ₂ Concentration		Calculated MeCl ₂ Emission		Total MeCl ₂ Emission (lbs)
			ppm	lbs/ft ³	Rate (lbs/hr)	Pounds (lbs)	
Run #1/ P100-35	8:49- 9:10	21	1465	3.2×10^{-4}	277.6	97.1	97.1
Run #2/ P120-32	10:40-10:59	19	2135	4.6×10^{-4}	404.5	128	128
Run #3/ P120-32	10:59-11:15	16	2229	4.8×10^{-4}	422	112.6	813
	11:15-11:30	15	2511	5.4×10^{-4}	475.7	118.9	
	11:30-11:46	16	2337	5.1×10^{-4}	442.8	118.1	
	11:46-12:00	14	2383	5.2×10^{-4}	451.5	105.4	
	12:00-12:15	15	2186	4.7×10^{-4}	414.1	103.5	
	12:15-12:30	15	2550	5.5×10^{-4}	482.1	120.8	
	12:30-12:49	19	2225	4.8×10^{-4}	<u>421.5</u>	133.5	

Average for Run #3 = 451

APPENDICES

Appendix I through IV contain additional information for measurements and calculations regarding stack ventilation and emission estimations. The set of appendices includes the stack calculation data sheets, an explanation of the flow rate and emission calculations, and the criteria and correction methods to convert data at actual conditions to standard conditions.

Appendix I provides a complete set of ventilation and sampling measurements collected during the survey. The top portion of the data sheet contains the sampling site and sample locations, survey date, industrial hygienist performing the survey, the environmental parameters, and the ventilation stack profile and calculations. The second half of the data sheet lists the exhaust emission measurements and data calculation results. Totals for the period monitored (min) and quantity of material emitted (lbs) have also been provided. Separate data sheets have been prepared for each sample location and chemical species monitored.

Appendix II contains two sections which address the ventilation calculations and guidelines for correction of data to standard conditions. In the first part of Appendix II, a description of the ventilation calculations has been provided. This section explains each calculation made on the top portion of the stack calculation data sheets, located in Appendix I. The second part of Appendix II provides a list of the criteria used to determine if sampling data should be corrected to standard conditions, as described in the American Conference of Governmental Industrial Hygienists (ACGIH) Industrial Ventilation Manual, 20th edition. Following ACGIH recommendations, ventilation measurements were not corrected to standard conditions because the recommended environmental parameters, which would require these corrections were not exceeded. All emission calculations have been made for actual conditions on the day of the survey unless otherwise specified.

Appendix III describes the lower section of the stack calculation data sheets, which have been provided in Appendix I. A step-by-step explanation of the emission rate and total emission calculations has been provided. Calculations may be made when air concentrations have been provided in mg/m^3 or ppm.

In the event that there was a need to correct to standard conditions, an example of the necessary calculations have been provided in Appendix IV. In most cases, environmental conditions will not cause a significant bias of the estimated exhaust flow rates. The calculations, however have been provided for the customer's convenience.

Appendix V is a summary of production runs by foam grade. Appendix VI and Appendix VII present the analytical results for the blank and spiked samples submitted to the Industrial Hygiene Lab, The Dow Chemical Company, Midland, Michigan. Appendix VIII is a map of the Foamex LP facility, Orlando, Florida.

STACK CALCULATION DATA SHEET (mg/m³)

LOCATION: **FOMEX, ORLANDO, FLORIDA**
 SURVEY DATE: **10-Oct-91** INDUSTRIAL HYGIENIST: **JAMES CHAMBERS**
 Dry Bulb Temp.: **81 F**
 Wet Bulb Temp.: **73 F** Duct Diameter (inches) = **40.0**
 Rel. Humidity: **69%** Duct Area (ft²) = **8.73**

Sample Point	Traverse 1		Traverse 2	
	VP (" wg)	V (fpm)	VP (" wg)	V (fpm)
1	0.17	1651	0.10	1266
2	0.19	1746	0.13	1444
3	0.21	1835	0.16	1602
4	0.24	1946	0.18	1699
5	0.25	2003	0.21	1835
6	0.20	1791	0.25	2003
7	0.21	1835	0.18	1699
8	0.19	1746	0.21	1835
9	0.06	981	0.21	1835
10	0.05	896	0.18	1699
	AVERAGE (1) 1643 fpm		AVERAGE (2) 1692 fpm	

Average Velocity **1667 fpm**
 Flow Rate **14,551 acfm**

Compound = **2,4-TDI**
 Molecular Wt. = **174**

Exhaust Emission Calculations :

Sample Description (# / Monitoring Period)	Concentration (mg/m ³)	Sample Duration (min)	Emission Conc. (lbs/ft ³)	Emission Rate (lbs/hr)	Amount Emitted (lbs/Sample)
#1 (8:49-9:10)	1.870	21	1.2E-07	0.102	0.036
#2 (10:40-10:59)	0.779	19	4.9E-08	0.042	0.013
#4 (10:59-11:15)	1.040	16	6.5E-08	0.057	0.015
#5 (11:15-11:30)	0.896	15	5.6E-08	0.049	0.012
#6 (11:30-11:46)	0.964	16	6.0E-08	0.053	0.014
#7 (11:46-12:00)	0.847	14	5.3E-08	0.046	0.011
#8 (12:00-12:15)	1.369	15	8.5E-08	0.075	0.019
#9 (12:15-12:30)	1.909	15	1.2E-07	0.104	0.026
#10 (12:30-12:49)	1.148	19	7.2E-08	0.063	0.020
			0.0E+00	0.000	0.000

Duration of Monitoring	150 min	Total Emission During Monitoring Period (lbs)	0.17 lbs
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NOTES :

Sample Number 2 was not analyzed due to an temporary line shut down and equipment maintenance.

* MEANS BREAKTHROUGH GREATER THAN 10 %

STACK CALCULATION DATA SHEET (mg/m3)

LOCATION: **FOMEX ORLANDO, FLORIDA**
 SURVEY DATE: **10 Oct 91** INDUSTRIAL HYGIENIST: **JAMES CHAMBERS**

Dry Bulb Temp.: **81 F**
 Wet Bulb Temp.: **73 F** Duct Diameter (Inches) = **40.0**
 Rel. Humidity: **69%** Duct Area (ft2) = **8.73**

Sample Point	Traverse 1		Traverse 2	
	VP (" wg)	V (fpm)	VP (" wg)	V (fpm)
1	0.17	1651	0.10	1266
2	0.19	1746	0.13	1444
3	0.21	1835	0.15	1602
4	0.24	1946	0.18	1699
5	0.25	2003	0.21	1835
6	0.20	1791	0.25	2003
7	0.21	1835	0.18	1699
8	0.19	1746	0.21	1835
9	0.06	981	0.21	1835
10	0.05	896	0.18	1699
	AVERAGE (1) 1643 fpm		AVERAGE (2) 1692 fpm	

Average Velocity **1667 fpm**
 Flow Rate **14,551 acfm**

Compound = **2,6-TDI**
 Molecular Wt. = **174**

Exhaust Emission Calculations :

Sample Description (# / Monitoring Period)	Concentration (mg/m3)	Sample Duration (min)	Emission Conc. (lbs/ft3)	Emission Rate (lbs/hr)	Amount Emitted (lbs/Sample)
#1 (8:49-9:10)	4.890	21	3.1E-07	0.267	0.093
#2 (10:40-10:59)	1.923	19	1.2E-07	0.105	0.033
#4 (10:59-11:15)	2.336	16	1.5E-07	0.127	0.034
#5 (11:15-11:30)	2.533	15	1.6E-07	0.138	0.035
#6 (11:30-11:46)	2.476	16	1.5E-07	0.135	0.036
#7 (11:46-12:00)	1.993	14	1.2E-07	0.109	0.025
#8 (12:00-12:15)	2.090	15	1.3E-07	0.114	0.028
#9 (12:15-12:30)	3.844	15	2.4E-07	0.210	0.052
#10 (12:30-12:49)	2.748	19	1.7E-07	0.150	0.047
			0.0E+00	0.000	0.000

Duration of Monitoring **150 min**

Total Emission During Monitoring Period (lbs) **0.38 lbs**

NOTES :

Sample Number 2 was not analyzed due to an unscheduled shut down and equipment maintenance.

* MEANS BREAKTHROUGH GREATER THAN 10 %

STACK CALCULATION DATA SHEET (ppm)

LOCATION:

FOMEX ORLANDO, FLORIDA

SURVEY DATE:

10-Oct-91

INDUSTRIAL HYGIENIST:

JAMES CHAMBERS

Dry Bulb Temp.:

81 F

Wet Bulb Temp.:

73 F

Duct Diameter (Inches) =

4.0

Rel. Humidity:

69 %

Duct Area (ft²) =

8.73

Sample Point	Traverse 1		Traverse 2	
	VP (" wg)	V (fpm)	VP (" wg)	V (fpm)
1	0.17	1651	0.10	1266
2	0.19	1746	0.13	1444
3	0.21	1835	0.16	1602
4	0.24	1946	0.18	1699
5	0.25	2003	0.20	1835
6	0.20	1791	0.25	2003
7	0.21	1835	0.18	1699
8	0.19	1746	0.21	1835
9	0.06	981	0.21	1835
10	0.05	896	0.18	1699
		AVERAGE (1)	AVERAGE (2)	
		1643 fpm	1692 fpm	

Average Velocity
Flow Rate

1667 fpm

14,551 acfm

Compound =

Methylene Chloride

Molecular Wt. =

85

Exhaust Emission Calculations:

Sample Description (# / Monitoring Period)	Concentration (ppm)	Sample Duration (min)	Emission Conc. (lbs/ft ³)	Emission Rate (lbs/hr)	Amount Emitted (lbs/Sample)
#1 / (8:49:50-9:10)	1465.00	21	3.2E-04	277.551	97.143
#2 / (9:40:40-10:59)	2136.00	19	4.6E-04	404.674	128.147
#4 / (10:59-11:15)	2229.00	16	4.8E-04	422.294	112.612
#5 / (11:15-11:30)	2511.00	15	5.4E-04	475.720	118.930
#6 / (11:30-11:48)	2337.00	16	5.1E-04	442.755	118.068
#7 / (11:46-12:00)	2383.00	14	5.2E-04	451.470	105.343
#8 / (12:00-12:15)	2186.00	15	4.7E-04	414.147	103.537
#9 / (12:15-12:30)	2550.00	15	5.5E-04	483.108	120.777
#10 / (12:30-12:49)	2225.00	19	4.8E-04	421.536	133.486
			0.0E+00	0.000	0.000

Duration of
Monitoring

150 min

Total Emission During
Monitoring Period (lbs)

1038.04 lbs

NOTES:

Sample #2 was not analyzed due to an unscheduled line shut down and equipment maintenance

STACK CALCULATION DATA SHEET (mg/m3)

LOCATION: **FOMEX ORLANDO, FLORIDA**
 SURVEY DATE: **10 Oct 91** INDUSTRIAL HYGIENIST: **JAMES CHAMBERS**
 Dry Bulb Temp.: **81 F**
 Wet Bulb Temp.: **73 F** Duct Diameter (inches) = **40.0**
 Rel. Humidity: **69%** Duct Area (ft2) = **8.73**

Sample Point	Traverse 1		Traverse 2	
	VP (" wg)	V (fpm)	VP (" wg)	V (fpm)
1	0.17	1651	0.10	1266
2	0.19	1746	0.13	1444
3	0.21	1835	0.16	1602
4	0.24	1946	0.18	1699
5	0.25	2003	0.21	1835
6	0.20	1791	0.25	2003
7	0.21	1835	0.18	1699
8	0.19	1746	0.21	1835
9	0.06	981	0.21	1835
10	0.05	896	0.18	1699
	AVERAGE (1) 1643 fpm		AVERAGE (2) 1692 fpm	

Average Velocity **1667 fpm**
 Flow Rate **14,551 acfm**

Compound = **METHYLENE CHLORIDE**
 Molecular Wt. = **85**

Exhaust Emission Calculations :

Sample Description (# / Monitoring Period)	Concentration (mg/m3)	Sample Duration (min)	Emission Conc. (lbs/ft3)	Emission Rate (lbs/hr)	Amount Emitted (lbs/Sample)
#1 (8:49-9:10)	5093.000	21	3.2E-04	277.589	97.156
#3 (10:40-10:59)	7421.000	19	4.6E-04	404.474	128.083
#4 (10:59-11:15)	7750.000	16	4.8E-04	422.406	112.642
#5 (11:15-11:30)	8783.000	15	5.5E-04	475.983	118.996
#6 (11:30-11:46)	8125.000	16	5.1E-04	442.845	118.092
#7 (11:46-12:00)	8285.000	14	5.2E-04	451.565	105.365
#8 (12:00-12:15)	7600.000	15	4.7E-04	414.230	103.558
#9 (12:15-12:30)	8866.000	15	5.5E-04	483.232	120.808
#10 (12:30-12:49)	7736.000	19	4.8E-04	421.643	133.520
			0.0E+00	0.000	0.000

Duration of Monitoring	150 min	Total Emission During Monitoring Period (lbs)	1038.22 lbs
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NOTES:
 Sample Number 2 was not analyzed due to an unscheduled line shut down and equipment maintenance

* MEANS BREAKTHROUGH GREATER THAN 10 %

APPENDIX II

EXHAUST VENTILATION CALCULATIONS FOR AIR FLOW MEASUREMENTS

1. Duct Area (A) = $\frac{\pi d^2}{4}$ (Round Duct); L x W (Rectangular Duct)
2. Velocity (V)[†] = $4005\sqrt{VP}$
3. Average Velocity (V_a) = $\frac{\text{Average V Traverse 1} + \text{Average V Traverse 2}}{2} = V_a$ (FPM)
4. Air Volume Rate at Ambient Conditions (Q_{acfm}) = (V_a) x (A)

Corrections for Temperature, Moisture, and Altitude are recommended by ACGIH when any of the following conditions exist^{††}

- A. Duct air temperature is outside the range of (40° F - 100° F).
- B. The elevation is greater than 1000 ft above sea level.
- C. When air temperature is greater than 100° F and the moisture content of the atmosphere is greater than 0.02 lbs of H₂O/pound of dry air.

d = Duct Diameter (ft)

L = Length of Duct (ft)

W = Width of Duct (ft)

VP = Velocity Pressure ("wg)

V = Velocity (FPM)

"wg = Inches of water gauge

Q_{acfm} = Actual Cubic Feet Per Minute - flow rate for actual environmental conditions in CFM

FPM = Feet Per Minute

CFM = Cubic Feet Per Minute

[†] Tables converting from velocity pressure (VP) to velocity (V) are available in Table 5-4 ACGIH Industrial Ventilation Manual, 20th Edition or Table 6-17 in the 19th or earlier editions. Velocity units are in feet per minute (FPM).

^{††} Guidelines for Temperature, Moisture, and Altitude corrections are summarized in the ACGIH Industrial Ventilation Manual, (Chapter 5.13) 20th Edition or (Section 9) 19th or earlier editions.

APPENDIX III

EXHAUST EMISSION CALCULATIONS

1. Conversions for Weight or Volume

A. $\text{mg} = (\text{lbs}) \times (2.20462 \times 10^{-6})$

B. $\text{m}^3 = (\text{ft}^3) \times (35.31)$

C. One gram-mole of an ideal gas will occupy 24.45 liters of volume at 70° F (room temperature), most vapors exhibit the properties of an ideal gas at low concentrations in air.

