STATE OF MICHIGAN

DEPARTMENT OF NATURAL RESOURCES
AIR QUALITY DIVISION
P.O. BOX 30028
LANSING, MICHIGAN 48909

AIR USE PERMIT APPLICATION

APPLICATION NO. 799-92

A-1

FOR AUTHORITY TO INSTALL, CONSTRUCT, RECONSTRUCT, RELOCATE, OR ALTER, AND OPERATE PROCESS, FUEL-BURNING, OR REFUSE-BURNING EQUIPMENT AND/OR CONTROL EQUIPMENT (PERMITS TO INSTALL AND OPERATE ARE REQUIRED BY ADMINISTRATIVE RULES PURSUANT TO ACT 348, P.A. 1965, AS AMENDED).

AIR QUALITY DIVISION
AUG 19 1992
PERMIT SECTION

1. APPLICANT: Business License Name of Corporation, Partnership, Individual Owner, Government Agency
CMI-TECH CENTER, INC.

2. MAILING ADDRESS: Number and Street; City or Village; State; Zip Code
1600 W. 8 MILE ROAD, FERNDALE, MICHIGAN 48220-2202

3. EQUIPMENT OR PROCESS LOCATION: Number and Street; City, Village or Township
1600 W. 8 MILE ROAD, FERNDALE

COUNTY: OAKLAND

ZIP CODE: 48220-2202

4. GENERAL NATURE OF BUSINESS:
POLYMER INJECTION MOLDING

5. EQUIPMENT OR PROCESS DESCRIPTION:
A PROTOTYPE NYLON PLASTIC INJECTION MOLDING FACILITY. REFER TO APPLICATION NO. 542-91.

6. ESTIMATED COST:
Air Pollution Control Equipment $; Total Project $ 400,000

7. ACTION AND TIMING:

	ESTIMATED STARTING DATE	ESTIMATED COMPLETION DATE
☐ Installation, construction, reconstruction, or alteration		
☒ Relocation	JANUARY, 1993	JANUARY, 1993
☐ Change of Ownership		

8. NAME OF PRIOR OWNER AS IN ITEM 1 ABOVE, AND PRIOR AIR USE PERMIT NUMBER, IF ANY:
NAME TERRY FRANKLYN, CMI-NOREN, INC. PERMIT NO APPLICATION 542-91

9. NAME AND TITLE OF OWNER OR AUTHORIZED MEMBER OF FIRM
Name DR. GARY RUFF Signature Gary S. Ruff
Title: EXECUTIVE VICE PRESIDENT Date: 8/6/92 Phone No. (313) 399-9600

10. CONTACT PERSON IF DIFFERENT THAN ITEM 9:
Name JEFFREY NORTON Phone No. (313) 357-5180

11. DISPOSITION OF APPLICATION: FOR DNR USE ONLY

Receipt of all information required by Rule 203	1/4/93	
Permit to install approved * on	1/7/93	* Signature Dawn M. Drake
Permit to operate approved * on		Signature
Application/permit voided on	3-13-07	Signature Lynn Fiedler
Application/permit denied on		Signature

*Subject to compliance with all Commission Rules and Conditions stipulated in the attached supplement.

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

JENNIFER M. GRANHOLM
GOVERNOR

STEVEN E. CHESTER
DIRECTOR

March 13, 2007

Environmental Coordinator
Hayes Lemmerz International Incorporated
1600 West Eight Mile Road
Ferndale, Michigan 48220

To Whom It May Concern:

This letter is in reference to your Permits to Install approved on various dates, for different processes, located at 1600 West Eight Mile Road, Ferndale, Michigan.

These permits identified as 799-92 and 368-99 have been voided as requested by Mr. Erik Gurshaw, Southeast Michigan District, Air Quality Division, Department of Environmental Quality (DEQ). These permits are void because all operations have ceased.

Please contact me if you have any questions concerning this action.

Sincerely,

Sue Thelen

Sue Thelen
Permit Section
Air Quality Division
517-373-7068

Enclosure
cc/enc: Ms. Teresa Seidel, DEQ

DEPARTMENT OF NATURAL RESOURCES
AIR QUALITY DIVISION
P.O. BOX 30028
LANSING, MICHIGAN 48909

STATE OF MICHIGAN

AIR USE PERMIT APPLICATION

FOR AUTHORITY TO INSTALL, CONSTRUCT, RECONSTRUCT, RELOCATE, OR ALTER, AND OPERATE PROCESS, FUEL-BURNING, OR REFUSE-BURNING EQUIPMENT AND/OR CONTROL EQUIPMENT (PERMITS TO INSTALL AND OPERATE ARE REQUIRED BY ADMINISTRATIVE RULES PURSUANT TO ACT 348, P.A. 1965, AS AMENDED).

APPLICATION NO. 799-92

AIR QUALITY DIVISION

AUG 19 1992

PERMIT SECTION

A-1

1. APPLICANT: Business License Name of Corporation, Partnership, Individual Owner, Government Agency
CMI-TECH CENTER, INC.

2. MAILING ADDRESS: Number and Street; City or Village; State; Zip Code
1600 W. 8 MILE ROAD, FERNDALE, MICHIGAN 48220-2202

3. EQUIPMENT OR PROCESS LOCATION: Number and Street; City, Village or Township
1600 W. 8 MILE ROAD, FERNDALE

COUNTY: OAKLAND

ZIP CODE: 48220-2202

4. GENERAL NATURE OF BUSINESS:
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5. EQUIPMENT OR PROCESS DESCRIPTION:
A PROTOTYPE NYLON PLASTIC INJECTION MOLDING FACILITY. REFER TO APPLICATION NO. 542-91.

6. ESTIMATED COST:
Air Pollution Control Equipment $; Total Project $ 400,000

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☐ Installation, construction, reconstruction, or alteration		
☒ Relocation	JANUARY, 1993	JANUARY, 1993
☐ Change of Ownership		

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NAME TERRY FRANKLYN, CMI-NOREN, INC. PERMIT NO. APPLICATION 542-91

9. NAME AND TITLE OF OWNER OR AUTHORIZED MEMBER OF FIRM
Name DR. GARY RUFF Signature Gary S Ruff
Title: EXECUTIVE VICE PRESIDENT Date: 8/6/92 Phone No. (313) 399-9600

10. CONTACT PERSON IF DIFFERENT THAN ITEM 9:
Name JEFFREY NORTON Phone No. (313) 357-5180

11. DISPOSITION OF APPLICATION: FOR DNR USE ONLY

Receipt of all information required by Rule 203	1/4/93	
Permit to install approved * on	1/7/93	Signature Dennis M. Drake
Permit to operate approved * on		Signature
Application/permit voided on	3-1307	Signature
Application/permit denied on		Signature

*Subject to compliance with all Commission Rules and Conditions stipulated in the attached supplement.

CMI-TECH CENTER, INC.
1600 W. Eight Mile Rd. Ferndale, MI 48220
A SUBSIDIARY OF CMI INTERNATIONAL INC.
[313] 399-9600

Copy sent to District Engineer
on 4-6-93

AIR QUALITY DIVISION
FEB 19 1993
PERMIT SECTION

February 18, 1993

Michigan Department of Natural Resources
Chief
Permit Unit
Air Quality Division
P.O. Box 30028
Lansing, Michigan 48909

Dear Sir or Madam:

This letter is to serve as formal notice and/or CMI's written application for a "Permit to Operate" a prototype plastic injection molding facility located at 1600 West 8 Mile Road, Ferndale, Michigan.

This request is in keeping with Rule 208 (2) and coincides with our "Permit to Install" identified as No. 799-92.

The facility is scheduled to be in Full operation on or about April 1, 1993.

Thank-you for your cooperation, should you have any questions please contact me direct.

Sincerely,

Jeff Norton
Environmental Engineer

cc: Dr. Gary Ruff
Diane Zekind

NATURAL RESOURCES COMMISSION
LARRY DEVUYST
PAUL EISELE
JAMES P. HILL
DAVID HOLLI
O. STEWART MYERS
JOEY M. SPANO
JORDAN B. TATTER

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF NATURAL RESOURCES

Stevens T. Mason Building, P.O. Box 30028, Lansing, MI 48909

ROLAND HARMES, Director

January 12, 1993

Dr. Gary Ruff
CMI-Tech Center, Inc.
1600 West 8 Mile Road
Ferndale, MI 48220-2202

Dear Dr. Ruff:

This letter is in reference to your Permit to Install application for a prototype plastic injection molding facility, located at 1600 West 8 Mile Road, Ferndale, Michigan. This application, identified as No. 799-92, has been evaluated and approved by the Air Quality Division, pursuant to the delegation of authority from the Michigan Air Pollution Control Commission.

This approval is based upon and subject to compliance with all administrative rules of the Commission and conditions stipulated in the attached supplement. Please review these conditions thoroughly so that you may plan for and take the actions necessary to ensure compliance with all of these conditions. Also note that Condition No. 1 requires you to apply, in writing, for a permit to operate within 30 days after completion of construction.

You are advised that contaminants discharged to the surface waters and/or groundwaters; materials disposed of on land; hazardous waste storage, treatment, and disposal; and resource recovery facilities must be approved by other divisions of the Department of Natural Resources. Additionally, your plant environment must be in compliance with all applicable requirements of the Departments of Public Health and Labor.

Additionally, Permit to Install No. 542-91 has been voided with the issuance of this permit, because the equipment has been relocated to this facility and is now covered by this permit.

Thank you for your cooperation. Please contact me if you have any questions regarding this permit.

Sincerely,

Dulles D. Copedge, Engineer
Thermal Process Unit
Permit Section
Air Quality Division
517-373-7081

DDC:nm
Enclosure
cc: Fred Rieth

SUPPLEMENT TO PERMIT NO. 799-92

CMI-Tech Center, Inc.
Ferndale, Michigan

JANUARY 7, 1993

GENERAL CONDITIONS

1. Rule 208(2) - Not more than 30 days after completion of the installation, Applicant shall apply, in writing, for a Permit to Operate. Completion of the installation is deemed to occur not later than commencement of a trial operation pursuant to Rule 201(4). Written application should be sent to: Chief, Permit Unit, Air Quality Division, Department of Natural Resources, P.O. Box 30028, Lansing, Michigan 48909.

2. Rule 201(4) - Trial operation of the equipment is permitted until the Michigan Air Pollution Control Commission acts upon the Permit to Operate. Operation of the equipment shall permanently cease upon denial of the Permit to Operate by the Commission.

3. Rule 208(3)(a) and (c) - Applicant shall demonstrate compliance with all Commission rules and with all general and special conditions of this permit prior to issuance of the Permit to Operate.

4. Rule 201 - Applicant shall not reconstruct, alter, modify, expand, or relocate this equipment unless plans, specifications, and an application for a Permit to Install are submitted to and approved by the Commission.

5. Rule 901 - Operation of this equipment shall not result in the emission of an air contaminant which causes injurious effects to human health or safety, animal life, plant life of significant value, or property, or which causes unreasonable interference with the comfortable enjoyment of life and property.

6. Rule 208(3)(b) - Operation of this equipment shall not interfere with the attainment or maintenance of the air quality standard for any air contaminant.

7. Operation of this equipment shall not result in significant deterioration of air quality.

8. Rule 912 - Applicant shall provide notification of any abnormal conditions or malfunction of process or control equipment covered by this application, resulting in emissions in violation of the Commission rules or of any permit conditions for more than two hours, to the District Supervisor. Such notice shall be made as soon as reasonably possible, but not later than 9:00 a.m. of the next working day. Applicant shall also, within 10 days, submit to the District Supervisor, a written detailed report, including probable causes, duration of violation, remedial action taken, and the steps which are being undertaken to prevent a reoccurrence.

9. Approval of this application does not exempt the Applicant from complying with any future regulations which may be promulgated under Act 348, P.A. 1965, as amended.

10. Approval of this permit does not obviate the necessity of obtaining such permits or approvals from other units of government as required by law.

11. Act No. 53 - Applicant shall notify any public utility of any excavation, tunneling and discharging of explosives or demolition of buildings which may affect said utility's facilities in accordance with Act 53 of the Public Acts of 1974, being sections 460.701 to 460.718 of the Michigan Compiled Laws and comply with each of the requirements of that Act.

12. The restrictions and conditions of this Permit to Install shall apply to any person or legal entity which now or shall hereafter own or operate the equipment for which this Permit to Install is issued. Any new owner or operator shall immediately notify the Chief of the Permit Unit, in writing, of such change in ownership or principal operator status of this equipment.

13. Rule 201(5) - If the installation, reconstruction, relocation, or alteration of the equipment for which this permit has been approved has not commenced within, or has been interrupted for, 18 months, this permit shall become void unless otherwise authorized by the Commission.

14. Rule 285 - Except as allowed by Rule 285 (a), (b), and (c), applicant shall not substitute any fuels, coatings, nor raw materials for those described in the application and allowed by this permit, nor make changes to the process or process equipment described in the application, without prior notification to and approval by the Air Quality Division.

SPECIAL CONDITIONS

15. There shall be no visible emissions from the prototype plastic injection molding facility, hereinafter "facility."

16. The volatile organic compound (VOC) emission rate from the facility shall not exceed 0.1 pounds per hour nor 4.4 tons per year.

17. Records of monthly material usage rates shall be kept on file for a period of at least two years and made available to the Air Quality Division upon request.