2. Conversions for Emission Concentration (EC)

A. To convert EC in mg/m^3 to EC in lbs/ft^3 :

$$\text{EC} (\text{lbs}/\text{ft}^3) = \left(\frac{\text{mg}}{\text{m}^3} \right) \times \left(\frac{2.2 \times 10^{-6} \text{ lbs}}{\text{mg}} \right) \times \left(\frac{\text{m}^3}{35.31 \text{ ft}^3} \right)$$

B. To convert EC in PPM to EC lbs/ft^3 :

$$\text{PPM} \times \left(\frac{\text{Molecular Weight}}{24.45} \right) = \left(\frac{\text{mg}}{\text{m}^3} \right)$$

$$\text{EC} (\text{lbs}/\text{ft}^3) = \left(\frac{\text{mg}}{\text{m}^3} \right) \times \left(\frac{2.2 \times 10^{-6} \text{ lbs}}{\text{mg}} \right) \times \left(\frac{\text{m}^3}{35.31 \text{ ft}^3} \right)$$

3. Emission Rate (ER) in lbs/hr

$$\text{ER} (\text{lbs}/\text{hr}) = \text{EC} (\text{lb}/\text{ft}^3) \times \text{Air Flow Rate} (\text{ft}^3/\text{min}) \times 60 (\text{min}/\text{hr})$$

4. Emission (E) in lbs (per source or vent)

A. Amount of material emitted from a source per given air sample time or monitoring period.

$$E (\text{lbs}) = \text{ER} (\text{lbs}/\text{hr}) \times \left(\frac{\text{Sample Duration} (\text{min})}{60 (\text{min}/\text{hr})} \right)$$

5. Total Emission over a given time period (lbs)

$$\sum E = E_1 + E_2 \dots E_n \text{ (sum of all sources and vents monitored)}$$

APPENDIX IV

TEMPERATURE, HUMIDITY AND ELEVATION CORRECTIONS
FOR STANDARD CONDITIONS†

1. Temperature Correction (
- C_t
-)

$$C_t = \frac{530}{T + 460}$$

Where: $T = ^\circ\text{F}$

2. Moisture/Humidity Correction (
- C_h
-)

$$C_h = \text{Density Factor (air/water - mixture)}^{\dagger\dagger}$$

Where: Dry Bulb (DB) = $^\circ\text{F}$
Wet Bulb (WB) = $^\circ\text{F}$

3. Elevation Correction (
- C_e
-)

$$C_e = [1 - (6.73 \times 10^{-6}) Z]^{5.258}$$

Where: $Z = \text{Elevation (ft)}$

4. Density Corrected for Standard Condition (
- ρ_c
-)

$$\rho_c = 0.075 \times (C_t) \times (C_h) \times (C_e)$$

Where: $\rho_c = \text{air density corrected}$

5. Velocity at Standard Conditions (
- V_s
-)

$$V_s = 1096 \sqrt{\frac{VP_m}{\rho_c}}$$

Where: $VP_m = \text{Velocity Pressure Measured}$

6. Volumetric Air Flow at Standard Conditions (
- Q_s
-)

$$Q_s = (V_s) \times (A)$$

Where: $A = \text{Cross Section Area of Stack in ft}^2$

† Guidelines for Temperature, Humidity and Elevation corrections are located in the ACGIH Ventilation Manual, (Chapter 9.7.2) 20th Edition or (Page 9-28) in 19th or earlier editions.

†† The humidity density correction factor (C_h) may be obtained in the ACGIH Industrial Ventilation Manual, (Figure 5-24) 20th Edition or (Figure 6-24) 19th or earlier editions.

REQUIRED FORMULATION INFORMATION
(to be filled out day of run)

DATE : 10-10-91
 FILLED OUT BY: V. Dalk

Time Mins.	Grade of foam	Water pphp	Water lb/min	Index	TDI lb/min	BA type	BA pphp	BA lb/min
19.15	P100-35	5.4	17.28	112	218.2	MeCl ₂	7.5	24.0
22.23	P120-32	4.15	15.8	110	203.97	''	6.5	24.7
110.00	P120-32*	4.15	16.60	110	214.70	MeCl ₂	6.5	26.0

21

TIME RUN COMPLETED: 12:47 PM

BA = blowing agent
 formdata.tbl

*Same grade as Run 2 but different demensions

APPENDIX VI

RESULTS OF TWO BLANK AND EIGHT SPIKE SAMPLES OF METHYLENE CHLORIDE (MeCl₂) PREPARED FOR FOAMEX LP, ORLANDO, FLORIDA, OCTOBER 10, 1991, AND ANALYZED BY THE INDUSTRIAL HYGIENE LABORATORY, THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

<u>Sample Number</u>	<u>Measured Weight of MeCl₂ (µg)</u>	<u>Actual Weight of MeCl₂ (µg)</u>	<u>% Reference Value</u>
11	ND	Blank	0
12	61,000	66,330	92
13	18,500	15,920	116
14	18,100	15,920	114
15	18,300	15,920	115
16	61,000	66,330	92
17	61,000	66,330	92
18	17,900	15,920	112
19	61,000	66,330	92
20	ND	Blank	0

ND = not detected at the analytical detection limits

$$\% \text{ Reference Value} = \frac{\text{Measured Weight of Methylene Chloride}}{\text{Actual Weight of Methylene Chloride}} \times 100$$

APPENDIX VII

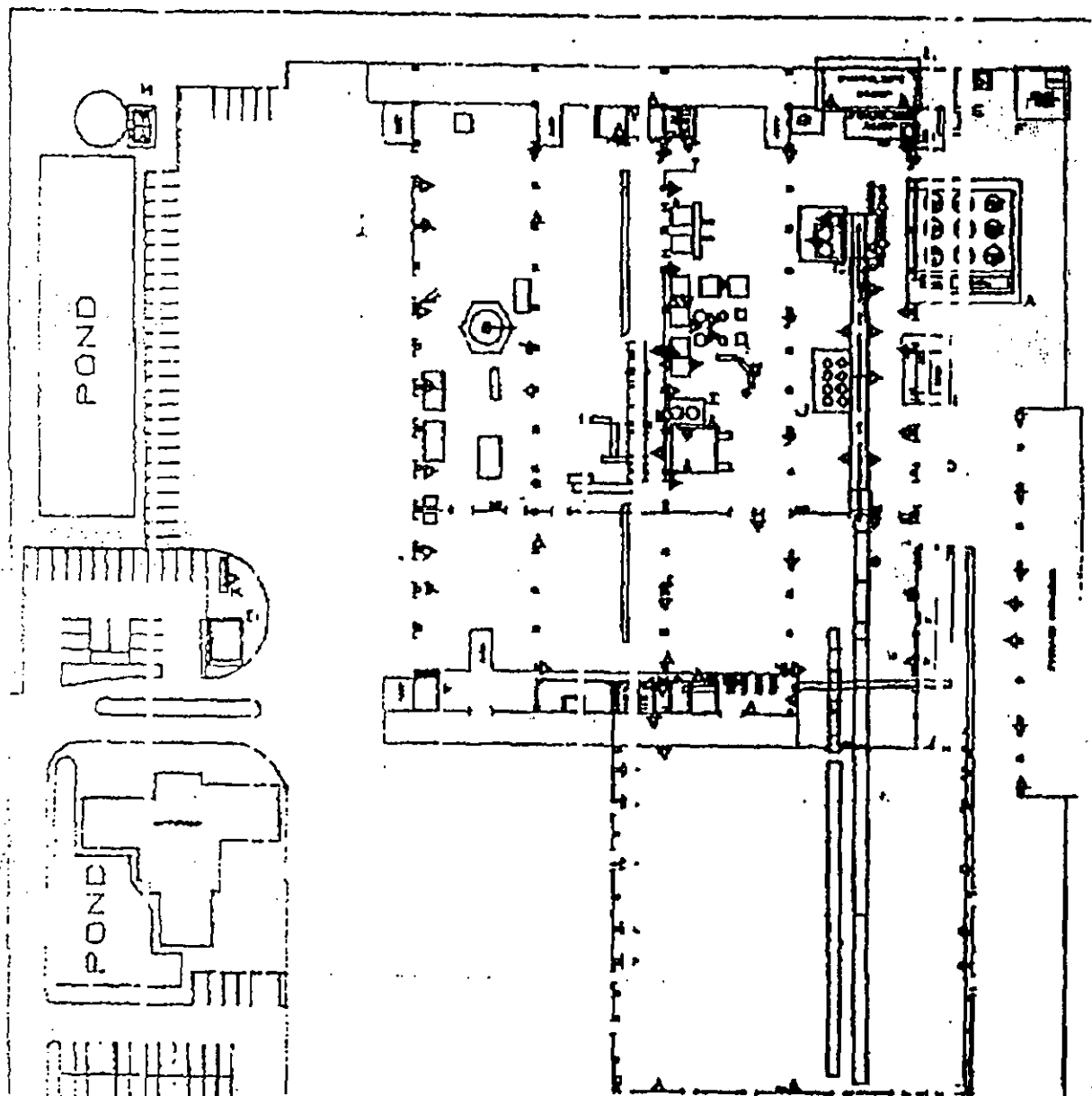
RESULTS OF TWO BLANK AND THREE SPIKE SAMPLES OF
 2,4-TOLUENE DIISOCYANATE AND 2,6-TOLUENE DIISOCYANATE PREPARED
 FOR FOAMEX LP, ORLANDO, FLORIDA, OCTOBER 10, 1991, AND ANALYZED BY
 THE INDUSTRIAL HYGIENE LABORATORY,
 THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

Sample Number	Actual Weight of		Measured Weight of		% of Ref. Value	
	2,4-TDI (µg)	2,6-TDI (µg)	2,4-TDI (µg)	2,6-TDI	2,4-TDI	2,6-TDI
11	Blank	Blank	ND	ND	0	0
12	Blank	Blank	ND	ND	0	0
13	4.88	4.88	4.05	4.35	83	89
17	4.88	4.88	4.10	3.8	84	78
19	4.88	4.88	ND	4.03	-	83

ND = not detected at the analytical detection limits for 2,4-TDI and 2,6-TDI of 1 µg

$$\% \text{ Reference Value} = \frac{\text{Measured Weight of Methylene Chloride}}{\text{Actual Weight of Methylene Chloride}} \times 100$$

APPENDIX VIII



LEGEND

- AREA A - TANK FARM
- AREA B - SILICONE TANK
- AREA C - BATCH TANK AREA
- AREA D - TRANSFORMER
- AREA E - WASTE OIL
- AREA F - HAZARDOUS WASTE
DRUM STORAGE
- AREA G - PAINT MATERIALS
DRUM STORAGE
- AREA H - BOILER HOUSE
- AREA I - BRICKER STORAGE TANK
(REBOND DEPARTMENT)
- AREA J - BRICKER STORAGE TANKS
(CEMENT TANKS)
- AREA K - PROPANE TANK
- AREA L - TRUCK SHOP
- AREA M - PUMP HOUSE AREA

- ▲ FIRE EXTINGUISHER
- △ FIRE HOSE REEL
- SCOTT AIR PACKS
- WHEELED INSUL FIRE EXT.
- ⊙ 3000 GPM, 350° F ALL ROTATION
HYDRANT MOUNTED MONITORS

APPENDIX C
TANK EMISSIONS CALCULATIONS

Storage Tank
Emission Report
Friday, June 17 1994
2:31 AM

----- Tank Characteristics -----

Identification

Identification No.: Tank #10
City: Orlando
State: Florida
Company: Foamex, L.P.

Input Parameters

Type of Tank: Horizontal Fixed Roof

Tank Dimensions

Shell Length (ft): 37
Diameter (ft): 7
Liquid Height (ft): 0
Volume (gallons): 10651
Turnovers: 5
Net Throughput (bbl/yr): 53255
Is tank underground? (Y/N): N

Paint Characteristics

Paint Color: White
Paint Shade: White
Condition: Good

Breather Vent Settings

Vacuum Setting(psig): 0.00
Pressure Setting(psig): 0.00

----- Storage Tank Contents Temperature Data -----

Daily Average Ambient Temperature (Degrees Farenheit) = 72.40
Daily Minimum Ambient Temperature (Degrees Farenheit) = 62.00
Daily Maximum Ambient Temperature (Degrees Farenheit) = 82.80
Daily Ambient Temperature Range = 20.80
Solar Insolation Factor = 1487.00
Alpha (Shell) = 0.17
Liquid Bulk Temperature (Degrees Farenheit) = 72.42
Average Liquid Surface Temperature (Degrees Farenheit) = 74.41
Daily Maximum Liquid Surface Temperature (Degrees Farenheit) = 79.92
Daily Minimum Liquid Surface Temperature (Degrees Farenheit) = 68.90
Daily Vapor Temperature Range = 22.05

----- Storage Tank Vapor Pressure Information -----

Speciation Option: None
Chemical Liquid: Methylene Chloride

Vapor Pressure of total mixture = 7.837953
Minimum Vapor Pressure of total mixture = 6.923928
Maximum Vapor Pressure of total mixture = 8.848535
Vapor Molecular Weight of Mixture = 84.940000

Vapor pressure range = 1.924607

---- Storage Tank Standing Loss Information (AP-42) ----

Effective Diameter =	18.14
Roof Outage =	0.00
Vapor Space Outage =	3.50
Vapor Space Volume =	904.65
Vapor Density =	0.1162
Breather Vent Range =	0.000000
Vapor Space Expansion Factor =	0.319417
Vented Vapor Saturation Factor =	0.407508
Total Standing Losses =	4992.73

---- Storage Tank Working Loss Information (AP-42) ----

Net Throughput (gal/year) =	53255
Liquid Volume (cubic feet) =	1424
Turnovers =	5
Turnover Factor =	1.0000
Working Loss Product Factor =	1.00
Total Working Losses =	844.16

---- Storage Tank Total Losses (AP-42) ----

Total losses = 5836.89

APPENDIX D
STEAM BOILER
EMISSIONS CALCULATIONS

FUEL COMBUSTION CALCULATION INPUT PARAMETERS

DATE: 20-Nov-92

HOURS OF OPERATION

STEAM BOILER

hrs/day	=	hrs/yr	=	8,760
days/wk	=			
wks/yr	=			

FUEL CONSUMPTION

Natural Gas Consumption = 36.792 Million cu.ft./yr

EMISSION FACTORS

Emission factors Natural Gas are from AP-42, Table 1.4-1.

Particulates (Uncontrolled)

lbs/1,000,000 cu.ft. of Natural Gas = 5 lbs/1,000,000 cu.ft.

Sulfur Dioxide

lbs/1,000,000 cu.ft. of Natural Gas = 0.6 lbs/1,000,000 cu.ft.

Nitrogen Oxide

lbs/1,000,000 cu.ft. of Natural Gas = 140 lbs/1,000,000 cu.ft.

Carbon Monoxide

lbs/1,000,000 cu.ft. of Natural Gas = 35 lbs/1,000,000 cu.ft.

Hydrocarbon

lbs/1,000,000 cu.ft. of Natural Gas = 3 lbs/1,000,000 cu.ft.

ADDITIONAL DATA

Efficiency of Air Pollution Control = 0 %

CALCULATION OF EMISSIONS

PARTICULATES

Natural Gas Consumption

$$\frac{36.792 \text{ million cu. ft./yr} \quad \times \quad 5.0 \text{ lb/million cu.ft.}}{2,000 \text{ lbs/ton}}$$

$$= 0.09198 \text{ tons/yr}$$

Air Pollution Control Efficiency = 0 %

Total Controlled Particulates =

$$0.09198 \text{ tons/yr} \times (1 - 0.000000) = 0.09198 \text{ tons/yr}$$

$$\frac{0.09198 \text{ tons/yr} \times 2,000 \text{ lbs/ton}}{8,760 \text{ hrs/yr}} = 0.021 \text{ lbs/hr}$$

SULFUR DIOXIDE (SO2)

Natural Gas Consumption

$$\frac{36.792 \text{ million cu. ft./yr} \quad \times \quad 0.6 \text{ lb/million cu.ft.}}{2,000 \text{ lbs/ton}}$$

$$= 0.011038 \text{ tons/yr}$$

$$\frac{0.011038 \text{ tons/yr} \times 2,000 \text{ lbs/ton}}{8,760 \text{ hrs/yr}} = 0.00252 \text{ lbs/hr}$$

NITROGEN OXIDE (NOX)

Natural Gas Consumption

$$\frac{36.792 \text{ million cu. ft./yr} \quad \times \quad 140.0 \text{ lb/million cu.ft.}}{2,000 \text{ lbs/ton}}$$

$$= 2.57544 \text{ tons/yr}$$

$$\frac{2.57544 \text{ tons/yr} \times 2,000 \text{ lbs/ton}}{8,760 \text{ hrs/yr}} = 0.588 \text{ lbs/hr}$$

CARBON MONOXIDE (CO)

Natural Gas Consumption

$$\frac{36.792 \text{ million cu. ft./yr} \quad \times \quad 35.0 \text{ lb/million cu.ft.}}{2,000 \text{ lbs/ton}}$$

$$= 0.64386 \text{ tons/yr}$$

$$\frac{0.64386 \text{ tons/yr} \times 2,000 \text{ lbs/ton}}{8,760 \text{ hrs/yr}} = 0.147 \text{ lbs/hr}$$

HYDROCARBONS (HC)

Natural Gas Consumption

$$\frac{36.792 \text{ million cu. ft./yr} \quad \times \quad 3.0 \text{ lb/million cu.ft.}}{2,000 \text{ lbs/ton}}$$

$$= 0.055188 \text{ tons/yr}$$

$$\frac{0.055188 \text{ tons/yr} \times 2,000 \text{ lbs/ton}}{8,760 \text{ hrs/yr}} = 0.0126 \text{ lbs/hr}$$

FUEL COMBUSTION EMISSION CALCULATIONS SUMMARY

<u>POLLUTANT</u>	<u>EMISSION RATE</u> <u>(LB/HR) (TON/YR)</u>	
PARTICULATES	0.021	0.09198
SULFUR DIOXIDE	0.00252	0.011038
NITROGEN OXIDE	0.588	2.57544
CARBON MONOXIDE	0.147	0.64386
HYDROCARBONS	0.0126	0.055188

1.4 NATURAL GAS COMBUSTION

1.4.1 General¹⁻²

Natural gas is one of the major fuels used throughout the country. It is used mainly for power generation, for industrial process steam and heat production, and for domestic and commercial space heating. The primary component of natural gas is methane, although varying amounts of ethane and smaller amounts of nitrogen, helium and carbon dioxide are also present. Gas processing plants are required for recovery of liquefiable constituents and removal of hydrogen sulfide (H₂S) before the gas is used (see Natural Gas Processing, Section 9.2). The average gross heating value of natural gas is approximately 9350 kilocalories per standard cubic meter (1050 British thermal units/standard cubic foot), usually varying from 8900 to 9800 kcal/scm (1000 to 1100 Btu/scf).

1.4.2 Emission And Controls³⁻²⁶

Even though natural gas is considered to be a relatively clean fuel, some emissions can occur from the combustion reaction. For example, improper operating conditions, including poor mixing, insufficient air, etc., may cause large amounts of smoke, carbon monoxide and hydrocarbons. Moreover, because a sulfur containing mercaptan is added to natural gas to permit detection, small amounts of sulfur oxides will also be produced in the combustion process.

Nitrogen oxides are the major pollutants of concern when burning natural gas. Nitrogen oxide emissions are functions of combustion chamber temperature and combustion product cooling rate. Emission levels vary considerably with the type and size of unit and with operating conditions.

In some large boilers, several operating modifications may be used for NO_x control. Staged combustion, for example, including off-stoichiometric firing and/or two stage combustion, can reduce emissions by 5 to 50 percent.²⁶ In off-stoichiometric firing, also called "biased firing", some burners are operated fuel rich, some fuel lean, and others may supply air only. In two stage combustion, the burners are operated fuel rich (by introducing only 70 to 90 percent stoichiometric air), with combustion being completed by air injected above the flame zone through second stage "NO ports". In staged combustion, NO_x emissions are reduced because the bulk of combustion occurs under fuel rich conditions.

Other NO_x reducing modifications include low excess air firing and flue gas recirculation. In low excess air firing, excess air levels are kept as low as possible without producing unacceptable levels of unburned combustibles (carbon monoxide, volatile organic compounds and smoke) and/or other operating problems. This technique can reduce NO_x emissions 5 to 35 percent, primarily because of lack of oxygen during combustion. Flue gas recirculation into the primary combustion zone, because the flue gas is relatively cool and oxygen deficient, can also lower NO_x emissions 4 to 85 percent, depending on the amount of gas recirculated. Flue gas recirculation is best suited for new boilers. Retrofit application would require extensive burner modifications.

TABLE 1.4-1. UNCONTROLLED EMISSION FACTORS FOR NATURAL GAS COMBUSTION^a

Furnace size & type (10 ⁶ Btu/hr heat input)	Particulate ^b		Sulfur dioxide ^c		Nitrogen oxides ^d		Carbon monoxide ^e		Volatile organics			
	kg/10 ⁶ m ³	lb/10 ⁶ ft ³	kg/10 ⁶ m ³	lb/10 ⁶ ft ³	kg/10 ⁶ m ³	lb/10 ⁶ ft ³	kg/10 ⁶ m ³	lb/10 ⁶ ft ³	Nonmethane		Methane	
									kg/10 ⁶ m ³	lb/10 ⁶ ft ³	kg/10 ⁶ m ³	lb/10 ⁶ ft ³
Utility boilers (> 100)	16 - 80	1 - 5	9.6	0.6	8800 ^h	550 ^h	640	40	23	1.4	4.8	0.3
Industrial boilers (10 - 100)	16 - 80	1 - 5	9.6	0.6	2240	140	560	35	44	2.8	48	3
Domestic and commercial boilers (< 10)	16 - 80	1 - 5	9.6	0.6	1600	100	320	20	84	5.3	43	2.7

^aExpressed as weight/volume fuel fired.

^bReferences 15-18.

^cReference 4. Based on avg. sulfur content of natural gas, 4600 g/10⁶ m³ (2000 gr/10⁶ scf).

^dReferences 6-5, 7-8, 11, 14, 18-19, 21.

^eExpressed as NO₂. Tests indicate about 95 weight % NO_x is NO₂.

^fReferences 4, 7-8, 16, 18, 22-25.

References 16, 18. May increase 10 - 100 times with improper operation or maintenance.

^hFor tangentially fired units, use 4400 kg/10⁶ m³ (275 lb/10⁶ ft³). At reduced loads, multiply factor by load reduction coefficient in Figure 1.4-1. For potential NO_x reductions by combustion modification, see text. Note that NO_x reduction from these modifications will also occur at reduced load conditions.

Studies indicate that low NO_x burners (20 to 50 percent reduction) and ammonia injection (40 to 70 percent reduction) also offer NO_x emission reductions.

Combinations of the above combustion modifications may also be employed to reduce NO_x emissions further. In some boilers, for instance, NO_x reductions as high as 70 to 90 percent have been produced by employing several of these techniques simultaneously. In general, however, because the net effect of any of these combinations varies greatly, it is difficult to predict what the reductions will be in individual applications.

Although not measured, all particulate has been estimated to be less than 1 micrometer in size.²⁷ Emission factors for natural gas combustion are presented in Table 1.4-1, and factor ratings in Table 1.4-2.

TABLE 1.4-2. FACTOR RATINGS FOR NATURAL GAS COMBUSTION

Furnace type	Particulate	Sulfur oxides	Nitrogen oxides	Carbon monoxide	Volatile organics	
					Nonmethane	Methane
Utility boiler	B	A	A	A	C	C
Industrial boiler	B	A	A	A	C	C
Commercial boiler	B	A	A	A	D	D
Residential furnace	B	A	A	A	D	D

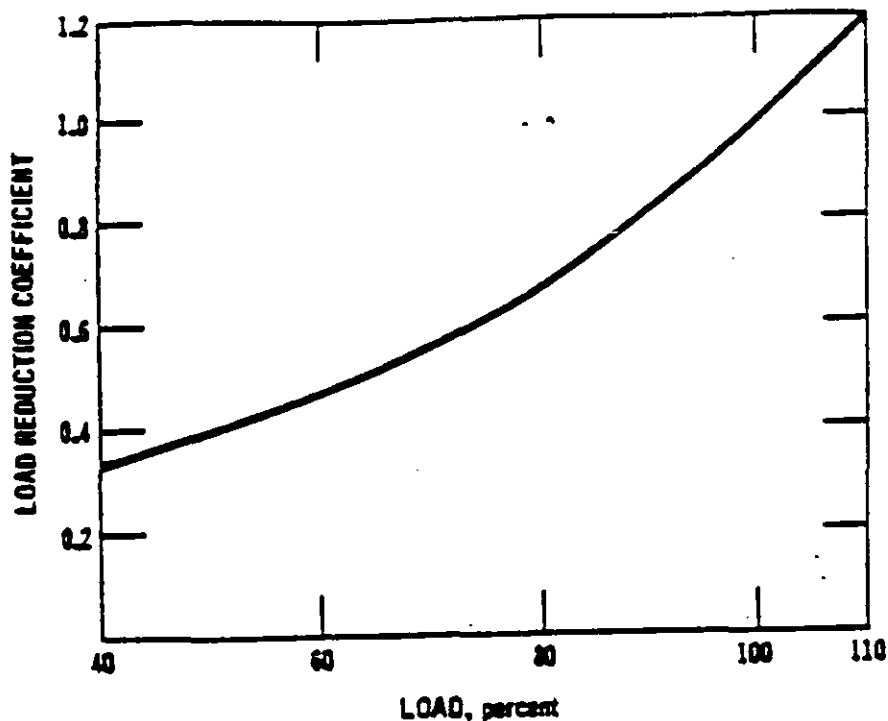


Figure 1.4-1. Load reduction coefficient as function of boiler load. (Used to determine NO_x reductions at reduced loads in large boilers.)

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APPENDIX E

**ENVIRONMENTAL HEATING
EMISSIONS CALCULATIONS**

FUEL COMBUSTION CALCULATION INPUT PARAMETERS

DATE: 02-Dec-92

HOURS OF OPERATION

Environmental Heating

hrs/day	=	hrs/yr	=	400
days/wk	=			
wks/yr	=			

FUEL CONSUMPTION

Natural Gas Consumption	=	0.74 Million cu.ft./yr
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EMISSION FACTORS

Emission factors Natural Gas are from AP-42, Table 1.4-1.

Particulates (Uncontrolled)

lbs/1,000,000 cu.ft. of Natural Gas	=	5 lbs/1,000,000 cu.ft.
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Sulfur Dioxide

lbs/1,000,000 cu.ft. of Natural Gas	=	0.6 lbs/1,000,000 cu.ft.
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Nitrogen Oxide

lbs/1,000,000 cu.ft. of Natural Gas	=	140 lbs/1,000,000 cu.ft.
-------------------------------------	---	--------------------------

Carbon Monoxide

lbs/1,000,000 cu.ft. of Natural Gas	=	35 lbs/1,000,000 cu.ft.
-------------------------------------	---	-------------------------

Hydrocarbon

lbs/1,000,000 cu.ft. of Natural Gas	=	3 lbs/1,000,000 cu.ft.
-------------------------------------	---	------------------------

ADDITIONAL DATA

Efficiency of Air Pollution Control	=	0 %
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CALCULATION OF EMISSIONS

PARTICULATES

Natural Gas Consumption

$$\frac{0.74 \text{ million cu. ft./yr} \quad \times \quad 5.0 \text{ lb/million cu.ft.}}{2,000 \text{ lbs/ton}}$$

$$= 0.00185 \text{ tons/yr}$$

Air Pollution Control Efficiency = 0 %

Total Controlled Particulates =

$$0.00185 \text{ tons/yr} \times (1 - 0.000000) = 0.00185 \text{ tons/yr}$$

$$\frac{0.00185 \text{ tons/yr} \times 2,000 \text{ lbs/ton}}{400 \text{ hrs/yr}} = 0.00925 \text{ lbs/hr}$$

SULFUR DIOXIDE (SO2)

Natural Gas Consumption

$$\frac{0.74 \text{ million cu. ft./yr} \quad \times \quad 0.6 \text{ lb/million cu.ft.}}{2,000 \text{ lbs/ton}}$$

$$= 0.000222 \text{ tons/yr}$$

$$\frac{0.000222 \text{ tons/yr} \times 2,000 \text{ lbs/ton}}{400 \text{ hrs/yr}} = 0.00111 \text{ lbs/hr}$$

NITROGEN OXIDE (NOX)

Natural Gas Consumption

$$\frac{0.74 \text{ million cu. ft./yr} \quad \times \quad 140.0 \text{ lb/million cu.ft.}}{2,000 \text{ lbs/ton}}$$

$$= 0.0518 \text{ tons/yr}$$

$$\frac{0.0518 \text{ tons/yr} \times 2,000 \text{ lbs/ton}}{400 \text{ hrs/yr}} = 0.259 \text{ lbs/hr}$$

CARBON MONOXIDE (CO)

Natural Gas Consumption

$$\frac{0.74 \text{ million cu. ft./yr} \quad \times \quad 35.0 \text{ lb/million cu.ft.}}{2,000 \text{ lbs/ton}}$$

$$= 0.01295 \text{ tons/yr}$$

$$\frac{0.01295 \text{ tons/yr} \times 2,000 \text{ lbs/ton}}{400 \text{ hrs/yr}} = 0.06475 \text{ lbs/hr}$$

HYDROCARBONS (HC)

Natural Gas Consumption

$$\frac{0.74 \text{ million cu. ft./yr} \quad \times \quad 3.0 \text{ lb/million cu.ft.}}{2,000 \text{ lbs/ton}}$$

$$= 0.00111 \text{ tons/yr}$$

$$\frac{0.00111 \text{ tons/yr} \times 2,000 \text{ lbs/ton}}{400 \text{ hrs/yr}} = 0.00555 \text{ lbs/hr}$$

FUEL COMBUSTION EMISSION CALCULATIONS SUMMARY

POLLUTANT	EMISSION RATE (LB/HR) (TON/YR)	
PARTICULATES	0.00925	0.00185
SULFUR DIOXIDE	0.00111	0.000222
NITROGEN OXIDE	0.259	0.0518
CARBON MONOXIDE	0.06475	0.01295
HYDROCARBONS	0.00555	0.00111

APPENDIX F
MATERIAL SAFETY DATA SHEETS

Fax Transmittal Memo 7672
 To **KAY RYKOWSKI**
 Company
 Location
 Telephone #
 Comments

8550369

Telephone #

No. of Pages 26 Today's Date 11/19/92 Time 11:00 AM
 From JACK. WANAT
 Company FOAMEX
 Location OLLAND Dept. Charge
 Fax # Telephone # 857-2510
 Original Description Destroy Return Call for pickup



MATERIAL SAFETY DATA SHEET

MILES INC.
 POLYMERS DIVISION
 Mobay Road
 Pittsburgh, PA 15205-9741

TRANSPORTATION EMERGENCY
 CALL CHEMTREC: 800-424-9300
 DISTRICT OF COLUMBIA: 202-483-7616

NON-TRANSPORTATION
 MILES EMERGENCY PHONE...: (412) 923-1800
 MILES INFORMATION PHONE.: (800) 662-2927

I. PRODUCT IDENTIFICATION:

PRODUCT NAME.....: Mondur TD-80 Grade A
 PRODUCT CODE.....: E-002
 CHEMICAL FAMILY.....: Aromatic Isocyanate
 CHEMICAL NAME.....: Toluene Diisocyanate (TDI)
 SYNONYMS.....: Benzene; 1,3-diisocyanato methyl-
 CAS NUMBER.....: 26471-62-5
 FORMULA.....: C9H6N2O2

II. HAZARDOUS INGREDIENTS:

INGREDIENT NAME /CAS NUMBER	EXPOSURE LIMITS	CONCENTRATION (%)	
2,4-Toluene Diisocyanate (TDI) 584-84-9	OSHA :	80%	
			.005 ppm TWA
			.040 mg/m3 TWA
			.020 ppm STEL
			.150 mg/m3 STEL
			.005 ppm TWA
ACGIH:		.036 mg/m3 TWA	
		.020 ppm STEL	
		.140 mg/m3 STEL	
2,6-Toluene Diisocyanate (TDI) 91-08-7	OSHA :	20%	
			Not Established
	ACGIH:		Not Established

III. PHYSICAL PROPERTIES:

PHYSICAL FORM.....: Liquid
 COLOR.....: Water white to pale yellow
 ODOUR.....: Sharp, pungent
 ODOR THRESHOLD.....: Greater than TLV of 0.005 ppm

Product Code: E-002
 Approval date: 02/06/92

MSDS Page 1
 Continued on next page

III. PHYSICAL PROPERTIES (Continued)

MOLECULAR WEIGHT.....: 174
BOILING POINT.....: Approx. 484 F (251 C) for TDI
MELTING/FREEZING POINT.....: Approx. 55 F (13 C) for TDI
SOLUBILITY IN WATER: Reacts slowly with water at normal room temperature
to liberate CO₂ gas.
SPECIFIC GRAVITY: 1.22 @ 77 F (25 C)
BULK DENSITY.....: 10.18 lbs/gal
% VOLATILE BY VOLUME.....: Negligible
VAPOR PRESSURE: Approx. 0.025 mmHg @ 77 F (25 C) for TDI
VAPOR DENSITY: 6.0 for TDI (Air = 1)

IV. FIRE AND EXPLOSION DATA:

FLASH POINT.....: 260.0 F (126.6 C) Pensky-Martens Closed Cup
(ASTM D-93)

FLAMMABLE LIMITS:

UPPER EXPLOSIVE LIMIT (UEL) (%): 9.5%

LOWER EXPLOSIVE LIMIT (LEL) (%): 0.9%

EXTINGUISHING MEDIA.....: Dry Chemical; Carbon Dioxide; Foam; Water

SPECIAL FIRE FIGHTING PROCEDURES: Full emergency equipment with self-contained breathing apparatus and full protective clothing (such as rubber gloves, boots, bands around legs, arms and waist) should be worn by firefighters. No skin surface should be exposed. During a fire, TDI vapors and other irritating, highly toxic gases may be generated by thermal decomposition or combustion. (See Section VIII). At temperatures greater than 350 F (177 C) TDI forms carbodiimides with the release of CO₂ which can cause pressure build-up in closed containers. Explosive rupture is possible. Therefore, use cold water to cool fire-exposed containers.

UNUSUAL FIRE / EXPLOSION HAZARDS: CAUTION: Reaction between water or foam and hot TDI can be vigorous.

V. HUMAN HEALTH DATA:

ROUTE(S) OF ENTRY.....: Inhalation. Skin contact from liquid, vapors or aerosols.