18. The exhaust gases from the facility process shall be discharged unobstructed vertically upwards to the ambient air from a stack with a maximum diameter of 6 inches at an exit point not less than 37 feet above ground level.

DDC:nm

AQD/PMT/8-92

PERMIT EVALUATION SHEET

APPLICANT NAME CMI-TECH CENTER INC APPLICATION NO. 799-92
E.I. NO.: A-4646 ,(DATE REQUESTED IF NEW)
LOCATION OF SOURCE: MAILING ADDRESS (IF DIFFERENT):
STREET ADDRESS 1600 8 MILE RD STREET ADDRESS SAME
CITY FERNDALE ZIP 48220-2202 CITY ZIP
COUNTY NAME/NUMBER OAKLAND / 63
REASON FOR APPLICATION (New Source,Alteration,etc) RELOCATED SOURCE

DESCRIPTION OF SOURCE & RELATED CONTROL EQUIP./TECHNOLOGY (Include Federal source class code and Control Code No. ie., (1-23-456-78)(12)

SOURCE#
- PROTOTYPE NYLON PLASTIC INJECTION MOLDING FACILITY
  2 MOLDING MACHINES
  2 LOW TEMP MELTING POINT METAL CORE MACHINES
  1 METAL CORE MELT-OUT TANK (WAX TANK)

CONTROL# SCC# 3-08-008-02 (3-08-008-02)
- NONE (000)

INSTALLATION DATE: PROCESS EQUIPMENT 1/30/93 CONTROL EQUIPMENT NONE

PERMIT(S) RELATED TO APPLICATION 542-91 VOIDS 542-91

STATE/FED. AIR REG'S SOURCE IS SUBJECT TO? NSPS, N NESHAPs Y PSD N
SIP(Rule No.(S) 702, 201, Act 64, Other NONE

MAPCC ACTION REQUIRED? Y / (N) EPA NOTIFICATION REQUIRED? Y / (N) DATE INFO SENT TO EPA

EMISSIONS FROM EQUIPMENT COVERED BY THIS PERMIT *

Pol. Codes		EXPECTED PPH	EXPECTED TPY	ALLOWABLE PPH	ALLOWABLE TPY	LIMIT
	PM10					
	SO2					
	CO					
	NOx					
	VOC	0.1	0.1	0.1	4.4	NO LIMIT

* Calculations are either attached to this sheet, or in a confidential file, where applicable.

ATTAINMENT STATUS	PM_{10}	SO_2	CO	O_3
ATTAINMENT				
NON ATTAINMENT				L

P - Primary S - Secondary A - All Standards
U - Unclassified * Close to Non Attainment

TRACKING TO BE DONE: (DATE DONE)

Permit Engineer
- NATICH
- TBact
- BACT/LAER Clearinghouse
- GLAPA Pollutants

Al Lydman
- ✓ Log NAA pollutants

Susan Parker
- PSD / or Netted Out
- NSPS
- NESHAPs
- Synthetic Minor for PSD and/or R220
- R220

Cathy Simon
- Rule 230

MAX. ALLOWED OPERATING SCHEDULE:
HR./DAY 24 DAYS/WK. 7 WKS./YR. 52

POLLUTANTS FOR PSD REVIEW NONE NETTED OUT NONE

POLLUTANTS FOR SYNTHETIC MINOR: PSD NONE RULE 220 N/A

Basis for Recommendation:

MINOR SOURCE OF VOC'S (LESS THAN 10 TPY) NO TOXIC EMISSIONS ARE EXPECTED. BACT IS NO CONTROL. NO RESPONSE FROM DISTRICT W/IN COMMENT PERIOD.

Reviewed by/Date: [signature] 1/6/93 Approved by/Date: [signature] 1/7/93

DESCRIPTION OF ANY REQUIRED MONITORING: (CEMS, PROCESS, CONTROL EQUIPMENT)

NONE

CONTROL EQUIPMENT BYPASS, IF ANY, & REASON WHEN BYPASS OCCURS:

N/A

PROCESS/CONTROL WASTE AND DISPOSAL:

LICENSED WASTE HAULER

AGREEMENT ON THE CONDITIONS.

DISTRICT: PERSON BERNIE GIA DATE 1/8/93
ENFORCEMENT: PERSON _____ DATE _____
APPLICANT: PERSON JEFFERY NORTON DATE 1/6/93

COORDINATION REQUIRED: (UNITS, DIVISIONS, AGENCIES)			
	PERSON CONTACTED	DATE CONTACTED	REQUESTED RESPOND BY
DISTRICT	BERNIE C	1/8/93	APPROVED
ENFORCEMENT			
MODELING			
STACK SAMPLING			
TOXICS			
WMD			
SWQ			
ERD			
L&W Mngt			
GEO SURVEY			
LAW ENFORCE			

STACK DATA

1) TOTAL HEIGHT(FT) 39
HEIGHT ABOVE BLDG.(ft) 12
EXIT DIMENSION(IN) 6
TEMP.(°F/°C) 150
ACTUAL FLOW RATE(CFM) 65

2) TOTAL HEIGHT(FT) _____
HEIGHT ABOVE BLDG.(ft) _____
EXIT DIMENSION(IN) _____
TEMP.(°F/°C) _____
ACTUAL FLOW RATE(CFM) _____

SEE ATTACHED ____

OFFSETS PROVIDED? Y / (N) HOW MUCH & FROM WHERE? NONE

GENERAL COMMENTS, MINOR CALCULATIONS, ETC.:

SEE ATTACHED SHEETS

** TOXIC COMPOUNDS MEETS RULE 230 GUIDELINES

COMPUTATION SHEET

RMT INC.

744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
CMI - Norēn				3/20/91	2197.01

Union Carbide Evaluation

Mass emission rate : 0.57 grams

Approximate generation period : 18 hours (1)

Approximate Carbowax surface area : 0.05 ft² (1)

Estimated total emission rate = 0.57 grams / 18 hours

= 0.0317 grams / hour

Extrapolation to CMI - Norēn Melt-Out Tanks

Proposed melt-out tank surface area: 3' × 40' = 120 ft²

Estimated melt-out tank emission rate:

$$\frac{120\ ft^2}{0.05\ ft^2} \times 0.0317\ \frac{grams}{hr} = 76.1\ grams/hr$$

$$76.1\ grams/hr \times \frac{1\ lb}{453.6\ g} = 0.168\ lb/hr \sim 0.17\ lb/hr$$

(1) Tele-Con on March 12, 1991, between Diane Gilkenson & Union Carbide & Martin Stromberger & RMT.

COMPUTATION SHEET

RMT INC®
744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
CMI - Norton	HJS	3/7/91	COW	3/26/91	2197.01

Estimated Specific Organic Compound Emission Rate for Each of 3 melt-out tanks:

Compound	Percent(1)	Estimated Emission Rate lb/hr x 10^{-2}	lb/yr (Ave)(2)	lb/yr (max)(3)
Methyl Ethyl Ketone	2.09	0.35	21	31
Acetic Acid	0.11	0.018	1.1	1.6
Methyl Formate	27.69	4.6	280	410
Dimethyl Ether	6.20	1.0	63	92
Acetaldehyde	10.82	1.8	110	160
Methyl Alcohol	0.13	0.022	1.3	1.9
2-Butyl Acetate	2.85	0.48	29	42
Methyl Acetate	6.87	1.2	70	100
Butyric Acid	2.26	0.38	23	34
1-Butyl Alcohol	0.29	0.049	3.0	4.3
~~Formic Acid~~	~~19.55~~	~~3.3~~	~~200~~	~~290~~
~~Formaldehyde~~	~~2.35~~	~~0.40~~	~~24~~	~~35~~

(1) Percent by weight of emissions generated in Union Carbide Study. Estimated emissions were calculated by multiplying the estimated total organic compound emission rate (0.17 lb/hr) by these percentages.

(2) Based on operation of the melt-out tank 24 hours per day and 250 days per year.

(3) Based on operation of the melt-out tank 24 hours per day and 365 days per year.

COMPUTATION SHEET

RMT INC.

SHEET 1 OF 2

744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
CMI - Noren	JMJS	7/11/91	DJF	7/11/91	2197.03

CMI - Noren intends to use the following materials as mold release and treatment compounds at their prototype facility:

Title	Use	Maximum Usage Rate
Zinc Stearate	- Mold release	2 - 8oz. cans/month
Mold Saver	- Mold preservative	1 - 8oz can/month
Paintable	- Mold coating	1 - 8oz can/month
Mold Cleaner	- Mold cleaner	1 - 8oz can/month

The usage rate of these materials is much lower than for typical plastic injection operations since the nylon to be used @ CMI - Noren has excellent release characteristics.

Estimated Emission Rates

8oz = 0.0625 gal

Zinc Stearate

0.125 gal/mo (2 8oz cans) × 10.08 lb/gal = 1.25 lb/month ✓

1.125 lb/month × 0.90 lb volatiles / lb material = 1.13 ✓ lb volatile/mo

1.13 × 12 mo/year = 13.5 lb volatiles/year ✓

50% of this is methyl chloroform (1,1,1 - trichloroethane)

COMPUTATION SHEET

RMT INC.

SHEET 2 OF 2

744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By:	Date	CHECKED By:	Date	PROJECT/PROPOSAL NO.
CMI - Noren	MJS	7/11/91	DJF	7/16/91	2199.03

Mold Saver, Paintable, Mold Cleaner (1 8oz can each)

- Assume 100% volatile

0.1875 gal/mo × 10.08 lb/gal = 1.89 lb volatile/mo

1.89 lb volatile/mo × 12 mo/year = 22.7 lb volatiles/year

Total = 36.2 lb volatiles/year

most of this is methyl Chloroform (1,1,1-TCA)

CMI-TECH CENTER, INC.
1600 W. Eight Mile Rd. Ferndale, MI 48220
A SUBSIDIARY OF CMI INTERNATIONAL INC.

(313) 399-9600

AIR QUALITY DIVISION
JAN 4 1993
PERMIT SECTION

December 30, 1992

Mr. Dale Copedge
Permit Engineer
MDNR
Steven T. Mason Building
P.O. Box 30028
Lansing, Michigan 48909

Subject: MSDS

Dear Mr. Copedge:

Enclosed are the MSDS requested with reference to the relocation of a Prototype Nylon Plastic Injection Molding Facility - Application No. 542-91.

Sincerely,

Jeffrey Norton

CMI-TECH CENTER INC.
1600 W. Eight Mile Rd. Ferndale, MI 48220
A SUBSIDIARY OF CMI INTERNATIONAL INC.

August 6, 1992

(313) 399-9600

Mr. Greg Edwards
Michigan Department of Natural Resources
Air Quality Division
Stevens T. Mason Building
P.O. Box 30028
Lansing, Michigan 48909

RE: Relocation of Prototype Nylon Plastic Injection Molding Facility - Application No. 542-91

Dear Mr. Edwards,

This letter is to inform you of the relocation of a prototype nylon plastic injection molding facility from CMI-Noren, Inc. located at: 14680 Apple Drive, Ottawa County, Fruitport, Michigan 49415, to CMI-Tech Center, Inc. located at: 1600 W. Eight Mile Road, Oakland County, Ferndale, Michigan 48220.

The transfer involves no more than moving the current equipment, materials and personnel to the Ferndale site. All processes will remain unchanged. (Ref: Application No. 542-91).

Enclosed with the application is a layout of the Ferndale site with the building to house the prototype facility highlighted in blue.

Thank you for your cooperation, and should you have any questions, please contact me directly.

Sincerely,

Jeffrey Norton

Jeffrey Norton
Environmental Engineer

JN/klk
cc: Dr. Gary Ruff
Diane Zekind

STATE OF MICHIGAN

DEPARTMENT OF NATURAL RESOURCES
AIR QUALITY DIVISION
P.O. BOX 30028
LANSING, MICHIGAN 48909

AIR USE PERMIT APPLICATION

APPLICATION NO.

FOR AUTHORITY TO INSTALL, CONSTRUCT, RECONSTRUCT, RELOCATE, OR ALTER, AND OPERATE PROCESS, FUEL-BURNING, OR REFUSE-BURNING EQUIPMENT AND/OR CONTROL EQUIPMENT (PERMITS TO INSTALL AND OPERATE ARE REQUIRED BY ADMINISTRATIVE RULES PURSUANT TO ACT 348, P.A. 1965, AS AMENDED).

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2. MAILING ADDRESS: Number and Street; City or Village; State; Zip Code
1600 W. 8 MILE ROAD, FERNDALE, MICHIGAN 48220-2202

3. EQUIPMENT OR PROCESS LOCATION: Number and Street; City, Village or Township
1600 W. 8 MILE ROAD, FERNDALE

COUNTY: OAKLAND

ZIP CODE: 48220-2202

4. GENERAL NATURE OF BUSINESS:
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5. EQUIPMENT OR PROCESS DESCRIPTION:
A PROTOTYPE NYLON PLASTIC INJECTION MOLDING FACILITY. REFER TO APPLICATION NO. 542-91.