HUMAN EFFECTS AND SYMPTOMS OF OVEREXPOSURE:

ACUTE INHALATION.....: TDI vapors or mist at concentrations above the TLV can irritate (burning sensation) the mucous membranes in the respiratory tract (nose, throat, lungs) causing runny nose, sore throat, coughing, chest discomfort, shortness of breath and reduced lung function (breathing obstruction). Persons with a preexisting, nonspecific bronchial hyperreactivity can respond to concentrations below the TLV with similar symptoms as well as asthma attack. Exposure well above the TLV may lead to bronchitis, bronchial spasm and pulmonary edema (fluid in lungs). These

V. HUMAN HEALTH DATA (Continued)

- effects are usually reversible. Chemical or hypersensitive pneumonitis, with flu-like symptoms (e.g., fever, chills), has also been reported. These symptoms can be delayed up to several hours after exposure.
- CHRONIC INHALATION**.....: As a result of previous repeated overexposures or a single large dose, certain individuals may develop isocyanate sensitization (chemical asthma) which will cause them to react to a later exposure to isocyanate at levels well below the TLV. These symptoms, which can include chest tightness, wheezing, cough, shortness of breath or asthmatic attack, could be immediate or delayed up to several hours after exposure. Similar to many non-specific asthmatic responses, there are reports that once sensitized an individual can experience these symptoms upon exposure to dust, cold air or other irritants. This increased lung sensitivity can persist for weeks and in severe cases for several years. Chronic overexposure to isocyanate has also been reported to cause lung damage (including decrease in lung function) which may be permanent. Sensitization can either be temporary or permanent.
- ACUTE SKIN CONTACT**.....: Isocyanates react with skin protein and moisture and can cause irritation which may include the following symptoms: reddening, swelling, rash, scaling or blistering. Cured material is difficult to remove.
- CHRONIC SKIN CONTACT**.....: Prolonged contact can cause reddening, swelling, rash, scaling, blistering, and, in some cases, skin sensitization. Individuals who have developed a skin sensitization can develop these symptoms as a result of contact with very small amounts of liquid material or as a result of exposure to vapor.
- ACUTE EYE CONTACT**.....: Liquid, aerosols or vapors are severely irritating and can cause pain, tearing, reddening and swelling. If left untreated, corneal damage can occur and injury is slow to heal. However, damage is usually reversible. See Section VI for treatment.
- CHRONIC EYE CONTACT**.....: Prolonged vapor contact may cause conjunctivitis.
- ACUTE INGESTION**.....: Can result in irritation and corrosive action in the mouth, stomach tissue and digestive tract. Symptoms can include sore throat, abdominal pain, nausea, vomiting and diarrhea.
- CHRONIC INGESTION**.....: None Found
- CARCINOGENICITY**.....: No carcinogenic activity was observed in lifetime inhalation studies in rats and mice (International Isocyanate Institute). NTP: The National Toxicology Program reported that TDI caused an increase in the number of tumors in exposed rats over those counted in non-exposed rats. The TDI was administered in corn-oil and introduced into the stomach through a tube. Based on this study, the NTP has listed TDI as a substance that may reasonably be anticipated to be a carcinogen in its Fourth Annual Report on Carcinogens. IARC: IARC has announced that it will list TDI as a substance for which there is sufficient evidence for its carcinogenicity in experimental animals but inadequate evidence for the carcinogenicity of TDI to humans (IARC Monograph 39). OSHA: Not listed.
- NTP.....: See Carcinogenicity Text.
- IARC.....: See Carcinogenicity Text.
- OSHA.....: Not regulated.

V. HUMAN HEALTH DATA (Continued)

MEDICAL CONDITIONS

AGGRAVATED BY EXPOSURE.....: Asthma, other respiratory disorders (bronchitis, emphysema, bronchial hyperreactivity), skin allergies, eczema.

VI. EMERGENCY AND FIRST AID PROCEDURES:

FIRST AID FOR EYES.....: Flush with copious amounts of water, preferably lukewarm for at least 15 minutes holding eyelids open all the time. Refer individual to physician or an ophthalmologist for immediate follow-up.

FIRST AID FOR SKIN.....: Remove contaminated clothing immediately. Wash affected areas thoroughly with soap and water for at least 15 minutes. Tincture of green soap and water is also effective in removing isocyanates. Wash contaminated clothing thoroughly before reuse. For severe exposures, get under safety shower after removing clothing, then get medical attention. For lesser exposures, seek medical attention if irritation develops or persists after the area is washed.

FIRST AID FOR INHALATION: Move to an area free from risk of further exposure. Administer oxygen or artificial respiration as needed. Obtain medical attention. Asthmatic-type symptoms may develop and may be immediate or delayed up to several hours. Consult physician.

FIRST AID FOR INGESTION.: Do not induce vomiting. Give 1 to 2 cups of milk or water to drink. DO NOT GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. Consult physician.

NOTE TO PHYSICIAN.....: EYES: Stain for evidence of corneal injury. If cornea is burned, instill antibiotic steroid preparation frequently. Workplace vapors have produced reversible corneal epithelial edema impairing vision. SKIN: This compound is a known skin sensitizer. Treat symptomatically as for contact dermatitis or thermal burns. INGESTION: Treat symptomatically. There is no specific antidote. Inducing vomiting is contraindicated because of the irritating nature of this compound. RESPIRATORY: This compound is a known pulmonary sensitizer. Treatment is essentially symptomatic. An individual having a skin or pulmonary sensitization reaction to this material should be removed from exposure to any isocyanate.

VII. EMPLOYEE PROTECTION RECOMMENDATIONS:

EYE PROTECTION REQUIREMENTS.....: Liquid chemical goggles or full-face shield. Contact lenses should not be worn. If vapor exposure is causing irritation, use a full-face, air-supplied respirator.

SKIN PROTECTION REQUIREMENTS.....: Chemical resistant gloves (butyl rubber, nitrile rubber, polyvinyl alcohol). However, please note that PVA degrades in water. Cover as much of the exposed skin area as possible with appropriate clothing. If skin creams are used, keep the area covered only by the cream to a minimum.

VII. EMPLOYEE PROTECTION (Continued)

- RESPIRATOR REQUIREMENTS.....: An approved positive pressure air-supplied respirator is required whenever TDI concentrations are not known or exceed the Short-Term Exposure Limit of 0.02 ppm or exceed the 8-hour Time Weighted Average TLV of 0.005 ppm. An approved air-supplied respirator with full facepiece must also be worn during spray application, even if exhaust ventilation is used. For emergency and other conditions where the exposure limits may be greatly exceeded, use an approved, positive pressure self-contained breathing apparatus. TDI has poor warning properties since the odor at which TDI can be smelled is substantially higher than 0.02 ppm. Observe OSHA regulations for respirator use (29 CFR 1910.134).
- VENTILATION REQUIREMENTS.....: Local exhaust should be used to maintain levels below the TLV whenever TDI is handled, processed, or spray-applied. At normal room temperatures (70 F) TDI levels quickly exceed the TLV unless properly ventilated. Standard reference sources regarding industrial ventilation (e.g., ACGIH Industrial Ventilation) should be consulted for guidance about adequate ventilation.
- MONITORING.....: TDI exposure levels must be monitored by accepted monitoring techniques to ensure that the TLV is not exceeded. (Contact Miles Inc. Product Safety for guidance). See Volume 1 (Chapter 17) and Volume 3 (Chapter 3) in Patty's Industrial Hygiene and Toxicology for sampling strategy.
- MEDICAL SURVEILLANCE.....: Medical supervision of all employees who handle or come in contact with TDI is recommended. These should include preemployment and periodic medical examinations with respiratory function tests (FEV, FVC as a minimum). Persons with asthmatic-type conditions, chronic bronchitis, other chronic respiratory diseases or recurrent skin eczema or sensitization should be excluded from working with TDI. Once a person is diagnosed as sensitized to TDI, no further exposure can be permitted.
- ADDITIONAL PROTECTIVE MEASURES.....: Safety showers and eyewash stations should be available. Educate and train employees in safe use of product. Follow all label instructions.

VIII. REACTIVITY DATA;

- STABILITY.....: This is a stable material.
- HAZARDOUS POLYMERIZATION...: May occur; May occur if in contact with moisture or other materials which react with isocyanates. Self-reaction may occur at temperatures over 350 F (177 C) or at lower temperatures if sufficient time is involved. See Section IV.
- INCOMPATIBILITIES.....: Water, amines, strong bases, alcohols. Will cause some corrosion to copper alloys and aluminum. Reacts with water to form heat, CO₂ and insoluble ureas.
- INSTABILITY CONDITIONS.....: Not Noted
- DECOMPOSITION PRODUCTS.....: By high heat and fire: carbon monoxide, oxides of nitrogen, traces of HCN, TDI vapors and mist.

IX. SPILL AND LEAK PROCEDURES:

SPILL OR LEAK PROCEDURES....: Evacuate and ventilate spill area; dike spill to prevent entry into water system; wear full protective equipment, including respiratory equipment during clean-up. (See Section VII). Major Spill: Call Miles Inc. at 412/923-1800. If transportation spill, call CHEMTREC 800/424-9300. If temporary control of isocyanate vapor is required, a blanket of protein foam (available at most fire departments) may be placed over the spill. Large quantities may be pumped into closed, but not sealed, container for disposal. Minor Spill: Absorb isocyanate with sawdust or other absorbent, shovel into suitable unsealed containers, transport to well-ventilated area (outside) and treat with neutralizing solution: mixture of water (80%) with non-ionic surfactant Tergitol TMN-10 (20%), or; water (90%), concentrated ammonia (3-8%) and detergent (2%). Add about 10 parts of neutralizer per part of isocyanate, with mixing. Allow to stand uncovered for 48 hours to let CO₂ escape. Clean-up: Decontaminate floor with decontamination solution letting stand for at least 15 minutes.

WASTE DISPOSAL METHOD.....: Follow all federal, state or local regulations. TDI must be disposed of in a permitted incinerator or landfill. Incineration is the preferred method for liquids. Solids are usually incinerated or landfilled.

EMPTY CONTAINER PRECAUTIONS.: Empty containers must be handled with care due to product residue. Decontaminate containers prior to disposal. Empty decontaminated containers should be crushed to prevent reuse. **DO NOT HEAT OR CUT EMPTY CONTAINER WITH ELECTRIC OR GAS TORCH.** (See Sections IV and VIII). Vapors and gases may be highly toxic.

X. SPECIAL PRECAUTIONS & STORAGE DATA:

STORAGE TEMPERATURE(MIN/MAX): 70 F (21 C)/90 F (32 C)

SHELF LIFE.....: 12 months

SPECIAL SENSITIVITY.....: If container is exposed to high heat, 350 F (177 C) it can be pressurized and possibly rupture. TDI reacts slowly with water to form polyureas and liberates CO₂ gas. This gas can cause sealed containers to expand and possibly rupture.

HANDLING/STORAGE PRECAUTIONS: Store in tightly closed containers to prevent moisture contamination. Do not reseal if contamination is suspected. Prevent all contact. Do not breathe the vapors. Warning properties (irritation of the eyes, nose and throat or odor) are not adequate to prevent chronic overexposure from inhalation. This material can produce asthmatic sensitization upon either single inhalation exposure to a relatively high concentration or upon repeated inhalation exposures to lower concentrations. Exposure to vapors of heated TDI can be extremely dangerous. Employee education and training in safe handling of this product are required under the OSHA Hazard Communication Standard.

XI. SHIPPING INFORMATION:

TECHNICAL SHIPPING NAME.....: Toluene Diisocyanate (TDI)
FREIGHT CLASS BULK.....: Toluene Diisocyanate
FREIGHT CLASS PACKAGE.....: Chemicals, NOI (Toluene Diisocyanate), NMFC
60000
PRODUCT LABEL.....: Product Label Established

DOT (HM-181)

PROPER SHIPPING NAME.....: Toluene Diisocyanate
HAZARD CLASS OR DIVISION.....: 6.1
UN/NA NUMBER.....: UN2078
PACKAGING GROUP.....: PG II, POISON
DOT PRODUCT RQ lbs (kgs).....: 100 lbs (45.4 kgs)
HAZARD LABEL(s).....: Poison
HAZARD PLACARD(s).....: Poison

IMO / IMDG CODE

PROPER SHIPPING NAME.....: Toluene Diisocyanate
HAZARD CLASS DIVISION NUMBER...: 6.1
UN NUMBER.....: UN2078
PACKAGING GROUP.....: II
HAZARD LABEL(s).....: Poison
HAZARD PLACARD(s).....: Poison

ICAO / IATA

PROPER SHIPPING NAME.....: Toluene Diisocyanate
HAZARD CLASS DIVISION NUMBER...: 6.1
UN NUMBER.....: UN2078
SUBSIDIARY RISK.....: None
PACKING GROUP.....: II
HAZARD LABEL(s).....: Poison
RADIOACTIVE?.....: Non-Radioactive
PASSENGER AIR - MAX. QTY.: 5 Liters
PASSENGER INSTRUCTION NUMBER...: 609
CARGO AIR - MAX. QTY.: 60 Liters
CARGO AIR INSTRUCTION NUMBER...: 611

XII. ANIMAL TOXICITY DATA:

TOXICITY DATA FOR: Toluene Diisocyanate
ACUTE TOXICITY

Product Code: E-002
Approval date: 02/06/92

MSDS Page 7
Continued on next page

XII. ANIMAL TOXICITY DATA (Continued)

- ORAL LD50.....: Range of 4130-6170 (Rats and Mice)
- DERMAL LD50.....: Greater than 10,000 mg/kg (Rabbits)
- INHALATION LC50....: Range of 16-50 ppm (Rat), 10 ppm (Mouse), 11 ppm (Rabbit), 13 ppm (Guinea Pig).
- EYE EFFECTS.....: Severe eye irritant capable of inducing corneal opacity.
- SKIN EFFECTS.....: Moderate skin irritant. Primary dermal irritation score; 4.12/8.0 (Draize). However, repeated or prolonged contact may culminate in severe skin irritation and/or corrosion.
- SENSITIZATION.....: Skin sensitizer in guinea pigs. One study using guinea pigs reported that repeated skin contact with TDI caused respiratory sensitization. Although poorly defined in experimental animal models, TDI is known to be a pulmonary sensitizer in humans. In addition, there is some evidence that cross-sensitization between different types of diisocyanates may occur.
- CHRONIC TOXICITY.....: Sub-chronic and chronic animal studies show that the primary effects of inhaling vapors and/or aerosols of TDI are restricted to the pulmonary systems. Emphysema, pulmonary edema, pneumonitis and rhinitis are common pathologic effects. Extended exposures to as low as 0.1 ppm TDI have induced pulmonary inflammation.
- CARCINOGENICITY.....: The NTP conducted carcinogenesis studies of a commercial grade TDI using rats and mice in which the test material was diluted in corn oil and administered by gavage. The investigators concluded that TDI was carcinogenic in male and female rats (fibrosarcomas, pancreatic adenomas, neoplastic liver nodules and mammary gland fibrosarcomas) and female mice (hemangiosarcomas and hepatocellular adenomas). However, chronic inhalation studies in which rats and mice were exposed to 0.05 and 0.15 ppm TDI (10-30 times recommended TLV, 8-hr level) induced no treatment-related tumorigenic effects. In these studies, both exposure levels produced extensive irritation to the nasal passages and upper respiratory system of the test animals indicating that suitable effective exposures were administered.
- MUTAGENICITY.....: TDI is positive in the Ames assay with activation. However, mammalian cell transformation assays using human lung cells and Syrian hamster kidney cells were negative, as were micronucleus tests using rats and mice.
- TERATOGENICITY.....: Rats were exposed to an 80:20 mixture of 2,4- and 2,6-toluene diisocyanate vapor at analytical concentrations of 0.021, 0.12 and 0.48 ppm. Minimal fetotoxicity was observed at a maternally toxic concentrations of 0.48 ppm. The NOEL for maternal and developmental toxicity was 0.12 ppm. No embryotoxicity or teratogenicity was observed.
- AQUATIC TOXICITY.....: LC50 - 96 hr (static): 165 mg/liter (Fathead minnow)
LC50 - 96 hr (static): Greater than 508 mg/liter (Grass shrimp) LC50 - 24 hr (static): Greater than 500 mg/liter (Daphnia magna)

 XIII. FEDERAL REGULATORY INFORMATION:

OSHA STATUS.....: This product is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

TSCA STATUS.....: On TSCA Inventory

CERCLA REPORTABLE QUANTITY...: 2,4-Toluene Diisocyanate = 100 lbs.;
2,6-Toluene Diisocyanate = 100 lbs.

SARA TITLE III:
SECTION 302 EXTREMELY
HAZARDOUS SUBSTANCES...: 2,4-Toluene Diisocyanate (TDI), CAS# 584-84-9,
80%;
2,6-Toluene Diisocyanate (TDI), CAS# 91-08-7,
20%

SECTION 311/312
HAZARD CATEGORIES.....: Immediate Health Hazard; Delayed Health Hazard;
Reactive Hazard

SECTION 313
TOXIC CHEMICALS.....: 2,4-Toluene Diisocyanate (TDI), CAS# 584-84-9,
80%, 2,6-Toluene Diisocyanate (TDI), CAS# 91-08-7,
20%

RCRA STATUS.....: TDI is listed as a hazardous waste (No. U-223) under Title 40 Code of Federal Regulations, Section 261.33 (f). The residue from decontaminating a TDI spill is also classified as a hazardous waste under Section 261.3 (c) (2) of RCRA.

 XIV. OTHER REGULATORY INFORMATION:

The following chemicals are specifically listed by individual states; other product specific health and safety data in other sections of the MSDS may also be applicable for state requirements. For details on your regulatory requirements you should contact the appropriate agency in your state.

COMPONENT NAME /CAS NUMBER	CONCENTRATION	STATE CODE
2,4-Toluene Diisocyanate (TDI) 584-84-9	80%	PA1, PA2, CA, FL, IL, MA, RI, NJ1, NJ2, NJ4, CN2, NY
2,6-Toluene Diisocyanate (TDI) 91-08-7	20%	PA1, CA, IL, MA, NJ1, NJ2, NJ4, CN2, NY

XIV. OTHER REGULATORY INFORMATION (Continued)

- CA - California Proposition 65
- FL - Florida Substance List
- IL - Illinois Toxic Substances List
- MA - Massachusetts Hazardous Substance List
- NJ1 - New Jersey Hazardous Substance List
- NJ2 - New Jersey Environmental Hazardous Substance List
- NJ4 - New Jersey Other - included in 5 predominant ingredients > 1%
- NY - New York Hazardous Substance List
- PA1 - Pennsylvania Hazardous Substance List
- PA2 - Pennsylvania Special Substances List
- RI - Rhode Island List of Designated Substances
- CN2 - Canada WHMIS Ingredient Disclosure List over 0.1%.

NFPA 704M RATINGS: Health Flammability Reactivity Other
 3 1 1
 0-Insignificant 1-Slight 2-Moderate 3-High 4-Extreme

HMIS RATINGS: Health Flammability Reactivity
 4* 1 1
 0-Minimal 1-Slight 2-Moderate 3-Serious 4-Severe
 *-Chronic Health Hazard

Miles' method of hazard communication is comprised of Product Labels and Material Safety Data Sheets. HMIS and NFPA ratings are provided by Miles as a customer service.

XV. APPROVALS;

REASON FOR ISSUE.....: Revising HM-181 Packing Group; Section 15 of the MSDS.
 PREPARED BY.....: G. L. Copeland
 APPROVED BY.....: J. H. Chapman
 APPROVAL DATE.....: 02/06/92
 SUPERSEDES DATE.....: 01/13/92
 MSDS NUMBER.....: 01794

This information is furnished without warranty, expressed or implied, except that it is accurate to the best knowledge of Miles Inc. The data on this sheet relates only to the specific material designated herein. Miles Inc. assumes no legal responsibility for use or reliance upon these data.

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HARCROS CHEMICALS INC
KANSAS CITY, KANSASRECEIVED
JUL 27 1989

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: METHYLENE CHLORIDE
PRODUCT CODE: 16-10394-08

DATE: 07/11/89 PAGE 01

CAS # 000075-09-2

FORMULA: CH(2)Cl(2)

CHEMICAL FAMILY: Chlorinated Hydrocarbons

CHEMICAL NAME AND SYNONYMS: Dichloromethane, Grades: Tech.; Reagent;
Urethane; Inhibited; Semiconductor (Low
Particle) Particulo-LO(TM) and M-Clene
(TM); Freon 30; Methylene ChlorideSUPPLIERS NAME: Harcros Chemicals Inc
5200 Speaker Rd
Kansas City, Mo 66106SUPPLIERS PHONE NUMBER: 913-321-3131
TRANSPORTATION EMERGENCY PHONE NUMBER: 1-800-424-9300

S.A.R.A. INFORMATION

HAZARDS: Fire: Pressure: Reactivity: Acute: Yes Chronic: Yes
PHYSICAL DATA: Mixture: Yes Pure: Solid: Liquid: Yes Gas:

SECTION I Hazardous Ingredients

Ingredient	Percent	TLV
Methylene Chloride (Stabilized) (CAS # 75-09-2) <>	>99	PEL=500 ppm 8Hr TWA PEL=1000 ppm Ceiling (ACC) PEL=2000 ppm Peak 5 mins. in any 2 Hrs OSHA (MAC) 10 hr TWA 75 ppm REL NIOSH 15 min Ceiling 500 ppm REL NIOSH
Propylene Oxide * (CAS # 75-56-9) <>	<0.5%	TLV=50 ppm A-2 8Hr TWA ACGIH PEL/TLV/TWA 8Hr 20 ppm OSHA/ACGIH

* Propylene oxide is described as an animal carcinogen by IARC.
It is proposed for addition in NTP's Fifth Annual Report on
Carcinogens.
**OSHA PEL under review, NIOSH REL and ACGIH TLV should be
observed. REL Ref (1) Sec IX.
<>- This chemical is subject to S.A.R.A. Title III section
313 part 372 reporting.

SECTION II Health Hazards

Threshold Limit Value: As Indicated in Section I. Odor threshold
approximately 200-300 ppm, causes olfactory fatigue.

Potential Effects of Exposure:

Eyes: Liquid contact causes pain, tearing and temporary corneal
injury. Vapors may irritate eyes.Skin: Mildly irritating, may produce a burning sensation.
Defatting by prolonged or repeated contact may cause skin to
become reddened, rough and dry, and may result in dermatitis.
Extensive skin contact with methylene chloride, such as
immersion, may cause an intense burning sensation followed by a
cold, numb feeling which will subside after contact. Is

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HARCROS CHEMICALS INC
KANSAS CITY, KANSAS

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: METHYLENE CHLORIDE
PRODUCT CODE: 16-10394-08

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SECTION II Health Hazards CONTINUED
rapidly absorbed through the skin, which can aggravate effects
of exposure by other routes. LD(Lo)(Rabbit): 2700 mg/kg

Inhalation: Major route of potential exposure. Methylene chloride depresses the central nervous system. Concentrations between 900-1,000 ppm may cause dizziness. Nausea, headache and vomiting can occur at concentrations above 2,000 ppm. At 7,000 ppm, numbness and tingling in arms and legs and rapid heartbeat have occurred. Loss of consciousness and death have occurred at levels above 9,000 ppm, if exposure is prolonged. These high levels may also cause cardiac arrhythmias (irregular heartbeats). For further effects see Note (B), Section IX and Note at end of this section.

Ingestion: Discomfort and possible aspiration pneumonitis if vomited. Gastrointestinal bleeding may follow. Absorption through the gastrointestinal tract may produce symptoms of central nervous system depression ranging from light headedness to unconsciousness. Some of the symptoms of inhalation in Note (B) Section IX, may occur. Oral LD(50) (rat): 1300 to 2400 mg/kg.

Studies indicate that anesthetic deaths occurred shortly after oral dosing, indicating rapid absorption from the gastrointestinal tract.

PRIMARY ROUTES OF EXPOSURE:

Inhalation, Ingestion.

TARGET ORGANS:

Skin, cardiovascular system, eyes, central nervous system.

Medical Conditions Aggravated by Exposure

Alcoholism, acute and chronic liver and kidney disease, chronic lung disease, anemia, coronary disease or rhythm disorders of the heart. Consumption of alcoholic beverages may increase the potential for development of toxic effects resulting from exposure to this product.

First aid:

Eyes: Immediately flush with water, continuing for 15 minutes, lifting eyelids frequently. Get medical assistance. Contact lenses should not be worn when working with this chemical.

Skin: Wash contaminated area with soap and water. A soothing ointment may be applied to irritated skin after cleansing. Remove contaminated clothing and footwear and wash clothing before reuse. Discard footwear which cannot be decontaminated. Seek medical attention.

Inhalation: Get person out of contaminated area to fresh air. If breathing has stopped artificial respiration should be started. Oxygen may be administered, if readily available. Seek medical attention immediately.

Ingestion: If swallowed DO NOT induce vomiting. If vomiting occurs spontaneously, keep person's head below hips to prevent inhalation. Never give anything by mouth to an unconscious person. Seek medical assistance immediately.

Other Information: Note to physician:

SKIN: If burns present, treat as any thermal burn, after

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SECTION II Health Hazards
decontamination.

CONTINUED

RESPIRATORY: Anesthetic or narcotic effect may occur. Administer oxygen if available. Bronchodilators, expectorants, and antitussives may be of help.

ORAL: May cause chemical pneumonia if aspirated into lungs. Danger of chemical pneumonia must be weighed against toxicity when considering emptying stomach. If lavage is performed, suggest endotracheal and/or esophagosopic control. Moderately toxic.

SYSTEMIC: May cause increase in carboxyhemoglobin levels. May increase myocardial irritability. Avoid epinephrine or similar drugs if at all possible. Consult standard literature. No specific antidote. Treatment based on the sound judgment of the physician and the individual reactions of the patient.

*Employees working with methylene chloride should be aware of the increased hazard from simultaneous exposure to carbon monoxide. This effect is "additive" in nature with the risk being greater for smokers. Employees with a history of cardiovascular disease should not be allowed to work with methylene chloride unless approved by a physician. See Note (B), Sec. IX.

CHRONIC TOXICITY:
Chronic overexposures to methylene chloride have caused liver and kidney disease in experimental animals.

See Section IX for further data on carcinogenicity of methylene chloride and propylene oxide, also reproductive toxicity (negative) for methylene chloride.

SECTION III Special Protection Information

Respiratory Protection: Above REL/TLV limitations and up to 750 ppm use self-contained breathing apparatus as recommended by NIOSH. For alternate protection at this level and coverage with higher exposures see Ref. (1) Section IX.

Ventilation Required: Use in a complete ventilated enclosure (e.g. in an exhausted hood), otherwise provide for sufficient air velocity to maintain concentrations below TLV limitation, taking into account the high volatility of methylene chloride.

Protective Clothing:

Eyes: For material used normally wear safety glasses with no sideshield perforations; for emergencies wear chemical safety goggles. Contact lenses should be avoided.

Skin: In handling wear impervious gloves. In an emergency or where there is any possibility of splashing causing repeated or prolonged contact, wear full impervious clothing. Preferred materials: polyvinyl alcohol or N-type rubber. (Polyvinyl alcohol will not stand long exposure to water). Polyfluorinated polyethylene also has been suggested.

Additional Protective Measures:

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SECTION III Special Protection Information CONTINUED
Safety shower, eye bath and washing facilities should be available.

To determine exposure levels monitoring should be performed regularly.

MONITORING EXPOSURE

BIOLOGICAL: Reports indicate that 33 ppm Methylene Chloride in breath during exposure is equivalent to an exposure of about 100 ppm in air. Blood analyzed for carboxyhemoglobin (COHb) may show 7 to 10% saturation following exposure to 250 and 500 ppm respectively. Amount of exertion, duration of exposure, and time sampled effect these ratios.

PERSONAL/AREA: The NIOSH P&CAM (Method) Numbers 127, S329 are applicable.

SECTION IV Fire & Explosion Hazard Data

Flash Point (Method): None

Flammable Limits (% Volume in Air): at 77 deg F

Upper: 19

Lower: 12

Extinguishing Media: Fires involving methylene chloride are unlikely, but, should one occur, it may be controlled by carbon dioxide, foam, dry chemicals or water fog.

Special Fire Fighting Procedures: Wear self-contained breathing apparatus approved by NIOSH, goggles if eye protection not provided. Use water spray on fire-exposed containers to prevent pressure build-up, and to flush spills away from exposed vessels. Forms flammable vapor - air mixture at approximately 212 deg. F or higher. Lower temperatures increase the difficulty of getting it to ignite.

Unusual Fire and Explosion Hazards: Methylene chloride is non-flammable and non-explosive under normal conditions of use. Vapors concentrated in a confined or poorly ventilated area can be ignited upon contact with a high energy spark, flame, or high intensity source of heat. This can occur at concentrations ranging between 12-19% by volume. At high temperatures, decomposition may produce hydrochloric acid gas and other toxic and irritating vapors such as phosgene, hence need to cool containers to prevent over-pressurization.

SECTION V Physical Data

Boiling Point: 103-104 deg. F

Specific Gravity (H(2)O=1): 1.32-1.33 @ 68 deg. F

Vapor Pressure (MM HG.): 350-352 @ 68 deg. F

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MATERIAL SAFETY DATA SHEET

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SECTION V Physical Data

Vapor Density (AIR=1): 2.9
Evaporation Rate (Ethyl Ether=1): 0.71
Solubility in Water: 2% by weight @ 77 deg. F.
Percent Volatile by Volume: 100
pH: Neutral
Appearance and Odor: Clear, colorless liquid with ether-like odor at concentrations over 100 ppm.

SECTION VI Reactivity Data

Stability: Stable

Incompatibility: Strong oxidants, alkali metals, amines; pure oxygen, open flames, electric arcs, aluminum and aluminum spray equipment. Aromatic solvents or 1,1,1-trichloroethane should not be mixed with methylene chloride in contact with aluminum because of a possible decomposition reaction. May react violently or explode upon contact with alkali or chemically active metals such as finely powdered aluminum, magnesium, potassium and sodium.

Industry usage for cleaning aluminum parts with methylene chloride is apparently without risk. The danger is confined to pressurized systems with dirty, wet, hot methylene chloride where reactivity with aluminum metal surface can become appreciable.

Prolonged exposure to water may cause noticeable hydrolysis above 140 deg. F, producing small amounts of hydrochloric acid.

Hazardous Decomposition Products: Hydrogen chloride, chlorine, and phosgene at high temperatures, eg in open flames and welding arcs.

Hazardous Polymerization: Will not occur.

SECTION VII Spill and Leak Procedures

Steps to be taken if material is released or spilled:

Immediately evacuate the area and provide maximum ventilation. If spill occurs indoors turn off air conditioning and/or heating system, to prevent vapors from contaminating entire building. Unprotected personnel should move upwind of spill. Only personnel equipped with proper respiratory and skin/eye protection (See Section III) should be permitted in area. Like area to contain spill. Take precautions as necessary to prevent contamination of ground and surface waters. Pump liquid into containers for recovery or disposal. Recover residual spilled material on absorbents, such as sawdust or vermiculite, and sweep into closed containers for disposal. After all visible traces, including ignitable vapors, have been

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SECTION VII Spill and Leak Procedures CONTINUED
removed, thoroughly wet vacuum the area. DO NOT flush to sewer.
If area of spill is porous, remove as much contaminated earth,
gravel, etc. as necessary and place in closed containers for
disposal.

Waste Disposal Method:

Contaminated sawdust, vermiculite or porous surface material must be disposed in a permitted hazardous waste management facility. Recovered liquids may be reprocessed or incinerated or must be treated in a permitted hazardous waste management facility. Care must be taken when using or disposing of chemical materials and/or their containers to prevent environmental contamination. It is your duty to dispose of the chemical materials and/or their containers in accordance with the Clean Air Act, the Clean Water Act, as well as any other relevant federal, state, or local laws/regulations regarding disposal.

EPA - Resource Conservation and Recovery Act (RCRA) Regulations
As produced, this material is a product and not a waste. If discarded or intended to be discarded as is, it is a hazardous waste as defined in RCRA (40 CFR 261.33). The EPA hazardous waste number is U080. Spent solvent has a hazardous waste ID No. F002.

SECTION VIII D.O.T. Shipping Information

Proper Shipping Name: HAZARDOUS SUBSTANCE NOS (CONTAINS METHYLENE CHLORIDE)
Hazard Class: ORM-E
ID Number: NA9188
Label Requirements: NO LABEL REQUIRED
Reportable Quantity: SHIPMENTS OF 01000 LBS OR MORE ARE REPORTABLE
Other Information:

SECTION IX Additional Information

This information may be of importance to you:

NOTES:

(A)
CARCINOGENICITY: Methylene chloride has been evaluated for possible cancer causing effects in laboratory animals. Inhalation studies at concentrations of 2,000 and 4,000 ppm increased the incidence of malignant liver and lung tumors in mice. Three inhalation studies of rats have shown increased incidence of benign mammary gland tumors in males at concentrations of 1,500 ppm and above. Rats exposed to 50 and 200 ppm via inhalation showed no increased incidence of tumors. Mice and rats exposed by ingestion at levels up to 250

CONTINUED ON PAGE 07

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JUL 27 1989

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: METHYLENE CHLORIDE
PRODUCT CODE: 16-10394-08

DATE: 07/11/89 PAGE 07

SECTION IX Additional Information CONTINUED

mg/kg/day lifetime and hamsters exposed via inhalation to concentrations up to 3,500 ppm life-time did not show an increased incidence of tumors.

The International Agency for Research on Cancer (IARC) has concluded that there is sufficient evidence for the carcinogenicity of methylene chloride to experimental animals, and inadequate evidence for the carcinogenicity of methylene chloride to humans, resulting in a classification as a 2nd animal carcinogen on the IARC list. The Agency has identified methylene chloride as an animal carcinogen, but it is not on the OSHA or NTP lists as of February 28, 1988. For further data see Ref (2) Sec IX.