6. ESTIMATED COST:
Air Pollution Control Equipment $; Total Project $ 400,000

7. ACTION AND TIMING:

	ESTIMATED STARTING DATE	ESTIMATED COMPLETION DATE
☐ Installation, construction, reconstruction, or alteration		
☒ Relocation	JANUARY, 1993	JANUARY, 1993
☐ Change of Ownership		

8. NAME OF PRIOR OWNER AS IN ITEM 1 ABOVE, AND PRIOR AIR USE PERMIT NUMBER, IF ANY:
NAME TERRY FRANKLYN, CMI-NOREN, INC. PERMIT NO. APPLICATION 542-91

9. NAME AND TITLE OF OWNER OR AUTHORIZED MEMBER OF FIRM
Name DR. GARY RUFF Signature Gary Ruff
Title: EXECUTIVE VICE PRESIDENT Date: 8/6/92 Phone No. (313) 399-9600

10. CONTACT PERSON IF DIFFERENT THAN ITEM 9:
Name JEFFREY NORTON Phone No. (313) 357-5180

11. DISPOSITION OF APPLICATION: FOR DNR USE ONLY

Receipt of all information required by Rule 203 _____

Permit to install approved * on _____ Signature _____

Permit to operate approved * on _____ Signature _____

Application/permit voided on _____ Signature _____

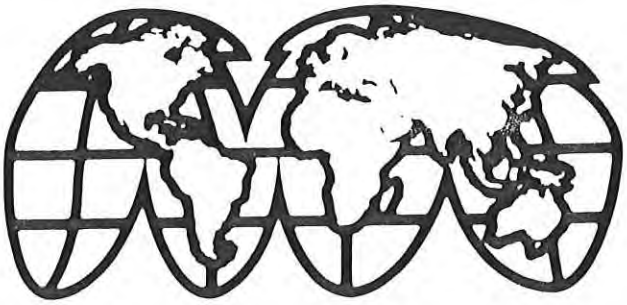
Application/permit denied on _____ Signature _____

*Subject to compliance with all Commission Rules and Conditions stipulated in the attached supplement.

LEXAN®

resin

MATERIAL SAFETY DATA



LEXAN PRODUCTS DIVISION
PLASTICS GROUP
GENERAL ELECTRIC COMPANY
ONE PLASTICS AVENUE
PITTSFIELD, MA 01201

GENERAL ELECTRIC

LEXAN resin

Issue Date **November 1985**

Supersedes Material Safety Data Publication Dated July 1983

INTRODUCTION

This publication provides guidelines and suggested precautions for the safe handling and processing of LEXAN® resins and supersedes all previously issued material safety data sheets on these products. General Electric Company recommends that all individuals read and understand this information prior to working with LEXAN resin and that this information be incorporated into individual plant safety programs. This brochure does not include information on the suitability of LEXAN resin for any specific application nor any precautions that may be appropriate for the use of finished products. The Material Safety Data contained in this publication include all information required to be furnished by manufacturers, distributors and importers of hazardous substances by the Occupational Safety and Health Administration (OSHA) pursuant to the Hazard Communication Standard (29 CFR 1910.1200).

USER'S RESPONSIBILITY

A brochure such as this cannot cover all possible individual situations. In addition, the conditions under which our products are processed and used are beyond our control. The products described herein are not hazardous when processed properly. A user of LEXAN resin is responsible for providing a safe workplace; therefore, all aspects of an individual operation should be examined to determine if or where precautions, in addition to those described herein, are required. Any health hazard and safety information contained herein should be passed on to customers and/or employees.

Manager – Product Safety
GENERAL ELECTRICAL COMPANY
Plastics Group

GENERAL ELECTRIC

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(413) 448-4929 (Day)

For additional non-emergency product safety information
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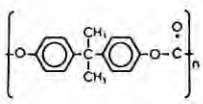
Plastics Technology Department
Mt. Vernon, Indiana 47620
(812) 838-7236

PRODUCT IDENTIFICATION

LEXAN® resin

The LEXAN resin family of solid organic thermoplastic resins include both Bisphenol-A-polycarbonate homopolymer and specialty copolymers based on BPA and other comonomers. The copolymers may be formulated as specialty resin grades or as components in polymer blends.

BASE RESIN (HOMOPOLYMER)

Chemical Family	Common Names	Chemical Composition	Chemical Structure	Molecular Weights
POLYCARBONATE	BISPHENOL-A-POLYCARBONATE POLY(BISPHENOL-A-CARBONATE)	CARBON 75.58% HYDROGEN 5.55% OXYGEN 18.87%	 n 45 ± 15	$\overline{M}_W$ 20,000 to 40,000 $\overline{M}_N$ 8,000 to 15,000

CHEMICAL NAMES (As Polymer)	EMPIRICAL FORMULA	CAS REGISTRY NUMBERS
Poly(oxycarbonyloxy-1,4-phenylene-(1-methylethylidene)-1,4-phenylene)	$(C_{16}H_{14}O_3)_n$	24936-68-3
SYNONYMS (as product of constitutent monomers)*		
Carbonic acid, polymer with 4.4'- (1-methylethylidene) bis (phenol)	$(CH_2O_3 \bullet C_{15}H_{16}O_2)_x$	25037-45-0
Carbonic dichloride, polymer with 4.4'-(1-methylethylidene) bis(phenol)	$(C_{15}H_{16}O_2 \bullet CCl_2O)_x$	25971-63-5

SPECIALTY RESINS (COPOLYMERS)

COMMON NAME: Bisphenol-A/Tetrabromobisphenol-A Copolycarbonate

CHEMICAL NAME: (as product of constitutent monomers)*

Carbonic dichloride, polymer with 4,4'-(1-methylethylidene) bis(2,6-dibromophenol) and 4,4'-(1-methylethylidene bis(phenol)	$(CCl_2O \bullet C_{15}H_{16}O_2 \bullet C_{15}H_{12}Br_4O_2)_x$	32844-27-2

COMMON NAME: Bisphenol-A/Isophthaloyldichloride/Terephthaloyldichloride Copolyester Carbonate

CHEMICAL NAME: (as product of constitutent monomers)*

1,3-Benzenedicarbonyldichloride, polymer with 1,4-benzene dicarbonyldichloride carbonic dichloride and 4,4'-(1-methylethylidene(bis(phenol)	$(C_{15}H_{16}O_2 \bullet C_8H_4Cl_2O_2 \bullet C_8H_4Cl_2O_2 \bullet CCl_2O)_x$	71519-80-7

COMMON NAME: Bisphenol-A/Trimellitic Anhydride Copolyester Carbonate

CHEMICAL NAME: (as product of constitutent monomers)*

5-Isobenzofurandicarboxylic acid, 1,3'-dihydro- 1,3 dioxo-, polymer with carbonic dichloride and 4,4'-(1-methylethylidene) bis(phenol)	$(C_9H_4O_5 \bullet C_{15}H_{16}O_2 \bullet CCl_2O)_x$	61156-92-1

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INGREDIENTS

Commercial and proprietary compounds are added to enhance the physical and chemical properties of the base resin. These additives include (but are not limited to) the following generic classes of compounds. Most standard and developmental (designated ML-XXXX) products contain more than one type of additive.

The specific chemical identities and precise proportions of some ingredients are proprietary. This information will be made available to health professionals in accordance with the provisions of the OSHA Hazard Communication Standard.

TYPE OF ADDITIVE	FUNCTION OR PURPOSE	GENERIC COMPOUND(S) AND/OR CLASS(ES) EMPLOYED	TYPICAL LEVELS (IN PELLETS)	TYPICAL LEXAN PRODUCT DESIGNATION(S)
THERMAL STABILIZERS	Inhibit thermal degradation and discoloration	Organic phosphites Alkyl epoxides Hindered phenols	<0.5%	101-, 121-, 131-, 141-, 141L-, 151-, 161-, 181-, 191-, and all other products in the 100, 200, 300, 500, 900, 1500, 2010, 2700, 2800, 2900, 3200, 3400, BE, BL, EM, FL, HF, HW, LDS 1890, LDS 1990, LS, OQ, PPC, WR, HP, HPS, ML and RL-series.
ULTRAVIOLET STABILIZERS	Extend outdoor weathering life	Substituted benzotriazoles Benzophenones	<0.5%	103-, 123-, 133-, 143-, 143L-, 153-, 163-, 183-, 193-, 203-, 303-, 503-, 923-, 943-, 953-, LS1-, LS2-, LS3-, HF1130-, HF2130-, QQ-, FL- and specific ML- and RL- resins.
REINFORCING AGENTS	Increase strength, rigidity and dimensional stability	Glass fiber Non-asbestos minerals	5 – 50%	500-, 3412-, 3413-, 3414-, 3432-, 3433-, 3434-, FL-, BL-, WR, HF, EM-, PPC- and specific ML- and RL- resins.
FLAME RETARDANTS	Improve ignition resistance and reduce rate of flame spread	Organic salts Perfluoralkyl polymer	<1%	900 series including 920-, 940-, 950-, 920A-, 940A-, 950A-, LEXAN C4600-, and specific ML- and RL- resins.
		TBBPA copolymers Other halogenated compounds	<8% (Halogen)	2014, 2015, 2514, 2814, 2816, 2034, 2035, 2534, BE1230, BL- and specific ML- and RL- resins.
MOLD RELEASE AGENTS	Processing efficiencies	Silicone fluids Aliphatic esters	<0.5%	All product grade numbers with "R" Suffix as in 141R-, 104R-, 141LR-, etc. and LDS 1890 and LDS 1990
ORGANIC POLYMERS	Property modification	Polyolefins, Polyesters Modified polyolefins, ABS Elastomeric polymers BPA-Polysiloxane copolymers	<20%	191-, 193-, 194-, ML4965-, ML4951, BL-12, ML4980, ML5133, ML4831, etc.
BLOWING AGENTS	Foam molding	Azoheterocyclics Phenyltetrazole	<5% (Concentrate)	All Foam Molding grades with FLC prefix as in FLC95-
COLORANTS	Standard and Custom Colors	Dyes and Pigments (See below)	<0.1% (Transparents) < 1% (Translucents) < 3% (Opaques)	A 3 to 6 digit color number following the grade designation as in 141-112 or 104-70096

TYPE	USAGE	COMPOSITION	PRODUCT DESIGNATIONS
SPECIALTY RESINS	Flame retardance Melt stability Thermal resistance	BPA/TBBPA/Copolycarbonate BPA/TIMA/Copolyester Carbonate BPA/IPC/TPC/Copolyester Carbonate	2014-, 2015-, ML 1754-, 150 series, PKG series PPC series

COLORANTS

Colored LEXAN resin formulations may contain commercially available dyes and pigments based on titanium dioxide, carbon black, phthalocyanines, cadmium (insoluble sulfides and sulfoselenides), lead salts, chromium (III), and other organic and inorganic compounds. In pelletized resin these colorants and the above identified additives are encapsulated in the polymer resin matrix and are not expected to create any unusual hazards when processed according to good manufacturing and industrial hygiene practices, and the enclosed guideline recommendations. (See PROCESSING FUMES.)

FDA GRADES

Specific grades of LEXAN resin (104, 124, 134, 144, 144L, 154, 164, 184, 194-, 1500-, PKG series and specific ML's) comply with the applicable provisions of U.S. FDA Food Additive Regulations governing food contact, (21 CFR 177.1580).

HAZARDOUS SUBSTANCES

OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)

NONE of the following materials, designated as Toxic and Hazardous Substances by the U.S. Department of Labor/ OSHA are used to produce LEXAN resin nor are they anticipated by-products in our production process.

29 CFR 1910. 1001 Asbestos
1002 Coal tar pitch volatiles
1003 4-Nitrobiphenyl
1004 alpha-Naphthylamine
1006 Methyl chloromethyl ether
1007 3.3'-Dichlorobenzidine (and salts)
1008 bis-Chloromethyl ether
1009 beta-Naphthylamine
1010 Benzidine
1011 4-Aminodiphenyl
1012 Ethyleneimine
1013 beta-Propiolactone
1014 2-Acetylaminofluorene
1015 4-Dimethylaminoazobenzene
1016 N-Nitrosodimethlyamine
1017 Vinyl chloride
1018 Inorganic arsenic
1029 Coke oven emissions
1043 Cotton dust
1044 1,2-Dibromo-3-chloropropane
1045 Acrylonitrile
1047 Ethylene oxide

LEXAN resin dust is **NOT** included on the list of Toxic and Hazardous Air Contaminants (29 CFR 1910.1000). This standard does however provide the following Permissible Exposure Limits (PEL) for Inert or Nuisance Dusts. In addition Threshold Limit Values (TLV) for Some Nuisance Particulates have been established by the American Conference of Governmental Industrial Hygienists (ACGIH).

INERT OR NUISANCE DUST: 8 hour Time-Weighted-Average		
	OSHA PEL	ACGIH (1984-85) TLV
Total Dust	15 mg/m³	10 mg/m³
Respirable Fraction	5 mg/m³	5 mg/m³

LEXAN resin does **NOT** contain vinyl chloride, monomeric phthalate esters, nor any EPA regulated halogenated biphenyls such as PCB's, PBB's, etc. (40 CFR 761), or chlorofluorocarbons (40 CFR 762).

TOXIC SUBSTANCES CONTROL ACT (TSCA)

LEXAN polycarbonate resin and all other chemical substances incorporated into the resin (additives, fillers, colorants and other polymeric substances) are included in the **TSCA INVENTORY OF CHEMICAL SUBSTANCES** compiled by the U.S. Environmental Protection Agency.