Epidemiology studies of 751 humans chronically exposed to methylene chloride in the workplace for a minimum of 20 years did not demonstrate any increase in deaths caused by cancer or cardiac problems. A second study of 2,227 workers confirmed these results.

Propylene oxide has caused increased incidence of nasal tumors in rats exposed by inhalation, forestomach tumors in rats exposed by gavage (forced-fed in oil) and injection site tumors when injected under the skin of rats.

REPRODUCTIVE TOXICITY: Reproductive toxicity tests have been conducted to evaluate the potential adverse effects methylene chloride may have on reproduction and offspring of laboratory animals. The results indicate that no birth defects are unlikely. Exposures having no effect on the mother should have no effect on the fetus. Did not cause birth defects in animals; other effects were seen in the fetus only at doses which cause toxic effects to the mother. In animal studies, has been shown not to interfere with reproduction. Negative or equivocal results have been obtained in mutagenicity tests using mammalian cells or animals. This is consistent with the lack of interaction with DNA in rats and hamsters. Although results of Ames bacterial tests have generally been positive, overall the data suggest that genotoxic potential doses not appear to be a significant factor in the toxicity of methylene chloride.

(B) Gross overexposure may cause serious problems including respiratory arrest. Animal studies show that metabolism of methylene chloride results in a release of carbon monoxide in the blood, causing an increase of carboxyhemoglobin. The latter decreases the ability of the blood to carry oxygen to the body tissues. There is no significant impairment at concentrations of methylene chloride below the ACGIH TLV. The vapor from methylene chloride is capable of producing potentially fatal cardiac arrhythmias in laboratory animals. The minimum level at which this was found to occur with a five minute exposure was 50,000 ppm in the monkey and 400,000 ppm in the mouse. As indicated in Section II, persons with angina or heart disease should not be exposed to this product.

(C) Methylene chloride vapors are heavier than air and will collect in low areas. Keep container closed when not in use.

Store only in closed, properly labeled containers. Do not store or stack aluminum in contact with methylene chloride to prevent possible solvent decomposition (stacking corrosion).

HARCROS CHEMICALS INC
KANSAS CITY, KANSAS

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: METHYLENE CHLORIDE
PRODUCT CODE: 15-10394-08

DATE: 07/11/89 PAGE 08

SECTION IX Additional Information

CONTINUED

Under normal conditions methylene chloride may be stored satisfactorily in galvanized black iron or steel. Aluminum is not generally recommended for storage and handling.

Caution should be taken not to use in pressurized or totally enclosed system of aluminum construction. (Example: paint or adhesive spray system.)

A chlorinated solvent used as a flashpoint suppressant must be added in sufficient quantity or the resultant mixture may have a flashpoint lower than the flammable component.

Do not use cutting or welding torches on drums that contained methylene chloride unless properly purged and cleaned.

Containers of this material may be hazardous when emptied. "Empty" containers retain product residues. Observe all hazard precautions outlined in this sheet.

No smoking where material is used or stored.

Minimize skin contact. Wash with soap and water before eating, drinking, smoking or using toilet facilities.

Safety shower, eye bath and washing facilities should be available.

Store in tightly sealed, labeled containers in a cool, dry, well-ventilated area. Prevent water or moist air from entering storage tanks or containers.

References:

- (1) NIOSH/OSHA Pocket Guide to Chemical Hazards DHHS (NIOSH) Publication No. 85-114.
- (2) Identification and classification of carcinogens ACGIH:86 NPCAHMIS 310 H

***** END OF REPORT *****

NAME: GENE TURNER

DATE ISSUED: 11/22/1985
DATE REVISED: 05/12/1989

< = LESS THAN
> = MORE THAN

N/A = NOT APPLICABLE
N/D = NOT DETERMINED
N/E = NOT ESTABLISHED

UNK - UNKNOWN

The information provided in this Material Safety Data Sheet has been obtained from sources believed to be reliable. Harcros Chemicals Inc provides no warranties, either expressed or implied and assumes no responsibility for the accuracy or completeness of the data contained herein. This information is offered for your information, consideration and investigation. You should satisfy yourself that you have all current data relevant to your particular use. Harcros Chemicals Inc knows of no medical condition, other than those noted on this material safety data sheet, which are generally recognized as being aggravated by exposure to this product.

MATERIAL SAFETY DATA SHEET

Page

BASF CORPORATION
1419 BIDDLE AVENUE

WYANDOTTE, MI 48192
(313) 246-5246

Original Date: 11/14/19
Revision Date: 11/14/19

Emergency Telephone: (800) 424-9300 (CHEMTREC)
(800) 832-HELP (BASF Hotline)

BOTH NUMBERS ARE AVAILABLE DAYS, NIGHTS, WEEKENDS, & HOLIDAYS.

SECTION 1 - PRODUCT INFORMATION

Product ID: NPU 583541

Name: PLURACOL•POLYOL 924

Tradename:
PLURACOL•POLYOL 924

Common Chemical Name:
POLYETHER POLYOL

Synonyms:
CONVENTIONAL POLYOL

Molecular Formula:
CONVENTIONAL POLYOL

Molecular Wt.: NOT ESTABLISHED

Chemical Family: Polyether polyol

SECTION 2 - INGREDIENTS

Chemical Name:	CAS Number:	Amount:	PEL/TLV Data:
PLURACOL Polyol 924	9082-00-2	100.0 X	NOT ESTABLISHED

Product ID: NPU 583541

Name: PLURACOL-POLYOL 924

SECTION 3 - PHYSICAL PROPERTIES

Color: Water White
 Form/Appearance: Liquid
 Odor: Polyol
 Odor Intensity: Low

	Typical	Low-RANGE-High	Unit of Measure
Sp. Gravity:	1.020		
Bulk Density:	8.5100		LB/GAL
Viscosity:	565.000		CP
pH:	NOT AVAILABLE		25.0 DEG

	Typical	Low-RANGE-High	Deg.	@ Pressure
Boiling Pt:	NOT AVAILABLE			
Freezing Pt:	NOT AVAILABLE			
Decomp. Temp:	NOT AVAILABLE			

Solubility in Water Description: Slightly Soluble
 Vapor Density: LOW, NO DATA

pH: Neutral

SECTION 4 - FIRE AND EXPLOSION DATA

	Typical	Low-RANGE-High	Deg.	Method
Flash Point:	400.0			F PENSKY-MARTINS
Autoignition:	NOT AVAILABLE			CLOSE

Extinguishing Media:

Use water fog, foam, CO2 or dry chemical extinguishing media.

Fire Fighting Procedures:

Firefighters should be equipped with self-contained breathing apparatus and turn out gear.

Unusual Hazards:

None known.

SECTION 5 - HEALTH EFFECTS

Routes of entry for solids and liquids include eye and skin contact, ingestion and inhalation. Routes of entry for gasses include inhalation and eye and skin contact.

PLURACOL Polyol 924 - Low hazard liquid.

Acute Overexposure Effects:

Contact with the eyes and skin may result in irritation. Inhalation of the vapors or mists may result in respiratory irritation. Ingestion of the liquid may result in gastric disturbances. There are no other known acute effects associated with this material.

Chronic Overexposure Effects:

There are no other known chronic effects associated with this material.

First Aid Procedures - Skin:

Wash affected areas with soap and water. Remove and launder contaminated clothing before reuse. Get immediate medical attention.

First Aid Procedures - Eyes:

Immediately wash eyes with running water for 15 minutes. Get immediate medical attention.

First Aid Procedures - Ingestion:

If swallowed, dilute with water and immediately induce vomiting. Never give fluids or induce vomiting if the victim is unconscious or having convulsions. Get immediate medical attention.

First Aid Procedures - Inhalation:

Move to fresh air. Aid in breathing, if necessary, and get immediate medical attention.

First Aid Procedures - Notes to Physicians:

None known.

First Aid Procedures - Aggravated Medical Conditions:

No data is available which addresses medical conditions that are generally recognized as being aggravated by exposure to this product. Please refer to Section 5 (Effects of Overexposure) for effects observed in animals.

Product ID: NPU 583541

Name: PLURACOL-POLYOL 924

Page

SECTION 5 - HEALTH EFFECTS (Cont.)

First Aid Procedures - Special Precautions:
None

SECTION 6 - REACTIVITY DATA

Reactivity - Stability Data:
Stable

Reactivity - Incompatibility:
Avoid moisture to protect product quality.

Reactivity - Conditions/Hazards to Avoid:
Exposure to moisture and temperatures > 80F.

Reactivity - Hazardous Decomposition/Polymerization:
Hazardous decomposition products: CO and CO₂.

Reactivity - Corrosive Properties:
Not Corrosive.

Reactivity - Oxidizer Properties:
Not an oxidizer

Other Reactivity Data:
None known.

SECTION 7 - PERSONAL PROTECTION

Personal Protection - Clothing:
Gloves, coveralls, apron, boots as necessary to prevent skin contact.

Personal Protection - Eyes:
Chemical goggles; also wear a face shield if splashing hazard exists.

Product ID: NPU 583541

Name: PLURACOL-POLYOL 924

Page

SECTION 7 - PERSONAL PROTECTION (Cont.)

Personal Protection - Respiration:

Approved organic vapor mist respirator as necessary.

Personal Protection - Ventilation:

Use local exhaust to control vapors/mists.

Personal Protection - Explosion Proofing:

None required.

Other Personal Protection Data:

Avoid contact with skin as required by good normal hygiene practices.

SECTION 8 - SPILL-LEAK/ENVIRONMENTAL

Spill/Leak Procedures - General:

Spills should be contained, solidified and placed in suitable containers for disposal at a licensed facility.

Spill/Leak Procedures - Waste Disposal:

Incinerate or bury in a licensed facility. Do not discharge into waterways or sewer systems without proper authority.

Spill/Leak Procedures - Container Disposal:

Steel drums must be emptied (as defined by RCRA, Section 261.7 or state regulations that may be more stringent) and can be sent to a licensed drum reconditioner for reuse, a scrap metal dealer or an approved landfill. Drums destined for a scrap dealer or landfill must be punctured or crushed to prevent reuse.

SECTION 9 - STORAGE AND HANDLING

Storage and Handling - General:

Store in a ventilated storage area between 70-80F. Avoid excessive

Product ID: NPU 583541

Name: PLURACOL-POLYOL 924

Page

SECTION 9 - STORAGE AND HANDLING (Cont.)

temperatures, low or high. Avoid moisture.

Other Storage and Handling Data:

No other specific storage requirements.

SECTION 10A - FEDERAL REGULATORY INFORMATION

TSCA Inventory Status:

Listed on Inventory: YES

RCRA Haz. Waste No.: N/A

CERCLA: NO Reportable Qty.: (IF YES)

SARA TITLE III, SECTION 313: NOT LISTED

SECTION 10B - STATE REGULATORY INFORMATION

State Regulatory Information: (By Component)

NJ/PA/MA/VTX

CAS #: 9082-00-2 Name: PLURACOL Polyol 924

YES

SECTION 10C - OTHER REGULATORY INFORMATION

Hazard Ratings:

HMIS

Health:

1

Fire:

0

Reactivity:

0

Special:

FEMA Approved: NO

NO: X

RIFM Approved: NO

NO: X

IFRA Guidelines: NO

Product Grades: USP:

NF:

FCC:

FDA Approved: NO

Use:

Product ID: NPU 583541

Name: PLURACOL-POLYOL 824

Page

SECTION 100 - ADDITIONAL REGULATORY TEXT

This product contains a chemical known to the State of California to cause cancer, birth defects and/or reproductive harm.

Product ID: NPU 583541

Name: PLURACOL-POLYOL 924

Page

SECTION 11 - TRANSPORTATION INFORMATION

DOT Proper Shipping Name:

NONE

DOT Technical Name:

NONE

DOT Primary Hazard Class:

NONE

DOT Secondary Hazard Class:

NONE

DOT Label Required:

NONE

DOT Placard Required:

ONE

DOT Poison Constituent:

NONE

BASF Commodity Codes: 344

UN/NA Code: N/A E/R Guide: NA

Bill of Lading Description:

POLYPROPYLENE GLYCOL

* is a registered trademark of BASF Corporation.

† is a trademark of BASF Corporation.

WHILE BASF CORPORATION BELIEVES THE DATA SET FORTH HEREIN ARE ACCURATE AS THE DATE HEREOF, BASF CORPORATION MAKES NO WARRANTY WITH RESPECT THERETO AND EXPRESSINGLY DISCLAIMS ALL LIABILITY FOR RELIANCE THEREON. SUCH DATA ARE OFFERED SOLELY FOR CONSIDERATION, INVESTIGATION, AND VERIFICATION.

END OF DATA SHEET

MATERIAL SAFETY DATA SHEET
FOR COATINGS, RESINS, AND RELATED MATERIALS
REPLACES NPCA 1-82

RECEIVED
JAN 16 1992

ALDO Products Co. Inc.
1604 N. Main Street
Kannapolis, North Carolina 28081

New

EMERGENCY TELEPHONE NO.

(704) 788-9405

INFORMATION TELEPHONE NO.

(704) 932-3054

DATE OF PREPARATION

6-14-90

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NUMBER 120
PRODUCT NAME ALDOBOND
PRODUCT CLASS RESIN SOLUTION

SECTION II - HAZARDOUS INGREDIENTS

INGREDIENT	CAS NO.	PERCENT	OCCUPATIONAL EXPOSURE LIMIT		VAPOR PRESSURE
			TLV	PEL	
1,1,1-Trichloroethane	71-55-6	81.0	350 PPM	350 PPM	100 mmHg @20° C
1,4 Diethylene dioxide	123-91-1	3.0	25 PPM	25 PPM	100 mmHg @20° C

- NOTE: 1. This product contains the following chemicals which are subject to reporting under Section 313 of Title III:
1,1,1-Trichloroethane, 1,4 Diethylene dioxide
2. All other chemicals in this product are Trade Secret and are not regulated as hazardous by any state Right-to-Know law.

SECTION III - PHYSICAL DATA

BOILING RANGE 162-191° F

VAPOR DENSITY HEAVIER LIGHTER THAN AIR

EVAPORATION RATE FASTER SLOWER THAN ETHER

% VOLATILE VOLUME

WT/GAL

75.0%

10.1 lbs.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLAMMABILITY CLASSIFICATION OSHA Combustible FLASH POINT N/A LEL N/A
DOT Liquid UN2831

EXTINGUISHING MEDIA:
 FOAM "ALCOHOL"
FOAM CO2 DRY CHEMICAL WATER FOG OTHER

UNUSUAL FIRE AND EXPLOSION HAZARDS - Sealed containers may burst under intense heat.

SPECIAL FIREFIGHTING PROCEDURES - Use self contained positive pressure respiratory equipment in enclosed areas.

SECTION V - HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE - Dizziness, drunkenness, drowsiness, unconsciousness, death at extreme doses.

MEDICAL CONDITIONS PRONE TO AGGRAVATION BY EXPOSURE - Not known

PRIMARY ROUTE(S) OF ENTRY: DERMAL INHALATION INGESTION

EMERGENCY AND FIRST AID PROCEDURES - EYES AND SKIN: Remove contaminated clothing and flush areas with water for 5-15 minutes. INHALATION: Remove to fresh air. If breathing stopped, administer respiration or oxygen. Call a physician.
INGESTION: Do not induce vomiting. Call a physician.

SECTION VI - REACTIVITY DATA

STABILITY UNSTABLE STABLE

HAZARDOUS POLYMERIZATION MAY OCCUR WILL NOT OCCUR

HAZARDOUS DECOMPOSITION PRODUCTS - Hydrogen Chloride, Carbon Monoxide

CONDITIONS TO AVOID - Open flames, hot surfaces or electric arcs.

INCAMPATIBILITY (MATERIALS TO AVOID) - Water - Long term contact can produce corrosive acid. Avoid prolonged contact with or storage in aluminum or its alloys.

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Small spills: Remove with absorbent material.

Large spills: Recover free liquid, put in closed containers. Clean up area with absorbent material. Avoid breathing vapors. Ventilate enclosed areas or wear self contained breathing apparatus. Keep out of sewers and water courses.

WASTE DISPOSAL

Dispose of absorbed material at an approved disposal site or facility.

SECTION VIII - SAFE HANDLING AND USE INFORMATION

RESPIRATORY PROTECTION - Use vapor canister or supplied-air respiratory protection in confined or enclosed spaces that are not ventilated.

VENTILATION - Use adequate ventilation to keep concentration of vapors below exposure limits.

PROTECTIVE GLOVES - Use protective gloves if needed to avoid skin irritation.

EYE PROTECTION - Use goggles or face shield if eye contact may occur.

OTHER PROTECTIVE EQUIPMENT - Not needed

HYGIENIC PRACTICES: Keep solvent concentration in working atmosphere below TLV.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING - Store in cool, dry place. Keep containers tightly closed.

OTHER PRECAUTIONS - Prevent prolonged or repeated breathing of vapor or mist. Do not take internally. Keep out of reach of children.