PHYSICAL PROPERTY DATA*

LEXAN resin, an amorphous solid, is supplied in the form of cylindrical pellets averaging 2.5 mm in diameter and 3.2 mm in length.

TEMPERATURE

GLASS TRANSITION Tg (amorphous)	150°C (302°F)
VICAT SOFTENING ASTM D-1525	152 – 157°C (306 – 315°F)
INJECTION MOLDING Typical Range	288 – 343°C (550 – 650°F)
THERMAL DECOMPOSITION	Thermogravimetric Analysis (in air)
Initial (Onset)	420°C (788°F)
50% Wt. Loss	480°C (896°F)
IGNITION TEMPERATURE	ASTM D-1929 (Setchkin Method)
Flash Ignition	449°C (840°F)
Self Ignition	632°C (1070°F)

WEIGHT

SPECIFIC GRAVITY (H_2O = 1)	Range 1.2 to 1.6
BULK DENSITY (unfilled)	Pellets 641 kg/m³ (40 lbs/ft³)

RESIN SOLUBILITY

WATER	Insoluble
METHYLENE CHLORIDE	≈ 20% by wt.

VOLATILES

WATER	Typical Range	0.20 ± .05% at R.T.
METHYLENE CHLORIDE		Residual Solvent < 150 ppm

COLOR AVAILABILITY

NATURAL	Transparent, water white
PIGMENTED	Unlimited; transparent to opaque

OTHER

ODOR	None to minimal
VAPOR PRESSURE	These properties are not applicable to solid compounds such as LEXAN polycarbonate
VAPOR DENSITY	
BOILING POINT	
EVAPORATION RATE	

*Typical values for general purpose grades based on material tested but may vary from sample to sample. Consult product literature for specialty grades. Typical values should not be construed as guaranteed analysis of any specific lot or as specification values.

PROCESSING FUMES

GENERAL

Virtually all thermoplastic resins emit processing fumes when heated to extrusion or injection molding temperatures. These fumes are complex mixtures of vapors, droplets and suspended particulates which are representative of the specific resin formulation. Colorants and other additives used to enhance resin properties may be volatilized. In addition, the fumes may contain thermal decomposition products from the base resin and the various additives.

The concentration and composition of processing fume components will depend upon the processing temperature, resin formulation, residence time in the processing equipment, surface area of the molded part, equipment variables (screw design, venting parameters, etc.) and the dryness of the resin.

LEXAN RESIN

When processed according to General Electric recommended procedures, LEXAN resin processing fumes (or resin dust from secondary operations such as regrinding) are not known or expected to cause any adverse human health effects. However, the full range of potential effects has not been completely characterized. Certain sensitive individuals and individuals with respiratory impairments may be affected by exposure to specific components in the processing fumes. Such potential effects would primarily relate to the principal exposure routes – that is irritation of the eyes, nose, throat or skin (see FIRST AID Section).

The major fume components evolved by LEXAN resin at recommended processing conditions include water, carbon dioxide, diphenylcarbonate, methylene chloride and phenol. These fume components do not pose an unusual health hazard at concentrations expected in the workplace. Nevertheless, potential exposures should be minimized by good housekeeping, good industrial hygiene practice and adequate ventilation.

8 hour Time-Weighted-Average				
	OSHA (PEL)		1984-85 ACGIH (TLV)	
	PPM	mg/m³	PPM	mg/m³
Carbon dioxide	5,000	9,000	5,000	9,000
Diphenylcarbonate	–	–	–	–
Methylene chloride	500	1,800	100	360
Phenol	5	19	5	19

VENTILATION

Ventilation requirements for each particular workplace must be determined on an individual basis. Information and guidelines on ventilation standards and design techniques may be found in the following publications:

- **NIOSH Recommended Industrial Ventilation Guidelines;** GPO #017-033-00136-7. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
- **Industrial Ventilation, 18th Edition;** Available from the American Conference of Governmental Industrial Hygienists, Committee on Industrial Ventilation, P.O. Box 16153, Lansing, MI 48901.
- **Fundamentals Governing the Design and Operation of Local Exhaust Systems;** (ANSI-792.2) Available from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

In general, the continuous supply of fresh air to the general workplace area together with the continuous removal of processing fume contaminated air through exhaust hoods and associated enclosed ducting will provide adequate ventilation for most operations. The exhaust hoods should be positioned to prevent routine inhalation of smoke, fumes, dust and vapors from molding and other operations.

Note: Processing fume condensates, which may include toxic contaminants, are flammable and should be periodically removed from exhaust hoods, ductwork and other surfaces. Protective clothing, including rubber gloves, should be worn during clean-up operations to prevent skin contact.

ODOR

The odor of LEXAN resin processing fumes will vary somewhat with specific resin formulations. In general, the odor is mild and not offensive to most individuals.

FIRST AID

Some individuals with specific sensitivities may exhibit eye, nose, throat or dermal irritation if overexposed to processing fumes.

Eye Irritation: Flush eyes thoroughly with clean, low pressure water.

Skin Irritation: Wash affected areas with soap and water.

Respiratory Irritation: Leave the exposure area and obtain fresh air. Provide appropriate protection before allowing re-entry.

In all cases, a physician should be contacted if irritation persists.

Note: Molten resin can cause severe thermal burns which may require expert emergency attention.

FIRE AND EXPLOSION HAZARDS

FLAMMABILITY

LEXAN resin burns with difficulty because a substantial amount of energy is required to break down the polymer into smaller fragments which will support combustion. Generally, a continuous external flame source is needed to initiate and sustain combustion. In the absence of flashover fire conditions, a LEXAN resin fire will tend to extinguish itself. Precautions similar to those taken with wood and other combustible materials are recommended.

SMOKE

When forced to burn, LEXAN resin will produce a sooty fire; that is, it will generate opaque black smoke (particulate carbon) reflecting the inherent combustion resistance of polycarbonate.

TOXICITY

The primary toxic product of combustion from LEXAN polycarbonate is carbon monoxide. Carbon dioxide, an asphyxiant, is also produced. Some flame retardant grades will evolve trace quantitites of hydrogen bromide under combustion conditions. LEXAN resin does **not** produce products of combustion such as hydrogen cyanide, phosgene, acrolein, hydrogen chloride or sulfur dioxide.

FIRE FIGHTING

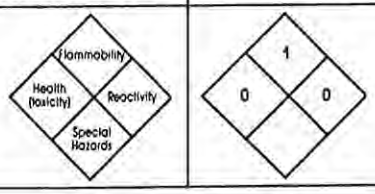
Water is the best extinguishing medium. Carbon dioxide is not generally recommended because its lack of cooling capacity may permit re-ignition. MSHA/NIOSH approved pressure demand breathing apparatus should be used. Personnel without suitable respiratory protection should leave the area. **Caution:** Stacked cardboard resin containers will be weakened by water absorption and may collapse.

EXPLOSION

LEXAN resin pellets, because of their size, do not present a dust explosion hazard.

Post-molding operations, such as regrinding and sawing, should be periodically checked for proper maintenance of dust control devices. Likely sources of ignition, such as static build-up, should be eliminated. Good housekeeping and adequate ventilation can prevent accumulation of potentially explosive dust concentrations. For additional information see **NFPA 654: "Standard for the Prevention of Dust Explosions in the Plastics Industry"** published by the National Fire Protection Association (Volume Five of the National Fire Codes).

NFPA 704

NFPA FIRE HAZARD CLASSIFICATION	LEXAN RESIN
4 – Extreme 3 – High 2 – Moderate 1 – Slight 0 – Insignificant	

HEALTH HAZARD DATA

None of the base resins, blending resins or elastomeric impact modifiers in the physical form present in polycarbonate-based resins are hazardous substances within the meaning of the OSHA Hazard Communication Standard.

ORAL TOXICITY

LEXAN resin has very low acute oral toxicity. When resin was administered orally as a corn oil suspension in a single dose of 5 g/kg to rats, no mortalities occurred. Necropsy revealed no outstanding gross pathological organ changes.

In subchronic testing the resin was considered physiologically inert when fed to rats for 8 weeks at a dietary level of 6%.

DERMAL TOXICITY/IRRITATION/SENSITIZATION

LEXAN resin has low acute dermal toxicity. When two different grades were tested on intact and abraded rabbit skin (200 and 2000 mg/kg occluded wrapping, 24 hr exposure), no compound-related deaths or adverse clinical observations were noted. The minimum lethal dose was rated as "greater than 2000 mg/kg".

LEXAN resin is not a primary skin irritant and does not cause systemic or local sensitization. Two different resin grades were tested for irritation potential on intact and abraded rabbit skin (500 mg, occluded wrapping, 24 hr exposure). Neither material was classified as a primary skin irritant; only minimal irritation resulted.

In a test for non-antigenicity, guinea pigs received intraperitoneal injections (3 ml every other day over a 12-day period) of saline or sesame oil extracts of LEXAN resin. After 33 days, they were challenged by a 3 ml intravenous injection or a 0.1 ml intracutaneous injection of saline extract. No systemic or local sensitization was observed.

EYE IRRITATION

LEXAN resin, in a finely divided form, is a mild eye irritant. When two different grades of LEXAN resin (pellets mechanically ground to approx. 20 mesh) were placed in the conjunctival sacs of albino rabbits (100 mg, unwashed), mild irritation occurred – consistent with the abrasive nature of the ground resin particle.

When a 0.1 ml aliquot of saline or sesame oil resin extract was similarly tested, no ocular reactions were observed – consistent with the absence of chemical irritation.

FUME INHALATION

Process fumes from typical LEXAN resins are not considered toxic. In acute exposure tests, laboratory rats were exposed to processing fumes at concentrations exaggerating those that would be likely to occur in workplace situations. No deaths or signs of toxicity except transient irritancy in some cases were noted during these 6-hour fume exposure tests. Neither were there any distinct or consistent treatment-related tissue or organ changes in gross necropsies performed after 14-day post-exposure observation periods.

HEALTH HAZARDS

There are no known acute or chronic health hazards associated with exposure to LEXAN resins, nor are there any medical conditions known to be generally aggravated by such exposure. See PROCESSING FUMES and VENTILATION section.

REACTIVITY DATA

LEXAN polycarbonate is a stable thermoplastic solid compound and will not undergo hazardous polymerization.

DIFFERENTIAL THERMAL ANALYSIS

LEXAN polycarbonate, when heated in air will absorb energy (endothermic) at 475°C (888°F) and 520°C (968°F) ane evolve a variety of decomposition products. Above 520°C (968°F) heat is evolved (exothermic) as more of the decomposition products are converted to carbon monoxide and carbon dioxide.

SPILL OR LEAK PROCEDURES

LEXAN resin pellets spilled on floors, aisles and other working surfaces are a slipping hazard. Sweep, shovel or vacuum spilled resin into containers for reuse or disposal.

RCRA

LEXAN resin pellets, regrind, molded parts, extrusion purge, etc., are not hazardous wastes as defined by regulations implementing the Resource Conservation and Recovery Act (RCRA). In general, these materials may be discarded in accordance with the State and local regulations governing the disposal of other common or non-RCRA regulated waste materials.

"SUPERFUND"

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or "Superfund" levies a tax on hazardous waste materials expected to remain at a hazardous waste disposal facility after its closure (i.e., landfills). LEXAN resins and items produced from these resins are not regulated as hazardous wastes and are not subject to this Superfund tax.

SPECIAL PROTECTION

In general, special protection beyond established industrial safety practices and procedures is not required for the handling or processing of LEXAN resin.

Typical protection would include:

- Safety glasses with side shields
- Substantial, well insulated gloves to prevent contact with hot polymer
- Face shield and rubber gloves for cleaning processing fume deposits from exhaust hoods and other surfaces.
- Self contained breathing equipment, if needed for fire fighting.

SPECIAL PRECAUTIONS

Special precautions beyond good industrial hygiene practice and those identified in this brochure will primarily depend upon specific workplace conditions and special hazards.

Enforce rules of good industrial hygiene practice:

- Wash hands prior to eating.
- Do not store or consume food in processing areas.
- Do not use production equipment to heat food.
- Do not smoke in processing areas.
- Provide adequate ventilation.

Incorporate the information in this brochure in individual plant safety programs.

HANDLING AND STORAGE

PACKAGING

LEXAN resin is packaged in standard unit weights.

Unit Weight	Packaging Material	Configuration
50 lb	Multi-wall paper bags	40 bags/pallet
1000 lb	Corrugated cardboard	1 gaylord/pallet

Bulk shipments are available in truckload and railcar quantities. The bulk density range of LEXAN resin pellets is 38 – 42 lbs/ft^3.

STORAGE

LEXAN polycarbonate will not degrade during storage. Heating and/or cooling is not required although the packaged resin should be stored indoors to protect the packaging material from rain or excessive moisture. Do not stack pallets more than three units high. Periodically check storage for vertical stability. Do not store flammable materials in resin storage area. (See SPILL OR LEAK PROCEDURES).

TRANSPORTATION

For transportation purposes, LEXAN resin is not defined or designated as a hazardous material by the U.S. Department of Transportation under Title 49 of the Code of Federal Regulations.

DOT Proper Shipping Name . . . . . .Not applicable
DOT Hazard Class/ID Number . . . . . .Not applicable
DOT Label . . . . . .Not applicable
Hazardous Substance(s)/RQ's . . . . . .Not applicable

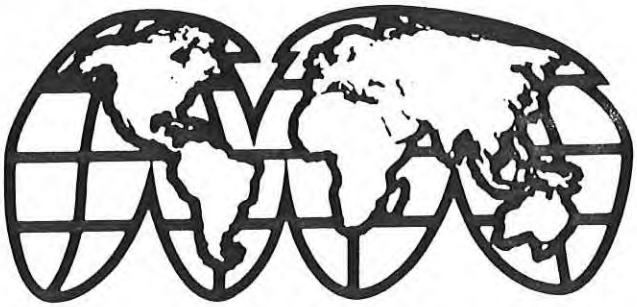
Packaging materials are labeled with the product name, LEXAN resin and the manufacturer, GENERAL ELECTRIC COMPANY.

NOVEMBE

Polymer

LNP® resin

MATERIAL SAFETY DATA



COMPOSITE POLYMERS OPERATIONS
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GENERAL ELECTRIC COMPANY
ONE PLASTICS AVENUE
PITTSFIELD, MA 01201

GENERAL ELECTRIC

LOMOD® resin

Issue Date **November 1985**

Supersedes Material Safety Data Publication Dated July 1983

INTRODUCTION

This publication provides guidelines and suggested precautions for the safe handling and processing of LOMOD® resins and supersedes all previously issued material safety data sheets on these products. General Electric Company recommends that all individuals read and understand this information prior to working with LOMOD resin and that this information be incorporated into individual plant safety programs. This brochure does not include information on the suitability of LOMOD resin for any specific application nor any precautions that may be appropriate for the use of finished products. The Material Safety Data contained in this publication include all information required to be furnished by manufacturers, distributors and importers of hazardous substances by the Occupational Safety and Health Administration (OSHA) pursuant to the Hazard Communication Standard (29 CFR 1910.1200).

USER'S RESPONSIBILITY

A brochure such as this cannot cover all possible individual situations. In addition, the conditions under which our products are processed and used are beyond our control. The products described herein are not hazardous when processed properly. A user of LOMOD resin is responsible for providing a safe workplace; therefore, all aspects of an individual operation should be examined to determine if or where precautions, in addition to those described herein, are required. Any health hazard and safety information contained herein should be passed on to customers and/or employees.

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(812) 838-7236

PRODUCT IDENTIFICATION

LOMOD® resin

The LOMOD resin Family of engineering elastomers includes compositions based on co-(polyether-ester) copolymers alloyed or blended with other specialty polymers, copolymers and elastomers.

BASE RESINS (COPOLYMERS)

COMMON NAME: Copolyester-ether resin B

CHEMICAL NAMES: 1, 4-Benzenecarboxylic acid, dimethylester, polymer with 1, 4-butanediol, 1, 6-hexanediol and α-hydro-ω-hydroxy (poly (oxy-1, 4-butanediol)

$(C_{10}H_{10}O_4 \bullet C_6H_{14}O_2 \bullet C_4H_{10}O_2 \bullet (C_4H_8O)_nH_2O)_x$

CAS REGISTRY NUMBER: 61987-75-5

COMMON NAME: Copolyester-ether resin J

CHEMICAL NAMES: 1, 4-Benzenedicarboxylic acid, dimethylester polymer with 1, 4-butanediol and poly (oxypropylene) bis (N-trimallitimide)

$(C_{10}H_{10}O_4 \bullet C_4H_{10}O_2 \bullet (C_9H_4O_5 \bullet (C_3H_6O)_mC_6H_{16}N_2O)_x$

CAS REGISTRY NUMBER: 95910-39-7

BLENDING/ALLOYING RESIN

COMMON NAMES: Poly (butyleneterephthalate) (PBT)
Poly (tetramethyleneterephthalate)

CHEMICAL NAMES: Poly (oxy-1, 4-butanediyloxycarbonyl-1, 4-phenylene carbonyl) $(C_{12}H_{12}O_4)_n$
1, 4-Benzenedicarboxylic acid, polymer with 1, 4-butanediol $(C_8H_6O_4 \bullet C_4H_{10}O_2)_x$
1, 4-Benzenedicarboxylic acid, dimethylester, polymer with 1, 4-butanediol $(C_{10}H_{10}O_4 \bullet C_4H_{10}O_2)_x$

CAS REGISTRY NUMBERS: 30965-26-5
26062-94-2
24968-12-5

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INGREDIENTS

Commercial and proprietary compounds are added to enhance the physical and chemical properties of the base resin. These additives include (but are not limited to) the following generic classes of compounds. Most standard and developmental (designated X) products contain more than one type of additive.

The specific chemical identities and precise proportions of some ingredients are proprietary. This information will be made available to health professionals in accordance with the provisions of the OSHA Hazard Communication Standard.

TYPE OF ADDITIVE	FUNCTION OR PURPOSE	GENERIC COMPOUND(S) AND/OR CLASS(ES) EMPLOYED	TYPICAL LEVELS (IN PELLETS)	TYPICAL LOMOD PRODUCT DESIGNATION(S)
THERMAL STABILIZERS	Inhibit thermal degradation and discoloration	Organic phosphites Epoxides Hindered phenols Thioesters	0.1 – 5%	All products including those designated as XA, XB, A, or B
ULTRAVIOLET STABILIZERS	Extend outdoor weathering life	Substituted benzotriazoles Benzophenones	< 2%	Product grade numbers with "U" Suffix as in XB0100U-
REINFORCING AGENTS	Increase strength, rigidity and dimensional stability	Glass fibers Non-asbestos minerals	2 – 55%	Products numbered within the 0900 to 3000 Series
FLAME RETARDANTS	Improve ignition resistance and reduce rate of flame spread	Antimony oxide Brominated organic compounds	5 – 30%	Products numbered within the 0400 to 3000 Series
MOLD RELEASE & FLOW PROMOTERS	Processing Efficiencies	Polyolefins Esters	< 5%	All product grades
ORGANIC POLYMERS	Impact modifiers and Blending alloys	Polyacrylates PBT	1 – 60%	Products numbered within the 0400 to 3000 Series
COLORANTS	Standard and Custom Colors	Dyes and Pigments (See below)	< 2%	A four digit color number following the grade designation as in LOMOD BO100-7011

*See BLENDING/ALLOYING POLYMERS: page 3

COLORANTS

Colored LOMOD resin formulations may contain commercially available dyes and pigments based on titanium dioxide, carbon black, phthalocyanines, cadmium (insoluble sulfides and sulfoselenides), chromium (III) and other organic and inorganic compounds. In pelletized resin these colorants and the above identified additives are encapsulated in the polymer resin matrix and are not expected to create any unusual hazards when processed according to good manufacturing and industrial hygiene practices and the enclosed guideline recommendations. (See PROCESSING FUMES.)

HAZARDOUS SUBSTANCES

OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)

NONE of the following materials, designated as Toxic and Hazardous Substances by the U.S. Department of Labor/ OSHA are used to produce LOMOD resin nor are they anticipated by-products in our production process.

29 CFR 1910, 1001 Asbestos
1002 Coal tar pitch volatiles
1003 4-Nitrobiphenyl
1004 alpha-Naphthylamine
1006 Methyl chloromethyl ether
1007 3,3'-Dichlorobenzidine (and salts)
1008 bis-Chloromethyl ether
1009 beta-Naphthylamine
1010 Benzidine
1011 4-Aminodiphenyl
1012 Ethyleneimine
1013 beta-Propiolactone
1014 2-Acetylaminofluorene
1015 4-Dimethylaminoazobenzene
1016 N-Nitrosodimethlyamine
1017 Vinyl chloride
1018 Inorganic arsenic
1025 Lead
1029 Coke oven emissions
1043 Cotton dust
1044 1,2-Dibromo-3-chloropropane
1045 Acrylonitrile
1047 Ethylene oxide

LOMOD resin dust is **NOT** included on the list of Toxic and Hazardous Air Contaminants (29 CFR 1910.1000). This standard does however provide the following Permissible Exposure Limits (PEL) for Inert or Nuisance Dusts. In addition Threshold Limit Values (TLV) for Some Nuisance Particulates have been established by the American Conference of Governmental Industrial Hygienists (ACGIH).

LOMOD resin does **NOT** contain vinyl chloride, monomeric phthalate esters, nor any EPA regulated halogenated biphenyls such as PCB's, PBB's, etc. (40 CFR 761), or chlorofluorocarbons (40 CFR 762).

INERT OR NUISANCE DUST: 8 hour Time-Weighted-Average		
	OSHA PEL	ACGIH (1984-85) TLV
Total Dust	15 mg/m³	10 mg/m³
Respirable Fraction	5 mg/m³	5 mg/m³

TOXIC SUBSTANCES CONTROL ACT (TSCA)

LOMOD resin and all other chemical substances incorporated into the resin (additives, fillers, colorants and other polymeric substances) are included in the **TSCA INVENTORY OF CHEMICAL SUBSTANCES** compiled by the U.S. Environmental Protection Agency.

PHYSICAL PROPERTY DATA*

LOMOD resins are semi-crystalline and are supplied in the form of cylindrical pellets averaging 3.2 mm in diameter and 3.2 mm in length.

TEMPERATURE

MELTING POINT	T_m	150 – 220°C
VICAT SOFTENING	Typical Range	105 – 200°C
INJECTION MOLDING	Typical Range	320 – 485°C

IGNITION TEMPERATURE	ASTM D-1929 (Setchkin Method)
Flash Ignition	300 – 340°C
Self Ignition	330 – 390°C

WEIGHT

SPECIFIC GRAVITY (H_2O = 1)	Range 1.1 to 1.6
BULK DENSITY (unfilled)	Pellets 641 kg/m³ (40 lbs/ft³)

RESIN SOLUBILITY

WATER	Insoluble

VOLATILES

WATER	0.3 ± 0.1%
TETRAHYDROFURAN	< 100 ppm

COLOR AVAILABILITY

NATURAL	Opaque white
PIGMENTED	Full range of opaque resins

OTHER

ODOR	Slight
VAPOR PRESSURE VAPOR DENSITY BOILING POINT EVAPORATION RATE	These properties are not applicable to solid compounds such as LOMOD resin

*Typical values for general purpose grades based on material tested but may vary from sample to sample. Consult product literature for specialty grades.

PROCESSING FUMES

GENERAL

Virtually all thermoplastic resins emit processing fumes when heated to extrusion or injection molding temperatures. These fumes are complex mixtures of vapors, droplets and suspended particulates which are representative of the specific resin formulation. Colorants and other additives used to enhance resin properties may be volatilized. In addition, the fumes may contain thermal decomposition products from the base resin and the various additives.

The concentration and composition of processing fume components will depend upon the processing temperature, resin formulation, residence time in the processing equipment, surface area of the molded part, equipment variables (screw design, venting parameters, etc.) and the dryness of the resin.

LOMOD RESIN

When processed according to General Electric recommended procedures, LOMOD resin processing fumes (or resin dust from secondary operations such as regrinding) are not known or expected to cause any adverse human health effects. However, the full range of potential effects has not been completely characterized. Certain sensitive individuals and individuals with respiratory impairments may be affected by exposure to specific components in the processing fumes. Such potential effects would primarily relate to the principal exposure routes – that is irritation of the eyes, nose, throat or skin (see FIRST AID Section).

The major fume components evolved by LOMOD resin at recommended processing conditions include water and tetrahydrofuran. These fume components do not pose an unusual health hazard at concentrations expected in the workplace. Nevertheless, potential exposure should be minimized by good housekeeping, good industrial hygiene practices and adequate ventilation.

8 hour Time-Weighted Average				
	OSHA (PEL)		ACGIH (1984) (TLV)	
	PPM	mg/M^3	PPM	mg/M^3
Tetrahydrofuran	200	590	200	590

VENTILATION

Ventilation requirements for each particular workplace must be determined on an individual basis. Information and guidelines on ventilation standards and design techniques may be found in the following publications.

- **NIOSH Recommended Industrial Ventilation Guidelines;** GPO #017-033-00136-7. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
- **Industrial Ventilation, 18th Edition;** Available from the American Conference of Governmental Industrial Hygienists, Committee on Industrial Ventilation, P.O. Box 16153, Lansing, MI 48901.
- **Fundamentals Governing the Design and Operation of Local Exhaust Systems;** (ANSI-792.2) Available from American National Standards Institute, 1430 Broadway, New York, NY 10018.

In general, the continuous supply of fresh air to the general workplace area together with the continuous removal of processing fume contaminated air through exhaust hoods and associated enclosed ducting will provide adequate ventilation for most operations. The exhaust hoods should be positioned to prevent routine inhalation of smoke, fumes, dust and vapors from molding and other operations.

Note: Processing fume condensates, which may include toxic contaminants, are flammable and should be periodically removed from exhaust hoods, ductwork and other surfaces. Protective clothing, including rubber gloves, should be worn during clean-up operations to prevent skin contact.

ODOR

The odor of LOMOD resin processing fumes, is slight and may vary somewhat with specific resin formulations. In general, the odor is not offensive to most individuals.

FIRST AID

Some individuals with specific sensitivities may exhibit eye, nose, throat or dermal irritation if overexposed to resin processing fumes.

Eye Irritation: Flush eyes thoroughly with clean, low pressure water.

Skin Irritation: Wash affected areas with soap and water.