Post-it Fax Note 7672

To: *Harling Lawson Associates*
Company: *Harling Lawson Associates*
Location: *Orlando*
Fax #: *407-855-0329* Telephone #

No. of Pages: *8* Today's Date: *6/27* Time: *1:45 PM*
From: *JACK WANAT*
Company: *FOAMEX*
Location: *ORLANDO* Dept. Charge
Fax #
Original Disposition: Destroy Return Call for pickup

Banner glue containing Methylene Chloride. MSDS

MATERIAL SAFETY DATA SHEET

PAGE 1

IMPERIAL ADHESIVES, INC.
6315 WICHE RD. CINCINNATI, OHIO 45237 137

INFORMATION & EMERGENCY NOS: IMPERIAL (513) 351-1300, CHEMTREC (800) 424-9300

PRODUCT IDENTITY 109355 WHISPER SPRAY

RECEIVED
APR 30 1993

PLANT MANAGER/SAFETY DIRECTOR
FOAMEX
REGENCY INDUSTRIAL PARK
1351 GEMINI BLVD.
ORLANDO, FL. 32837

INVOICE NO: 231300
ORDER DATE: 4/20/93
LAST REVISION DATE: 4/07/93
REVISION NUMBER: 002

HMIS RATING

ACUTE HEALTH: 1+ FLAMMABILITY: 1 REACTIVITY: 0
HAZARD RATING: 0-MINIMAL 1-SLIGHT 2-MODERATE 3-HIGH 4-EXTREME --CHRONIC

SECTION I - PRODUCT IDENTIFICATION

PRODUCT IDENTITY: 109355 WHISPER SPRAY
CHEMICAL NAME: N/A - MIXTURE
D.O.T. NUMBER: N/A D.O.T. HAZARD CLASS: N/A

SECTION II - HAZARDOUS COMPONENTS

HAZARDOUS COMPONENTS ARE LISTED IN THIS SECTION IF THEY ARE PRESENT AT OR ABOVE 1% IN THE MIXTURE. NTP, IARC AND OSHA CARCINOGENS ARE LISTED AND FOOTNOTED IF THEY ARE PRESENT AT OR ABOVE 0.1% IN THE MIXTURE. ADDITIONAL INFORMATION MAY BE FOUND IN SECTION VI. OTHER COMPONENTS MAY BE LISTED IF DEEMED APPROPRIATE. THE PERCENT BY WEIGHT GIVEN IS AN APPROXIMATE FORMULATION VALUE FOR THE COMPONENT IN THE FINISHED PRODUCT AND NOT A SPECIFICATION. COMPONENTS NOT LISTED ARE DEEMED TO BE NON-HAZARDOUS UNDER THE CRITERIA OF THE FEDERAL OSHA HAZARD COMMUNICATION STANDARD 29 CFR 1910.1200. COMPONENTS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA TITLE III SECTION 313 AND 40 CFR PART 372 ARE IDENTIFIED IN THIS SECTION.

CODES: N/R = NOT REQUIRED, N/A = NOT APPLICABLE, N/D = NOT DETERMINED, < = LESS THAN, > = GREATER THAN, MG/CUM = MILLIGRAMS PER CUBIC METER OF AIR

COMPONENTS	% WT.	A C G I H		O S H A		NOTES
		TLV-TWA	TLV-STEL	PEL-TWA	PEL-STEL	
METHYLENE CHLORIDE CAS NO. 75-09-2	70	50 PPM	N/D	500 PPM	N/D	(1,2,3)
ROSIN-DERIVED RESIN CAS NO. 8050-26-8	N/R	N/D	N/D	N/D	N/D	
TERPENE PHENOLIC RESIN CAS NO. 62863-03-4	N/R	N/D	N/D	N/D	N/D	

NOTES:
THIS PRODUCT CONTAINS THE FOLLOWING COMPONENTS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA TITLE III SECTION 313 AND 40 CFR PART 372 IN QUANTITIES GREATER THAN THE "de minimis" LEVEL: METHYLENE CHLORIDE AND PROPYLENE OXIDE (SEE NOTE 2).

(1) THE OSHA ACCEPTABLE CEILING CONCENTRATION IS 1000 PPM. THE OSHA ACCEPTABLE MAXIMUM PEAK ABOVE THE ACCEPTABLE CEILING CONCENTRATION FOR AN 8-HOUR SHIFT IS 2000 PPM FOR A MAXIMUM DURATION OF 5 MINUTES IN ANY 2 HOURS. NIOSH RECOMMENDS TREATING METHYLENE CHLORIDE AS A POTENTIAL HUMAN CARCINOGEN AND REDUCING EXPOSURE TO THE LOWEST FEASIBLE LIMIT.

CONTINUED ON PAGE 2

MATERIAL SAFETY DATA SHEET

PAGE 2

IMPERIAL ADHESIVES, INC.
6315 WIEHE RD. CINCINNATI, OHIO 45237
INFORMATION & EMERGENCY NOS: IMPERIAL (513) 351-1300, CHEMTREC (800) 424-93

PRODUCT IDENTITY 109355 WHISPER SPRAY

SECTION II - HAZARDOUS COMPONENTS (CONTINUED)

NOTES: (CONT'D)

(2) CONTAINS 0.5% PROPYLENE OXIDE CAS NO. 75-56-9. PROPYLENE OXIDE HAS A PEL-TWA OF 20 PPM AND A TLV-TWA OF 20 PPM. NIOSH RECOMMENDS TREATING PROPYLENE OXIDE AS A POTENTIAL HUMAN CARCINOGEN AND REDUCING EXPOSURE TO THE LOWEST FEASIBLE LIMIT. THE AMOUNT OF PROPYLENE OXIDE IN THE FINAL PRODUCT IS APPROXIMATELY 0.4% BY WEIGHT.

(3) BOTH METHYLENE CHLORIDE AND PROPYLENE OXIDE HAVE BEEN LISTED AS POTENTIAL HUMAN CARCINOGENS BY IARC AND NTP (SEE SECTION VI). THE ACGIH LISTS METHYLENE CHLORIDE AS A SUSPECTED HUMAN CARCINOGEN.

SECTION III - PHYSICAL DATA

APPEARANCE: CLEAR AMBER LIQUID

APPROXIMATE BOILING POINT/RANGE (DEG.F): 104

APPROXIMATE SPECIFIC GRAVITY (H₂O = 1): 1.21

APPROXIMATE PERCENT VOLATILE BY WEIGHT: 70

SOLUBILITY IN WATER:

FOR PRODUCT: N/D

FOR METHYLENE CHLORIDE: 2% @ 76 DEG.F.

FOR SOLIDS: NEGLIGIBLE

VAPOR DENSITY (AIR = 1): 2.9

VAPOR PRESSURE (MM HG @ 68 DEG.F): 355

EVAPORATION RATE (N-BUTYL ACETATE = 1): 14.5

FLASH POINT (DEG.F): NONE SETA - HOWEVER HIGH INTENSITY IGNITION SOURCES MAY IGNITE CONCENTRATED VAPORS. SEE SECTION IV.

FLAMMABLE/EXPLOSIVE LIMITS (% VOLUME IN AIR):
LOWER: 13.0 UPPER: 22.0

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT:

SEE BELOW UNDER "UNUSUAL FIRE AND EXPLOSION HAZARDS."

FLAMMABLE LIMITS:

SEE BELOW UNDER "UNUSUAL FIRE AND EXPLOSION HAZARDS."

EXTINGUISHING MEDIA:

WATER FOG

SPECIAL FIRE FIGHTING PROCEDURES:

WEAR SELF-CONTAINED BREATHING APPARATUS WHEN FIGHTING FIRES. WATER MAY BE USED TO KEEP FIRE EXPOSED CONTAINERS COOL UNTIL FIRE IS OUT. AVOID SPREADING BURNING LIQUIDS WITH WATER USED FOR COOLING PURPOSES.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

ALTHOUGH METHYLENE CHLORIDE HAS NO FLASH POINT OR FIRE POINT WHEN TESTED BY CONVENTIONAL MEANS, VAPORS CONCENTRATED IN A CONFINED OR POORLY VENTILATED AREA CAN BE IGNITED UPON CONTACT WITH A HIGH ENERGY SPARK, FLAME OR HIGH INTENSITY SOURCE OF HEAT. THIS CAN OCCUR AT CONCENTRATIONS RANGING FROM 13% TO 22% BY VOLUME.

MATERIAL SAFETY DATA SHEET

PAGE 3

IMPERIAL ADHESIVES, INC.
 6315 WIEHE RD. CINCINNATI, OHIO 45237
 INFORMATION & EMERGENCY NOS: IMPERIAL (513) 351-1300, CHEMTREC (800) 424-9300

PRODUCT IDENTIFY 102355 WHISPER SPRAY

 SECTION IV - FIRE AND EXPLOSION HAZARD DATA (CONTINUED)

UNUSUAL FIRE AND EXPLOSION HAZARDS:
 THE SOLID PORTION OF PRODUCT IS COMBUSTIBLE AND WILL DECOMPOSE DURING COMBUSTION OR UNDER PYROLYSIS CONDITIONS GIVING OFF TOXIC FUMES.

CLOSED CONTAINERS MAY BURST DUE TO PRESSURE BUILD-UP IF EXPOSED TO TEMPERATURES AT OR NEAR THE BOILING POINT OF THE PRODUCT. CLOSED CONTAINERS MAY RUPTURE EXPLOSIVELY IF EXPOSED TO EXTREME HEAT OR FIRE.

NEVER USE WELDING OR CUTTING TORCH ON OR NEAR DRUM (EVEN EMPTY) BECAUSE PRODUCT (EVEN JUST RESIDUE) MAY IGNITE EXPLOSIVELY.

 SECTION V - REACTIVITY DATA

STABILITY:
 STABLE UNDER NORMAL CONDITIONS

CONDITIONS TO AVOID:
 AVOID CONTACT WITH OPEN FLAME, ELECTRIC ARCS, HOT GLOWING SURFACE OR OTHER HIGH TEMPERATURE SOURCES WHICH INDUCE THERMAL DECOMPOSITION.

INCOMPATIBILITY (MATERIALS TO AVOID):
 AVOID CONTACT WITH STRONG OXIDIZING AGENTS, STRONG ALKALIES, STRONG ACIDS, AND CHEMICALLY ACTIVE METALS SUCH AS SODIUM, POTASSIUM, BARIUM, POWDERED ALUMINUM, MAGNESIUM, ZINC. AVOID PROLONGED CONTACT WITH, OR STORAGE IN, ALUMINUM OR ITS ALLOYS. AVOID WATER CONTAMINATION.

HAZARDOUS POLYMERIZATION:
 WILL NOT OCCUR

HAZARDOUS COMBUSTION AND DECOMPOSITION PRODUCTS:
 CARBON MONOXIDE, CARBON DIOXIDE, ACRID (CHOKING) SMOKE AND FUMES, HYDROGEN CHLORIDE, SMALL AMOUNTS OF PHOSGENE AND CHLORINE, VARIOUS HYDROCARBONS, OTHER UNIDENTIFIED TOXIC MATERIALS

 SECTION VI - HEALTH HAZARD DATA

PRIMARY ROUTES OF ENTRY:
 INHALATION, EYE CONTACT, SKIN CONTACT

EFFECTS OF ACUTE OVEREXPOSURE:
 FOR EACH POTENTIAL ROUTE OF EXPOSURE TO PRODUCT MIXTURE BASED ON EFFECTS OF INDIVIDUAL HAZARDOUS COMPONENTS PRESENT IN OSHA REPORTABLE AMOUNTS

EYE CONTACT:
 VAPORS ARE IRRITATING. DIRECT CONTACT WITH THE LIQUID OR OVEREXPOSURE TO ITS VAPORS OR MISTS CAN CAUSE MODERATE IRRITATION, PAIN, BURNING, TEARING, REDNESS. MAY CAUSE SLIGHT CORNEAL INJURY. EYE EFFECTS MAY BE ACCENTUATED IF MATERIAL IS NOT PROMPTLY REMOVED.

SKIN CONTACT:
 CONTACT MAY CAUSE IRRITATION. PROLONGED OR REPEATED CONTACT CAN CAUSE IRRITATION, PAIN, BURNING, REDNESS, DEFATTING (DRYING, CRACKING OR FLAKING OF SKIN), DERMATITIS (INFLAMMATION OF SKIN) AND POSSIBLE BURNS. SKIN EFFECTS MAY BE ACCENTUATED BY LIQUID BECOMING TRAPPED AGAINST THE SKIN BY CONTAMINATED CLOTHING AND SHOES. PERSONS WITH PRE-EXISTING SKIN DISORDERS MAY BE MORE SUSCEPTIBLE TO THE EFFECTS OF THIS MATERIAL.

MATERIAL SAFETY DATA SHEET

PAGE 4

IMPERIAL ADHESIVES, INC.

6315 WIEHE RD. CINCINNATI, OHIO 45237

INFORMATION & EMERGENCY NOS: IMPERIAL (513) 351-1300, CHEMTREC (800) 424-9300

PRODUCT IDENTITY 109355

WHISPER SPRAY

SECTION VI - HEALTH HAZARD DATA

(CONTINUED)

SKIN ABSORPTION:

ALTHOUGH ABSORPTION OF LIQUID THROUGH INTACT SKIN IS POSSIBLE, RESULTING IN SYSTEMIC EFFECTS (INJURY TO OTHER BODY SYSTEMS), A SINGLE PROLONGED EXPOSURE IS NOT LIKELY TO RESULT IN THE ABSORPTION OF HARMFUL AMOUNTS OF MATERIAL.

INHALATION:

EXCESSIVE INHALATION OF VAPORS OR MISTS CAN CAUSE NASAL AND RESPIRATORY IRRITATION, HEADACHE, NAUSEA, SIGNS OF NERVOUS SYSTEM DEPRESSION (SUCH AS LIGHTHEADEDNESS, DIZZINESS, LOSS OF COORDINATION AND EQUILIBRIUM, DROWSINESS, WEAKNESS, FATIGUE), POSSIBLE UNCONSCIOUSNESS, AND EVEN DEATH IN CONFINED OR POORLY VENTILATED AREAS. OVEREXPOSURE MAY CAUSE CARDIAC ARRHYTHMIAS (IRREGULAR HEARTBEATS).

OVEREXPOSURE TO METHYLENE CHLORIDE MAY CAUSE CARBOXYHEMOGLOBINEMIA, THEREBY IMPAIRING THE BLOOD'S ABILITY TO TRANSPORT OXYGEN. CONCENTRATIONS OF METHYLENE CHLORIDE IN THE 500 PPM TO 1000 PPM RANGE MAY PRODUCE MINIMAL ANESTHETIC OR NARCOTIC EFFECTS. PROGRESSIVELY HIGHER CONCENTRATIONS OVER 1000 PPM CAN CAUSE DIZZINESS OR DRUNKENNESS. CONCENTRATIONS AS LOW AS 10,000 PPM CAN CAUSE UNCONSCIOUSNESS AND DEATH. THESE HIGH CONCENTRATIONS MAY ALSO CAUSE CARDIAC ARRHYTHMIAS (IRREGULAR HEARTBEATS).

INGESTION:

MAY CAUSE IRRITATION OF THE DIGESTIVE TRACT, HEADACHE, NAUSEA, VOMITING, DIARRHEA AND SIGNS OF NERVOUS SYSTEM DEPRESSION AS FOR INHALATION. ASPIRATION OF MATERIAL INTO THE LUNGS DURING SWALLOWING OR VOMITING CAN CAUSE CHEMICAL PNEUMONITIS (LUNG INFLAMMATION AND DAMAGE) WHICH CAN BE FATAL. IF ASPIRATED, MAY BE RAPIDLY ABSORBED THROUGH THE LUNGS AND RESULT IN INJURY TO OTHER BODY SYSTEMS.

THE SINGLE DOSE ORAL TOXICITY OF METHYLENE CHLORIDE IS LOW. THE LD50 FOR RATS IS IN THE RANGE OF 1500-2500 MG/KG.

EMERGENCY AND FIRST AID PROCEDURES:

GET IMMEDIATE MEDICAL ATTENTION IF ANY SYMPTOMS OF OVEREXPOSURE OCCUR.

IF IN EYES:

IMMEDIATELY FLUSH WITH LARGE AMOUNTS OF WATER FOR AT LEAST 15 MINUTES. LIFTING UPPER AND LOWER EYELIDS OCCASIONALLY. GET IMMEDIATE MEDICAL ATTENTION.

IF ON SKIN:

REMOVE CONTAMINATED CLOTHING. THOROUGHLY WASH EXPOSED SKIN AREA WITH SOAP AND WATER. LAUNDRY CONTAMINATED CLOTHING BEFORE REUSE. DISCARD CONTAMINATED SHOES. SEE A PHYSICIAN IF IRRITATION OR INJURY DEVELOPS.