Respiratory Irritation: Leave the exposure area and obtain fresh air. Provide appropriate protection before allowing re-entry.

In all cases, a physician should be contacted if irritation persists.

Note: Molten resin can cause severe thermal burns which may require expert emergency attention.

FIRE AND EXPLOSION HAZARDS

FLAMMABILITY

LOMOD resin burns with difficulty because a substantial amount of energy is required to break down the polymer into smaller fragments which will support combustion. Generally, an external flame source is needed to initiate combustion. Precautions similar to those taken with wood and other combustible materials are recommended.

SMOKE

When burning, LOMOD resin produces a sooty fire; that is, it will generate opaque black smoke (particulate carbon) reflecting the inherent combustion resistance of LOMOD resins.

TOXICITY

The primary toxic product of combustion from LOMOD resin is carbon monoxide. Carbon dioxide, an asphyxiant, is also produced. Some flame retardant grades will evolve trace quantities of hydrogen bromide under combustion conditions. LOMOD resin does **not** produce products of combustion such as hydrogen cyanide, phosgene, acrolein, hydrogen chloride or sulfur dioxide.

FIRE FIGHTING

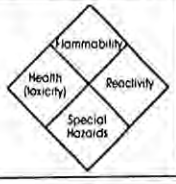
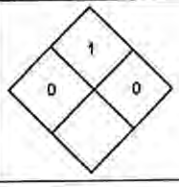
Water is the best extinguishing medium. Carbon dioxide is not generally recommended because its lack of cooling capacity may permit re-ignition. MSHA/NIOSH approved pressure demand breathing apparatus should be used. Personnel without suitable respiratory protection should leave the area. **Caution:** Stacked cardboard resin containers will be weakened by water absorption and may collapse.

EXPLOSION

LOMOD resin pellets, because of their size, do not present a dust explosion hazard.

Post-molding operations, such as regrinding and sawing, should be periodically checked for proper maintenance of dust control devices. Likely sources of ignition, such as static build-up, should be eliminated. Good housekeeping and adequate ventilation can prevent accumulation of potentially explosive dust concentrations. For additional information see **NFPA 654: "Standard for the Prevention of Dust Explosions in the Plastics Industry"** published by the National Fire Protection Association (Volume Five of the National Fire Codes).

NFPA 704

NFPA FIRE HAZARD CLASSIFICATION	LOMOD RESIN
4 – Extreme 3 – High 2 – Moderate 1 – Slight 0 – Insignificant	 

HEALTH HAZARD DATA

None of the base resins, blending resins or elastomeric impact modifiers in the physical form present in LOMOD resins are hazardous substances within the meaning of the OSHA Hazard Communication Standard.

Animal toxicity tests run individually on the several different base resins and on the blending/alloying polymer gave essentially similar results to those presented below.

ORAL TOXICITY

LOMOD resins have very low acute toxicity (LD_{50} > 5g/kg). When administered orally to laboratory rats in a single dose of 5 g/kg, no deaths or signs of toxicity were observed. No unusual organ or tissue changes were observed in test animals sacrificed after a 14-day post-exposure observation period.

DERMAL TOXICITY/IRRITATION/SENSITIZATION

LOMOD resins have low acute dermal toxicity. (LD_{MIN} > 2g/kg). When several different grades, in finely ground form, were tested on intact and abraded rabbit skin (occluded wrapping, 24 hr exposure), no compound-related deaths or adverse clinical observations were noted.

LOMOD resins are not primary skin irritants and do not cause sensitization. Finely ground resin, when applied at a dose of 0.5g to abraded and non-abraded rabbit skin, did not produce any detectable irritation or other clinical signs. When tested for skin sensitization potential in guinea pigs, no skin reactions were seen with either the inductive or challenge applications of resin.

EYE IRRITATION

LOMOD resins are not considered primary eye irritants. When typical LOMOD resins, in finely ground form were placed into the eyes of test rabbits, a slight transient redness occurred, consistent with the abrasive nature of the ground resin particles.

FUME INHALATION

Process fumes from typical LOMOD resins, when molded in accordance with General Electric recommendations, are not known, or expected to present any unusual toxicity hazard.

HEALTH HAZARDS

There are no known acute or chronic health hazards associated with exposure to LOMOD resins, nor are there any medical conditions known to be generally aggravated by such exposure. See PROCESSING FUMES and VENTILATION sections).

REACTIVITY DATA

LOMOD resin is a stable thermoplastic solid compound and will not undergo hazardous polymerization.

SPILL OR LEAK PROCEDURES

LOMOD resin pellets spilled on floors, aisles and other working surfaces are a slipping hazard. Sweep, shovel or vacuum spilled resin into containers for reuse or disposal.

RCRA

LOMOD resin pellets, regrind, molded parts, extrusion purge, etc., are not hazardous wastes as defined by regulations implementing the Resource Conservation and Recovery Act (RCRA). In general, these materials may be discarded in accordance with the State and local regulations governing the disposal of other common or non-RCRA regulated waste materials.

"SUPERFUND"

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or "Superfund" levies a tax on hazardous waste materials expected to remain at a hazardous waste disposal facility after its closure (i.e., landfills). LOMOD resins and items produced from these resins are not regulated as hazardous wastes and are not subject to this Superfund tax.

SPECIAL PROTECTION

In general, special protection beyond established industrial safety practices and procedures is not required for the handling or processing of LOMOD resin.

Typical protection would include:

- Safety glasses with side shields
- Substantial, well insulated gloves to prevent contact with hot polymer
- Face shield and rubber gloves for cleaning processing fume deposits from exhaust hoods and other surfaces.
- Self contained breathing equipment, if needed for fire fighting.

SPECIAL PRECAUTIONS

Special precautions beyond good industrial hygiene practice and those identified in this brochure will primarily depend upon specific workplace conditions and special hazards.

Enforce rules of good industrial hygiene practice:

- Wash hands prior to eating.
- Do not store or consume food in processing areas.
- Do not use production equipment to heat food.
- Do not smoke in processing areas.
- Provide adequate ventilation.

Incorporate the information in this brochure in individual plant safety programs.

HANDLING AND STORAGE

PACKAGING

LOMOD resin is packaged in standard unit weights.

Unit Weight	Packaging Material	Configuration
50 lb	Multi-wall paper bags	40 bags/pallet
1000 lb	Corrugated cardboard	1 gaylord/pallet

Bulk shipments are available in truckload and railcar quantities. The bulk density range of LOMOD resin pellets is 36 – 40 lbs/ft^3.

STORAGE

LOMOD resin will not degrade during storage. Heating and/or cooling is not required although the packaged resin should be stored indoors to protect the packaging material from rain or excessive moisture. Do not stack pallets more than three units high. Periodically check storage for vertical stability. Do not store flammable materials in resin storage area. (See SPILL OR LEAK PROCEDURES).

TRANSPORTATION

For transportation purposes, LOMOD resin is not defined or designated as a hazardous material by the U.S. Department of Transportation under Title 49 of the Code of Federal Regulations.

DOT Proper Shipping Name . . . . . .Not applicable
DOT Hazard Class/ID Number . . . . . .Not applicable
DOT Label . . . . . .Not applicable
Hazardous Substance(s)/RQ's . . . . . .Not applicable

Packaging materials are labeled with the product name, LOMOD resin and the manufacturer, GENERAL ELECTRIC COMPANY.

NOVEMBER 19[illegible]
Polymer [redacted]

NORYL®

resin

MATERIAL SAFETY DATA

NORYL PRODUCTS DIVISION
PLASTICS GROUP
GENERAL ELECTRIC COMPANY
NORYL AVENUE
SELKIRK, NEW YORK 12158

GENERAL ELECTRIC

NORYL resin

INDEX

Issue Date **November 1985**

Supercedes Material Safety Data publication dated October 1984.

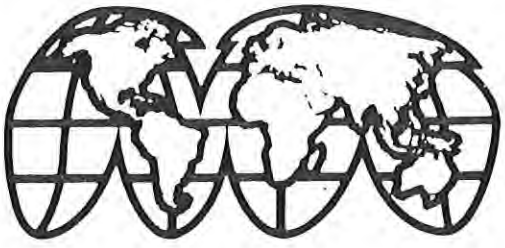
INTRODUCTION

This publication provides guidelines and suggested precautions for the safe handling and processing of NORYL® resins and supersedes all previously issued Material Safety Data sheets on these products. General Electric Company recommends that all individuals read and understand this information prior to working with NORYL resins and that this information be incorporated into individual plant safety programs. This brochure does not include information on the suitability of NORYL resins for any specific application nor any precautions that may be appropriate for the use of finished products. The Material Safety Data contained in this publication include all information required to be furnished by manufacturers, distributors and importers of hazardous substances by the Occupational Safety and Health Administration (OSHA) pursuant to the Hazard Communication Standard (29 CFR 1910.1200).

USER'S RESPONSIBILITY

A brochure such as this cannot cover all possible individual situations. In addition, the conditions under which our products are processed and used are beyond our control. The products described herein are not hazardous when processed properly. A user of NORYL resins is responsible for providing a safe workplace; therefore, all aspects of an individual operation should be examined to determine if or where precautions, in addition to those described herein, are required. Any health hazard and safety information contained herein should be passed on to customers and/or employees.

Manager – Product Safety
GENERAL ELECTRIC COMPANY
Plastics Group



NORYL® resin

PRODUCT IDENTIFICATION

NORYL resins, a family of solid organic thermoplastics, are proprietary formulations of polyphenylene ether with high-impact polystyrene polymers and polyamides.

BASE RESINS (HOMOPOLYMER)

COMMON NAMES: PPO® resin

CHEMICAL NAMES: Poly (2,6-dimethyl-1, 4-phenylene oxide)
Phenol, 2, 6-dimethyl; homopolymer

$(C_8H_8O)_n$

CAS REGISTRY NUMBER: 25134-01-4

ALLOYING/BLENDING RESINS

COMMON NAMES: High Impact Polystyrene
HIPS

$(C_8H_8)_x(C_4H_6)_y$

CHEMICAL NAMES: Poly (butadiene-styrene)
Benzene, ethenyl-, polymer with 1, 3-butadiene

CAS REGISTRY NUMBER: 9003-55-8

COMMON NAME: Nylon 6

CHEMICAL NAMES: Polycaprolactam
Poly [imino (1-oxo-1, 6-hexanediyl)]

$(C_6H_{11}NO)_n$

CAS REGISTRY NUMBER: 25038-54-4

COMMON NAME: Nylon 66

CHEMICAL NAMES: Poly (hexamethylenediamine-adipate)
Poly [imino (1, 6-dioxo-1, 6-hexanediyl) imino-1, 6-hexanediyl]

$(C_{12}H_{22}N_2O_2)_n$

CAS REGISTRY NUMBER: 32131-17-2

® NORYL and PPO are Registered Trademarks of General Electric Company.

INGREDIENTS

Commercial and proprietary compounds are added to enhance the physical and chemical properties of the base resin. These additives include (but are not limited to) the following generic classes of compounds. Most standard and developmental products contain more than one type of additive.

The specific chemical identities need precise proportions of some ingredients are proprietary. This information will be made available to health professionals in accordance with the provisions of the OSHA Hazard Communication Standard.

TYPE OF ADDITIVE	FUNCTION OR PURPOSE	GENERIC COMPOUND(S) AND/OR CLASS(ES) EMPLOYED	TYPICAL CONCENTRATIONS	TYPICAL NORYL PRODUCT DESIGNATION(S)
THERMAL STABILIZERS	Inhibit thermal degradation and discoloration	Organic phosphites Zinc, copper and potassium salts Hindered phenols	< 2%	All NORYL products, e.g. 731; ENG265; HB235; PX884; SE100; SPN420 GTX and CRN Series
ULTRAVIOLET STABILIZERS	Improve color stability and extend outdoor weathering life	Substituted benzotriazoles Benzophenones Hindered amines	< 4%	NORYL UV 180
REINFORCING AGENTS	Increase strength, rigidity and dimensional stability	Glass fibers Non-asbestos minerals	10 – 50%	GFN2; GFN3; HS1000; HS2000; SE1-GFN2; SE1-GFN3; PX1675-RFN420; RFN430; CRN630; GTX 800 Series
FLAME RETARDANTS	Improve ignition resistance and reduce rate of flame spread	Aryl phosphate esters Perfluoroalkylpolymers	3 – 20% < 1%	N190; N225; SE1; SE100; PX1005; FN215-/170-/150-/210, PC180; CRT200; EN185-/212-/185; SPN422L
		Antimony Oxide Brominated organic compounds	5 – 20%	SPN 580 SPN 585H
MOLD RELEASE AGENTS	Processing efficiencies	Polyethylene Polyethers	< 1.5%	All standard products except reinforced products
ORGANIC POLYMERS	Property modification	Polybutadiene/styrene Others Hydrocarbon resins	2 – 15%	Many standard and developmental products, e.g. PX1222; N300; CRN410, CRN630, GTX 800 Series, GTX 900 Series
BLOWING AGENTS	Foam molding	Azoheterocyclics Phenyltetrazoles Azocarbonamides	8 – 12%	FNC-20
COLORANTS	Standard and custom colors	Dyes and Pigments (See below)	0.5 – 15%	A 3 to 5 digit color number following the grade designations

COLORANTS

Colored NORYL resin formulations may contain commercially available dyes and pigments based on titanium dioxide, carbon black, phthalocyanines, cadmium (insoluble sulfides and sulfoselenides), lead salts, chromium (III) and other organic and inorganic compounds. In pelletized resin these colorants and the above identified additives are encapsulated in the polymer resin matrix and are not expected to create any unusual hazards when processed according to good manufacturing and industrial hygiene practices and the enclosed guideline recommendations. (See PROCESSING FUMES.)

FDA GRADES

Specific grades of NORYL modified polyphenylene oxide resin (731-XXXXS, GFN2-XXXXS, GFN3-XXXXS) comply with the applicable provisions of U.S. FDA Food Additive Regulations governing food contact (21 CFR 177.2460).

HAZARDOUS SUBSTANCES

OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)

NONE of the following materials designated as Toxic and Hazardous Substances by the U.S. Department of Labor/OSHA are used to produce NORYL resin nor are they anticipated by-products in our production process.

29 CFR 1910, 1001 Asbestos
1002 Coal tar pitch volatiles
1003 4-Nitrobiphenyl
1004 alpha-Naphthylamine
1006 Methyl chloromethyl ether
1007 3,3'-Dichlorobenzidine (and salts)
1008 bis-Chloromethyl ether
1009 beta-Naphthylamine
1010 Benzidine
1011 4-Aminodiphenyl
1012 Ethyleneimine
1013 beta-Propiolactone
1014 2-Acetylaminofluoroene
1015 4-Dimethylaminoazobenzene
1016 N-Nitrosodimethylamine
1017 Vinyl Chloride
1018 Inorganic arsenic
1029 Coke oven emissions
1043 Cotton dust
1044 1,2-Dibromo-3-chloropropane
1045 Acrylonitrile
1047 Ethylene oxide

NORYL resin dust is **NOT** included on the list of Toxic and Hazardous Air Contaminants (29 CFR 1910.1000). This standard does however provide the following Permissible Exposure Limits (PEL) for Inert or Nuisance Dusts. In addition Threshold Limit Values (TLV) for Some Nuisance Particulates have been established by the American Conference of Governmental Industrial Hygienists (ACGIH).

INERT OR NUISANCE DUST: 8 hour Time-Weighted-Average		
	OSHA PEL	ACGIH (1984-85) TLV
Total Dust	15 mg/m³	10 mg/m³
Respirable Fraction	5 mg/m³	5 mg/m³

NORYL resin does **NOT** contain vinyl chloride, monomeric phthalate esters, nor any EPA regulated halogenated biphenyls such as PCB's. PBB's, etc. (40 CFR 761), or chlorofluorcarbons (40 CFR 762).

TOXIC SUBSTANCES CONTROL ACT (TSCA)

NORYL resin and all other chemical substanced incorporated into the resin (additives, fillers, colorants and other polymeric substances) are included in the **TSCA INVENTORY OF CHEMICAL SUBSTANCES** compiled by the U.S. Environmental Protection Agency.

PHYSICAL PROPERTY DATA*

NORYL resin, an amorphous solid, is supplied in the form cylindrical pellets averaging 3 mm in diameter and 5.5 mm in length.

TEMPERATURE

GLASS TRANSITION T_g Amorphous		90 – 132°C (194 – 270°F)
VICAT SOFTENING	ASTM D-1525	109 – 142°C (228 – 288°F)
INJECTION MOLDING	Typical Range	232 – 325° (450 – 617°)
THERMAL DECOMPOSITION	Thermogravimetric Analysis (in air)	
Initial (Onset)	250°C	(480°F)
50% Wt. Loss	450°C	(840°F)
IGNITION TEMPERATURE	ASTM D-1929 (Setchkin Method)	
Flash Ignition	400°C	(752°F)
Self Ignition	490°C	(914°F)

WEIGHT

SPECIFIC GRAVITY (H_2O = 1)	Range 1.05 to 1.36
BULK DENSITY (unfilled)	Pellets 641 kg/m^3 (40 lbs/ft^3)

RESIN SOLUBILITY

WATER	Insoluble
METHYLENE CHLORIDE/ TRICHLOROETHYLENE	Approx. 10% by Wt.

VOLATILES

WATER	Equilibrium	0.07%
ORGANICS	Wt. loss (Typical)	± 0.5%

COLOR AVAILABILITY

PIGMENTED	Full range of opaque colors

OTHER

ODOR	Characteristic
VAPOR PRESSURE, VAPOR DENSITY, BOILING POINT, EVAPORATION RATE	These properties are not applicable to solid compounds such as NORYL resin

*Typical values for general purpose grades based on material tested but may vary from sample to sample. Consult product literature for specialty grades. Typical values should not be construed as a guaranteed analysis for any specific lot or as specification values.

PROCESSING FUMES

GENERAL

Virtually all thermoplastic resins emit processing fumes when heated to extrusion or injection molding temperatures. These fumes are complex mixtures of vapors, droplets and suspended particulates which are representative of the specific resin formulation. Colorants and other additives used to enhance resin properties may be volatilized. In addition, the fumes may contain thermal decomposition products from the base resin and the various additives.

The concentration and composition of processing fume components will depend upon the processing temperature, resin formulation, residence time in the processing equipment, surface area of the molded part, equipment variables (screw design, venting parameters, etc.) and the dryness of the resin.

NORYL RESIN

When processed according to General Electric recommended procedures, NORYL resin processing fumes (or resin dust from secondary operations such as regrinding) are not known or expected to cause any adverse human health effects. However, the full range of potential effects has not been completely characterized. Certain sensitive individuals and individuals with respiratory impairments may be affected by exposure to specific components in the processing fumes. Such potential effects would primarily relate to the principal exposure routes – that is irritation of the eyes, nose, throat or skin (see FIRST AID Section).

The major fume components evolved by NORYL resin at recommended processing conditions include water, styrene, ethyl benzene, toluene, and phenol. In addition, flame resistant grades of NORYL resin will evolve either aryl phosphate esters or brominated phenols. These fume components do not pose an unusual health hazard at concentrations expected in the workplace. Nevertheless, potential exposures should be minimized by good housekeeping, good industrial hygiene practice and adequate ventilation.

Fume Component	OSHA 8-hr. PEL	OSHA STEL	ACGIH (1984-85) TLV	ACGIH (1984-85) STEL
Styrene	100 ppm	200 ppm	50	100
Ethylbenzene	100 ppm	—	100	125
Triaryl* phosphate ethers	3.0 mg/m^3	—	3.0 mg/m^3	3.0 mg/m^3
Phenol	5 ppm	—	5	10
Toluene	200 ppm	300 ppm	100	150

*As triphenyl phosphate

INDUSTRIAL HYGIENE INFORMATION

Various government programs and regulations are rapidly increasing the amount of industrial hygiene information that is available on chemical substances. Although the applicability of this information to specific production operations will, of course, depend on local processing conditions, manufacturers are encouraged to remain current with developments in this field.

Industrial hygiene information on specific chemical compounds (styrene, toluene, phenol and ethylbenzene) evolved during thermal processing of NORYL resins is provided in standard industrial hygiene manuals and publications such as:

- Documentation of the Threshold Limit Values, 4th Edition; Available from the American Conference of Governmental Industrial Hygienists, 6500 Glenway Ave., Bldg. D-5, Cincinnati, OH 45211.
- Patty's Industrial Hygiene and Toxicology, 3rd Edition, G.D. Clayton and F.E. Clayton, 973 p. 1983 (ISBNO-471-08431-X). Available from Wiley, John and Sons, Inc., 605 Third Avenue, New York, NY 10158.

A mixture of triaryl phosphate esters is present in fumes evolved during the molding and extrusion of flame resistant grades of NORYL resin. The following industrial hygiene information on the processing of triaryl phosphate ester compounds has been published by our supplier.

TRIARYL PHOSPHATE ESTER COMPOUNDS

Avoid Skin Contact: Protective clothing and non-permeable gloves should be worn. If contact does occur, remove affected clothing immediately and wash thoroughly with soap and water.

Avoid Eye Contact: Protective goggles or a safety shield should be worn. If contact occurs use an eye wash for at least fifteen minutes and get medical attention.

Avoid Ingestion: No smoking, eating, drinking, or food handling should be permitted in the operating area. If ingestion occurs, induce vomiting and consult a physician.

Avoid Breathing Vapor: At normal room temperature the vapor pressure of triaryl phosphate esters is extremely low; however, they should still be used only in well ventilated areas. In high-temperature application use a general purpose filter gas mask. In misting conditions use a respirator with a mechanical filter and prevent skin exposure.

NOTE: Triaryl phosphate, used in plastics, paints and inks, can interact with esterase, an enzyme associated with certain white blood cells (monocytes). Blood samples from workers exposed to low levels of aryl phosphate esters may exhibit a reduced level of monocyte "color-staining" with esterase dependent dyes used in some cell counting methods. Those cells stain normally with traditional (non-esterase dependent) dyes. There have been no diseases or adverse health effects associated with this reduced cell-staining observation. Reduced levels of monocyte with esterase dependent dyes is routinely observed in 10-15% of the general population.

VENTILATION

Ventilation requirements for each particular workplace must be determined on an individual basis. Information and guidelines on ventilation standards and design techniques may be found in the following publications.

- **NIOSH Recommended Industrial Ventilation Guidelines;** GPO #017-033-00136-7. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
- **Industrial Ventilation, 18th Edition;** Available from the American Conference of Governmental Industrial Hygienists, Committee on Industrial Ventilation, P.O. Box 16153, Lansing, MI 48901.
- **Fundamentals Governing the Design and Operation of Local Exhaust Systems;** (ANSI-792.2) Available from American National Standards Institute, 1430 Broadway, New York, NY 10018.

In general, the continuous supply of fresh air to the general workplace area together with the continuous removal of processing fume contaminated air through exhaust hoods and associated enclosed ducting will provide adequate ventilation for most operations. The exhaust hood should be positioned to prevent routine inhalation of smoke, fumes, dust and vapors from molding and other operations.

Note: Processing fume condensates, which may include toxic contaminants, are flammable and should be periodically removed from exhaust hoods, ductwork and other surfaces. Protective clothing, including rubber gloves, should be worn during clean-up operations to prevent skin contact.

ODOR

The characteristic odor of NORYL resin processing fumes may (initially) be unpleasant and irritating to some individuals. Processing fume odors from any plastic material can be minimized by utilizing good ventilation practices.

FIRST AID

Some individuals with specific sensitivities may exhibit eye, nose, throat or dermal irritation if overexposed to processing fumes.

Eye Irritation: Flush eyes thoroughly with clean, low pressure water.

Skin Irritation: Wash affected areas with soap and water.

Respiratory Irritation: Leave the exposure area and obtain fresh air. Provide appropriate protection before allowing re-entry.

In all cases, a physician should be contacted if irritation persists.

Note: Molten resin can cause severe thermal burns which may require expert emergency attention.

HEALTH HAZARD DATA

None of the base resins, blending resins or elastomeric impact modifiers in the physical form present present in NORYL resins are hazardous substances within the meaning of the OSHA Hazard Communication Standard.

ORAL TOXICITY

NORYL resins have very low acute oral toxicity. When ground resin (approx. 20 mesh) was administered orally in single doses of 5g/kg pf body weight to laboratory rats, no mortalities occured. There were no overt signs of toxicity. Necropsy revealed no significant gross pathological organ changes.

In a two year dietary study, laboratory rats were fed polyphenylene oxide resin powder (up tp 10% by weight in the animal diet). There were no adverse effects on physical appearance, behavior, growth, food consumption, survival, clinical laboratory results, organ weights, or gross or microscopic pathology.

DERMAL TOXICITY/IRRITATION/SENSITIZATION

NORYL resins have no demonstrable acute dermal toxicity. When different grades of finely ground resin were tested on intact and abraded rabbit skin, no compound-related deaths or signs of toxicity were noted at the highest concentration tested (2000 mg/kg).

NORYL resins are not primary skin irritants and do not cause local sensitization. Finely ground resin, when applied at a dose of 0.5 grams to abraded and non-abraded skin of laboratory rabbits, did not produce any detectable irritation or other clinical signs.

EYE IRRITATION

NORYL resins are not considered primary eye irritants. When typical NORYL resins, in finely divided form were placed into the eyes of test rabbits a slight transient redness occurred – consistent with the expected slightly abrasive nature of the ground resin particles.

FUME INHALATION

Processing fumes from typical NORYL resins are not considered toxic. In acute inhalation tests, laboratory rats were exposed to processing fumes at concentrations exaggerating those that would likely occur in workplace situations. During the exposure periods (6 hour duration) signs of eye and nasal irritation were observed. These signs of irritation disappeared shortly after the animals were removed from the exposure chamber. No deaths or signs of toxicity were noted during fume exposure period. There were no distinct or consistent treatment related tissue or organ changes noted in gross necropsies.

HEALTH HAZARDS

There are no known acute or chronic health hazards associated with exposure to NORYL resins, nor are there any medical conditions known to be generally aggravated by such exposure. See PROCESSING FUMES and VENTILATION sections.

REACTIVITY DATA

NORYL resin is a stable thermoplastic solid compound and will not undergo hazardous polymerization.