IF BREATHED:

IF AFFECTED, REMOVE INDIVIDUAL TO FRESH AIR. IF BREATHING IS DIFFICULT, ADMINISTER OXYGEN. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. KEEP PERSON WARM, QUIET AND GET MEDICAL ATTENTION. DO NOT GIVE STIMULANTS, EPINEPHRINE (ADRENALIN), OR EPHEDRINE MAY ADVERSELY AFFECT THE HEART WITH FATAL RESULTS.

IF SWALLOWED:

IF MATERIAL HAS BEEN CONFINED TO MOUTH, RINSE OUT MOUTH WITH WATER. DO NOT SWALLOW WATER USED FOR RINSING PURPOSES. IF MATERIAL HAS BEEN SWALLOWED, IMMEDIATELY DRINK TWO GLASSES OF WATER. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. DO NOT INDUCE VOMITING. ASPIRATION OF MATERIAL INTO THE LUNGS DUE TO VOMITING CAN CAUSE CHEMICAL PNEUMONITIS AND/OR SYSTEMIC EFFECTS WHICH CAN BE FATAL. KEEP PERSON WARM, QUIET AND GET MEDICAL ATTENTION.

MATERIAL SAFETY DATA SHEET

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 INFORMATION & EMERGENCY NOS: IMPERIAL (513) 351-1300, CHEMTREC (800) 424-9300

PRODUCT IDENTITY 109355

WHISPER SPRAY

SECTION VI - HEALTH HAZARD DATA

(CONTINUED)

NOTE(S) TO PHYSICIAN:

BECAUSE RAPID ABSORPTION MAY OCCUR THROUGH LUNGS IF ASPIRATED AND CAUSE SYSTEMIC EFFECTS, THE DECISION OF WHETHER TO INDUCE VOMITING OR NOT SHOULD BE MADE BY AN ATTENDING PHYSICIAN. IF LAVAGE IS PERFORMED, SUGGEST ENDOTRACHEAL AND/OR ESOPHAGEAL CONTROL. DANGER FROM LUNG ASPIRATION MUST BE WEIGHED AGAINST TOXICITY WHEN CONSIDERING EMPTYING THE STOMACH. EXPOSURE MAY INCREASE "MYOCARDIAL IRRITABILITY." DO NOT ADMINISTER SYMPATHOMIMETIC DRUGS UNLESS ABSOLUTELY NECESSARY. IF BURN IS PRESENT, TREAT AS ANY THERMAL BURN, AFTER DECONTAMINATION. NO SPECIFIC ANTIDOTE. SUPPORTIVE CARE. TREATMENT BASED ON JUDGMENT OF THE PHYSICIAN IN RESPONSE TO REACTIONS OF THE PATIENT.

EFFECTS OF CHRONIC OVEREXPOSURE:

OVEREXPOSURE TO METHYLENE CHLORIDE CAN RAISE THE LEVEL OF CARBON MONOXIDE IN THE BLOOD CAUSING CARDIOVASCULAR STRESS. METHYLENE CHLORIDE HAS BEEN SHOWN TO CAUSE CANCER IN LABORATORY ANIMALS. METHYLENE CHLORIDE HAS BEEN LISTED AS A POSSIBLE HUMAN CARCINOGEN (GROUP 2B) BY IARC (INTERNATIONAL AGENCY FOR RESEARCH ON CANCER) AND AS A SUBSTANCE THAT "MAY REASONABLY BE ANTICIPATED TO BE A CARCINOGEN" BY NTP (NATIONAL TOXICOLOGY PROGRAM). THERE IS INADEQUATE INFORMATION TO ASSOCIATE METHYLENE CHLORIDE EXPOSURE DURING PREGNANCY WITH HARM TO THE FETUS.

OVEREXPOSURE TO METHYLENE CHLORIDE HAS APPARENTLY BEEN FOUND TO CAUSE LIVER ABNORMALITIES, KIDNEY EFFECTS AND LUNG DAMAGE IN LABORATORY ANIMALS

THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) HAS CLASSIFIED PROPYLENE OXIDE AS A PROBABLE HUMAN CARCINOGEN (GROUP 2A) BASED UPON SUFFICIENT EVIDENCE FROM LABORATORY ANIMAL TEST DATA. THE NATIONAL TOXICOLOGY PROGRAM (NTP) HAS LISTED PROPYLENE OXIDE AS A SUBSTANCE THAT "MAY REASONABLY BE ANTICIPATED TO BE A CARCINOGEN."

OVEREXPOSURE TO ROSIN-DERIVED RESINS: ROSIN AND SOME OF ITS DERIVATIVES HAVE BEEN REPORTED TO CAUSE SKIN SENSITIZATION OR AN ALLERGIC SKIN REACTION SUCH AS A RASH IN SUSCEPTIBLE INDIVIDUALS AFTER REPEATED OR PROLONGED SKIN CONTACT. SKIN CONTACT WITH THIS OR OTHER ROSIN DERIVATIVES AFTER SENSITIZATION MAY CAUSE AN ALLERGIC SKIN REACTION.

OVEREXPOSURE TO TERPENE PHENOLIC RESIN: NONE KNOWN

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

RESPIRATORY SYMPTOMS ASSOCIATED WITH PRE-EXISTING LUNG DISORDERS (e.g., ASTHMA-LIKE CONDITIONS) MAY BE AGGRAVATED BY EXPOSURE TO THIS MATERIAL. SKIN CONTACT MAY AGGRAVATE AN EXISTING DERMATITIS.

PRE-EXISTING ABNORMAL CONDITIONS OF THE EYES, SKIN, NOSE, THROAT, LUNGS, RESPIRATORY SYSTEM, AND/OR THE LIVER MAY BE AGGRAVATED BY EXPOSURE TO PHENOLIC RESINS.

OTHER HEALTH INFORMATION:

REPORTS HAVE ASSOCIATED REPEATED AND PROLONGED OCCUPATIONAL OVEREXPOSURE TO ORGANIC SOLVENTS WITH VARIOUS NEUROTOXIC EFFECTS INCLUDING PERMANENT BRAIN AND NERVOUS SYSTEM DAMAGE. SYMPTOMS INCLUDE LOSS OF MEMORY, LOSS OF INTELLECTUAL ABILITY AND LOSS OF COORDINATION. CHRONIC SKIN EXPOSURE TO SOLVENTS MAY CAUSE SIMILAR EFFECTS. INTENTIONAL MISUSE BY DELIBERATELY CONCENTRATING AND INHALING THE CONTENTS OF THIS PRODUCT MAY BE HARMFUL OR FATAL.

IF THIS MATERIAL IS USED IN A MANNER THAT COULD GENERATE PARTICULATES (DUST) AFTER SOLVENT EVAPORATION, IT IS RECOMMENDED THAT THE DUST BE TREATED AS A NUISANCE PARTICULATE ACCORDING TO THE AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH), TLV-TWA 10 MG/CUM OF TOTAL DUST.

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SECTION VI - HEALTH HAZARD DATA

(CONTINUED)

OTHER HEALTH INFORMATION:

ANY PROPOSED USE OF THIS PRODUCT IN ELEVATED-TEMPERATURE PROCESSES OR IN SPRAY APPLICATIONS SHOULD BE THOROUGHLY EVALUATED TO ASSURE THAT SAFE OPERATING CONDITIONS ARE ESTABLISHED AND MAINTAINED.

SECTION VII - SPILL, LEAK AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
WEAR APPROPRIATE SKIN AND EYE PROTECTION DURING CLEANUP. USE RESPIRATORY PROTECTION IF NEEDED.

SMALL SPILLS:

ABSORB LIQUID ON PAPER, RAGS, VERMICULITE, FLOOR ABSORBENT OR OTHER ABSORBENT MATERIAL AND TRANSFER TO HOOD. ALLOW VOLATILE PORTION TO EVAPORATE IN HOOD. ALLOW SUFFICIENT TIME FOR VAPORS TO COMPLETELY CLEAR HOOD DUCT WORK. AFTER VOLATILE PORTION HAS EVAPORATED, TRANSFER REMAINING MATERIAL TO APPROPRIATELY MARKED CONTAINER.

LARGE SPILLS:

ELIMINATE ALL IGNITION SOURCES (FLARES, FLAMES INCLUDING PILOT LIGHTS, ELECTRICAL SPARKS). PERSONS NOT WEARING PROTECTIVE EQUIPMENT SHOULD BE EXCLUDED FROM AREA OF SPILL UNTIL CLEAN-UP HAS BEEN COMPLETED. STOP SPILL AT SOURCE. DIKE AREA OF SPILL TO PREVENT SPREADING. PUMP LIQUID TO SALVAGE CONTAINER. REMAINING LIQUID MAY BE TAKEN UP ON SAND, CLAY, EARTH, FLOOR ABSORBENT, OR OTHER ABSORBENT MATERIAL AND SHOVELED INTO CONTAINERS. PREVENT RUN-OFF TO SEWERS, STREAMS OR OTHER BODIES OF WATER. IF RUN-OFF OCCURS, NOTIFY PROPER AUTHORITIES AS REQUIRED, THAT A SPILL HAS OCCURRED.

WASTE DISPOSAL METHOD:

DISPOSE OF MATERIAL IN ACCORDANCE WITH APPLICABLE LOCAL, COUNTY, STATE AND FEDERAL REGULATIONS. AS PRODUCED, THIS MATERIAL IS A PRODUCT AND NOT A WASTE.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION:

IF THE TLV OF THE PRODUCT OR ANY COMPONENT IS EXCEEDED, OR IF THE PRODUCT IS USED IN SUCH A MANNER AS TO GENERATE PARTICULATES (FUME, DUST, MIST), A NIOSH APPROVED RESPIRATOR IS ADVISED IN THE ABSENCE OF PROPER ENVIRONMENTAL CONTROL (SEE YOUR SAFETY EQUIPMENT SUPPLIER). ENGINEERING OR ADMINISTRATIVE CONTROLS SHOULD BE IMPLEMENTED TO REDUCE EXPOSURE.

VENTILATION:

GENERAL MECHANICAL VENTILATION MAY BE SUFFICIENT TO KEEP PRODUCT VAPOR AND/OR MIST CONCENTRATIONS WITHIN SPECIFIED TLV RANGES. IF GENERAL VENTILATION PROVES INADEQUATE TO MAINTAIN SAFE VAPOR AND/OR MIST CONCENTRATIONS, SUPPLEMENTAL LOCAL EXHAUST MAY BE REQUIRED.

PROTECTIVE GLOVES:

THE USE OF IMPERMEABLE GLOVES ARE ADVISED TO PREVENT SKIN IRRITATION IN SENSITIVE INDIVIDUALS (SEE YOUR SAFETY EQUIPMENT SUPPLIER).

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SECTION VIII - SPECIAL PROTECTION INFORMATION (CONTINUED)

EYE PROTECTION:

CHEMICAL SPLASH GOGGLES IN COMPLIANCE WITH OSHA REGULATIONS ARE RECOMMENDED TO SAFEGUARD AGAINST POTENTIAL EYE CONTACT, IRRITATION OR INJURY. HOWEVER, OSHA REGULATIONS ALSO PERMIT OTHER TYPE SAFETY GLASSES (CONSULT YOUR SAFETY EQUIPMENT SUPPLIER).

OTHER PROTECTIVE EQUIPMENT:

FOR OPERATIONS WHERE CONTACT CAN OCCUR, COVERALLS, APRON AND RUBBER FOOT COVERINGS ARE RECOMMENDED. A SAFETY SHOWER AND EYEWASH FACILITY SHOULD BE AVAILABLE.

SECTION IX - SPECIAL PRECAUTIONS AND OTHER COMMENTS

STORAGE AND HANDLING PRECAUTIONS:

PRACTICE SAFE WORKING PROCEDURES AND GOOD PERSONAL HYGIENE. USE PROTECTIVE EQUIPMENT WHEN NECESSARY. WASH THOROUGHLY AFTER HANDLING AND BEFORE EATING, DRINKING, SMOKING OR USING TOILET FACILITIES.

HANDLE WITH REASONABLE CARE. STORE IN A COOL, DRY, VENTILATED AREA. KEEP AWAY FROM HEAT AND OPEN FLAME. KEEP CONTAINERS TIGHTLY CLOSED WHEN NOT IN USE. USE WITH ADEQUATE VENTILATION. AVOID BREATHING VAPORS AND SPRAY MIST. AVOID EYE CONTACT AND REPEATED OR PROLONGED SKIN CONTACT. MATERIAL IS HIGHLY VOLATILE. IN CONFINED OR POORLY VENTILATED AREAS, VAPORS WHICH READILY ACCUMULATE CAN CAUSE UNCONSCIOUSNESS AND DEATH. CONCENTRATED VAPORS OF THIS PRODUCT ARE HEAVIER THAN AIR AND WILL COLLECT IN LOW AREAS SUCH AS PITS, DEGREASERS, STORAGE TANKS AND OTHER CONFINED AREAS. DO NOT ENTER AREAS WHERE VAPORS OF THIS PRODUCT ARE SUSPECTED UNLESS SPECIAL BREATHING APPARATUS IS USED AND AN OBSERVER IS PRESENT FOR ASSISTANCE. WHEN OPENING CONTAINERS, REMOVE TOP SLOWLY TO RELIEVE ANY PRESSURE BUILD-UP. DO NOT TRANSFER TO UNPARKED CONTAINER. FOR INDUSTRIAL USE ONLY.

ALUMINUM, MAGNESIUM AND THEIR ALLOYS ARE NOT ACCEPTABLE MATERIALS OF CONSTRUCTION FOR PUMPS, MIXERS, FITTINGS OR STORAGE TANKS BECAUSE SOLVENT DECOMPOSITION MAY OCCUR (ESPECIALLY IN PRESSURIZED OR ENCLOSED SYSTEMS) GENERATING HEAT, PRESSURE AND CORROSIVE GASES.

WHEN EXPOSED TO DIRECT HEAT, CHLORINATED SOLVENT LIQUID AND VAPORS FORM HYDROGEN CHLORIDE AND OTHER TOXIC AND CORROSIVE GASES WHICH WILL CORRODE METALS AND IRRITATE EYES, SKIN AND RESPIRATORY SYSTEM. LONG TERM CONTACT WITH WATER CAN DEplete STABILIZERS FOLLOWED BY SLOW HYDROLYSIS PRODUCING CORROSIVE ACID.

OTHER PRECAUTIONS:

PRODUCT MAY CORRODE, DEGRADE, OR OTHERWISE REACT WITH SOME METALS AND PLASTICS UPON PROLONGED CONTACT. CONSULT WITH EQUIPMENT SUPPLIER FOR PROPER CONSTRUCTION MATERIALS FOR STORAGE TANKS, MIXERS, FITTINGS, PIPES AND OTHER STORAGE AND HANDLING EQUIPMENT.

CONTAINERS OF THIS MATERIAL MAY BE HAZARDOUS WHEN EMPTIED. BECAUSE EMPTIED CONTAINERS RETAIN RESIDUES (VAPORS, LIQUIDS AND/OR SOLIDS), ALL HAZARD PRECAUTIONS GIVEN IN THIS DATA SHEET MUST BE OBSERVED.

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SECTION IX - SPECIAL PRECAUTIONS AND OTHER COMMENTS (CONTINUED)

OTHER COMMENTS:

THE RESPONSIBILITY TO PROVIDE A SAFE WORKPLACE REMAINS WITH THE USER. THE USER SHOULD CONSIDER THE HEALTH HAZARDS AND SAFETY INFORMATION CONTAINED HEREIN AS A GUIDE AND SHOULD TAKE THOSE PRECAUTIONS REQUIRED IN AN INDIVIDUAL OPERATION TO INSTRUCT EMPLOYEES AND TO DEVELOP WORK PRACTICE PROCEDURES FOR A SAFE WORK ENVIRONMENT.

THE INFORMATION CONTAINED HEREIN IS, TO THE BEST OF OUR KNOWLEDGE AND BELIEF, ACCURATE. HOWEVER, BECAUSE THE CONDITIONS OF HANDLING AND USE ARE BEYOND OUR CONTROL, WE MAKE NO GUARANTEE OF RESULTS, AND ASSUME NO LIABILITY FOR DAMAGES INCURRED BY THE USE OF THIS MATERIAL. IT IS THE RESPONSIBILITY OF THE USER TO COMPLY WITH ALL FEDERAL, STATE AND LOCAL LAWS AND REGULATIONS.

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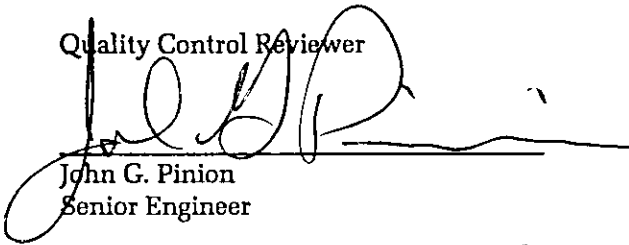
Application For Permit To
Construct Air Pollution Source
Foamex, L.P.
Volume I
Flexible Polyurethane Foam Manufacturing Facility
Orlando, Florida

June 30, 1994

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