DIFFERENTIAL THERMAL ANALYSIS

NORYL resin, when heated in air wil absorb energy (endothermic) from 390°C (835°F) to 470°C (878°F) and evolve a variety of decomposition products. Above 470°C heat is evolved (exothermic) as more of the decomposition products are converted to carbon monoxide and carbon dioxide.

SPILL OR LEAK PROCEDURES

NORYL resin pellets spilled on floors, aisles and other working surfaces are slipping hazard. Sweep, shovel or vacuum spilled resin into containers for resuse or disposal.

RCRA

NORYL resin pellets, regrind, molded parts, extrusion purge, etc., are not hazardous wastes as defined by regulations implementing the Resource Conservation and Recovery Act (RCRA). In general, these material may be discarded in accordance with State and local regulations governing the disposal of other common of non-RCRA regulated wastes materials.

"SUPERFUND"

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or "Superfund" levies a tax on hazardous waste materials expected to remain at a hazardous waste disposal facility after its closure (i.e., landfills). NORYL resins and items produced from these resins are not regulated as hazardous wastes and are not subject to this Superfund tax.

SPECIAL PROTECTION

In general, special protection beyond established industrial safety practices and procedures is not required for the handling or processing of NORYL resin.

Typical protection would include:

- Safety glasses with side shields.
- Substantial, well insulated gloves to prevent contact with hot polymer.
- Face shield and rubber gloves for cleaning processing fume deposits from exhaust hoods and other surfaces.
- Self contained breathing equipment, if needed for fire fighting.

SPECIAL PRECAUTIONS

Special precautions beyond good industrial hygiene practice and those identified in this brochure will primarily depend upon specific workplace conditions and special hazards.

Enforce rules of good industrial hygiene practice:

- Wash hands prior to eating.
- Do not store or consume food in processing areas.
- Do not use production equipment to heat food.
- Do not smoke in processing areas.
- Provide adequate ventilation.

Incorporate the information in this brochure into individual plant safety programs.

HANDLING AND STORAGE

PACKAGING

NORYL resin is packaged in standard unit weights.

Unit Weight	Packaging Material	Configuration
50 lb	Multi-wall paper bags	40 bags/pallet
1000 lb	Corrugated cardboard	1 gaylord/pallet

Bulk shipments are available in truckload and railcar quantities. The bulk density range of NORYL resin pellets is 38 – 42 lbs/ft^3.

STORAGE

NORYL resin will not degrade during storage. Heating and/or cooling is not required although the packaged resin should be stored indoors to protect the packaging material from rain or excessive moisture. Do not stack pallets more than three units high. Periodically check storage for vertical stability. Do not store flammable materials in resin storage area. (See SPILL OR LEAK PROCEDURES).

TRANSPORTATION

For transportation purposes, NORYL resin is not defined or designated as a hazardous material by the U.S. Department of Transportation under Title 49 of the Code of Federal Regulations.

DOT Proper Shipping Name . . . . . .Not applicable
DOT Hazard Class/ID Number . . . . . .Not applicable
DOT Label . . . . . .Not applicable
Hazardous Substance(s)/RQ's . . . . . .Not applicable

Packaging materials are labeled with the product name, NORYL resin and the manufacturer, GENERAL ELECTRIC COMPANY.

FIRE AND EXPLOSION HAZARDS

FLAMMABILITY

NORYL resins burn with difficulty because a substantial amount of energy is required to break down the polymer into smaller fragments which will support combustion.

Generally, a continuous external flame source is needed to initiate combustion. Precautions similar to those taken with wood and other combustible materials are recommended.

SMOKE

When forced to burn, NORYL resin will produce a sooty fire; that is, it will generate opaque black smoke (particulate carbon) reflecting the inherent combustion resistance of the materials.

TOXICITY

The primary toxic product of combustion from NORYL resins is carbon monoxide. Carbon dioxide, an asphyxiant, is also produced. When burned, flame resistant grades will evolve either arylphosphate esters or trace quantities of hydrogen bromide depending on the additive system used (see INGREDIENTS section).

FIRE FIGHTING

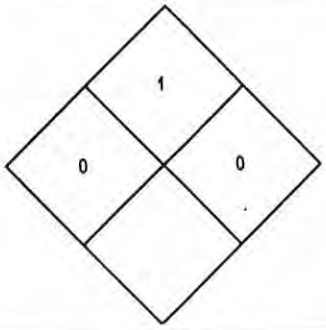
Water is the best extinguishing medium. Carbon dioxide is not generally recommended because its lack of cooling capacity may permit re-ignition. MSHA/NIOSH approved pressure demand breathing apparatus should be used. Personnel without suitable respiratory protection should leave the area. **Caution:** Stacked cardboard resin containers will be weakened by water absorption and may collapse.

EXPLOSION

NORYL resin pellets, because of their size, do not present a dust explosion hazard.

Post-molding operations, such as regrinding and sawing, should be periodically checked for proper maintenance of dust control devices. Likely sources of ignition, such as static build-up, should be eliminated. Good housekeeping and adequate ventilation can prevent accumulation of potentially explosive dust concentrations. For additional information see **NFPA 654: "Standard for the Prevention of Dust Explosions in the Plastics Industry"** published by the National Fire Protection Association (Volume Five of the National Fire Codes).

NFPA 704

NFPA FIRE HAZARD CLASSIFICATION		NORYL RESIN
4 – Extreme 3 – High 2 – Moderate 1 – Slight 0 – Insignificant		

NORYL®
resin

Business Office
GENERAL ELECTRIC COMPANY
Plastics Group
NORYL Products Division
Noryl Avenue/Route 32
Selkirk, New York 12158
Phone 1-800-GEPLAST

Manufacturing Location
Noryl Avenue/Route 32
Selkirk, New York 12158
Phone (518) 475-5360

Emergency Telephone Numbers
(518) 475-5566 (Day)
(518) 475-5222 (Eve/Weekend)
(413) 448-4929 (Day)

For additional non-emergency product safety information
NORYL Products Division
Selkirk New York 12158
(518) 475-5585

GENERAL ELECTRIC

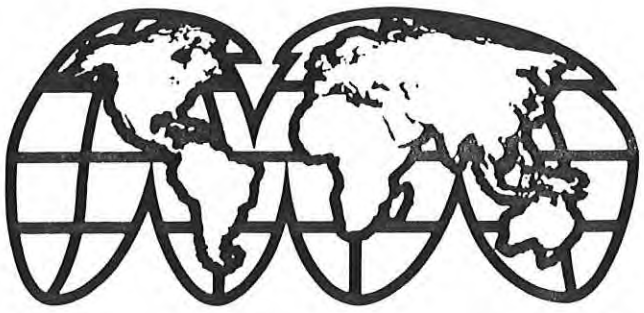
NOVEMBER 1985

Polymer

XENOY®

resin

MATERIAL SAFETY DATA



COMPOSITE POLYMERS OPERATIONS
PLASTICS GROUP
GENERAL ELECTRIC COMPANY
ONE PLASTICS AVENUE
PITTSFIELD, MASSACHUSETTS 01201

GENERAL ELECTRIC

XENOY® resin

Issue Date **November 1985**

Supersedes Material Safety Data Publication Dated July 1983

INTRODUCTION

This publication provides guidelines and suggested precautions for the safe handling and processing of XENOY® resins and supersedes all previously issued material safety data sheets on these products. General Electric Company recommends that all individuals read and understand this information prior to working with XENOY resin and that this information be incorporated into individual plant safety programs. This brochure does not include information on the suitability of XENOY resin for any specific application nor any precautions that may be appropriate for the use of finished products. The Material Safety Data contained in this publication include all information required to be furnished by manufacturers, distributors and importers of hazardous substances by the Occupational Safety and Health Administration (OSHA) pursuant to the Hazard Communication Standard (29 CFR 1910.1200).

USER'S RESPONSIBILITY

A brochure such as this cannot cover all possible individual situations. In addition, the conditions under which our products are processed and used are beyond our control. The products described herein are not hazardous when processed properly. A user of XENOY resin is responsible for providing a safe workplace; therefore, all aspects of an individual operation should be examined to determine if or where precautions, in addition to those described herein, are required. Any health hazard and safety information contained herein should be passed on to customers and/or employees.

Manager – Product Safety
GENERAL ELECTRICAL COMPANY
Plastics Group

GENERAL ELECTRIC

Business Office
GENERAL ELECTRIC COMPANY
Plastics Group
Composite Polymers Operations
One Plastics Avenue
Pittsfield, Massachusetts 01201
Phone 1-800-GEPLAST

Manufacturing Location
Highway 69 South
Mt. Vernon, Indiana 47620
Phone (812) 838-7255

Emergency Telephone Numbers
(812) 838-7245 (24 Hours)
(413) 448-4929 (Day)

For additional non-emergency product safety information
Manager, Product Safety
General Electric Company
Plastics Technology Department
Mt. Vernon, Indiana 47620
(812) 838-7236

PRODUCT IDENTIFICATION

XENOY® resin

The XENOY Thermoplastic Alloy family of organic thermoplastic resins are compositions based on:

1) Poly (butylene terephthalate homopolymer (PBT) and speciality resin formulations based on blends of PBT with other polymers such as poly (ethylene terephthalate) (PET) and polycarbonates (PC) modified with elastomeric impact modifiers.
2) Bisphenol-A-polycarbonate homopolymer (PC) and speciality resin formulations based on blends of PC and speciality copolycarbonates based on BPA and other comonomers) with other polymers such as poly (ethylene terephthalate) (PET), poly (cyclohexyl methylene terephthalate) (PCT), and poly (caprolactone) (PCL) modified with elastomers impact modifiers.

BASE RESINS (HOMOPOLYMERS)

COMMON NAMES: Polybutylene terephthalate (PBT)
Polytetramethylene terephthalate $(C_{12}H_{12}O_4)_n$

CHEMICAL NAMES: Poly (oxy-1, 4-butanediylcarbonyl-1, 4-phenylenecarbonyl)
1, 4-Benzenedicarboxylic acid, polymer with 1, 4-butanediol
1, 4-Benzenedicarboxylic acid, dimethylester, polymer with 1, 4-butanediol

CAS REGISTRY NUMBERS: 24968-12-5
26062-94-2
30965-26-5

COMMON NAME: Bisphenol-A polycarbonate

CHEMICAL NAMES: Poly (oxycarbonyloxy-1, 4-phenylene-(1-methylethylidene)-1, 4-phenylene)
Carbonic acid, polymer with 4, 4'-(1-methylethylidene) bis (phenol)
Carbonic dichloride, polymer with 4, 4'-(1-methylethilidene) bis (phenol) $(C_{16}H_{14}O_3)_n$

CAS REGISTRY NUMBERS: 24936-68-3
25037-45-0
25971-63-5

BLENDING/ALLOYING POLYMERS

COMMON NAMES: Polyethylene terephthalate (PET)

CHEMICAL NAMES: Poly (oxy-1, 2-ethanediyloxy carbonyl-1, 4-phenylene carbonayl) $(C_{10}H_8O_4)_n$

CAS REGISTRY NUMBER: 25038-59-9

COMMON NAME: Poly (cyclohexylmethylene terephthalate) (PCT)

CHEMICAL NAMES: 1, 4-Benzenedicarboxylic acid, dimethylester, polymer with 1, 4-cyclohexane dimethanol $(C_{10}H_{10}O_4 \bullet C_8H_{16}O_2)_x$

CAS REGISTRY NUMBER: 25135-20-0

COMMON NAME: Polycaprolactone

CHEMICAL NAME: 2-Oxepanone, homopolymer $(C_6H_{10}O_2)_n$

CAS REGISTRY NUMBER: 24980-41-4

COMMON NAME: Bisphenol-A/isophthaloyldichloride/terephthaloyldichloride copolyestercarbonate

CHEMICAL NAME: 4, 4'-(1-methylethylidene) bis (phenol), polymer with carbonic dichloride,
1, 3-benzenedicarbonyldichloride, and 1, 4-benezenedicarbonyldichloride
$(C_{15}H_{16}O_2 \bullet C_8H_4CL_2O_2 \bullet C_8H_4CL_2O_2CCL_2O)_x$

CAS REGISTRY NUMBER: 71519-80-7

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INGREDIENTS

Commercial and proprietary compounds are added to enhance the physical and chemical properties of the base resin. These additives include (but are not limited to) the following generic classes of compounds. Most standard and developmental (designated DX-XXXX) products contain more than one type of additive.

The specific chemical identities and precise proportions of some ingredients are proprietary. This information will be made available to health professionals in accordance with the provisions of the OSHA Hazard Communication Standard.

TYPE OF ADDITIVE	FUNCTION OR PURPOSE	GENERIC COMPOUND(S) AND/OR CLASS(ES) EMPLOYED	TYPICAL LEVELS (IN PELLETS)	TYPICAL XENOY PRODUCT DESIGNATION(S)
THERMAL STABILIZERS	Inhibit thermal degradation and discoloration	Organic phosphites Epoxides Hindered phenols Thioesters	0.1 – 5%	All products including those designated as DX and CX; these include the 1000, 2000, 3000, 4000 5000 and 6000 XENOY Products Series
ULTRAVIOLET STABILIZERS	Extend outdoor weathering life	Substituted benzotriazole Benzophenones	< 2%	All products with the "U" Suffix, as in XENOY 6620U, and a speciality grade XENOY 1103
REINFORCING AGENTS	Increase strength, rigidity and dimensional stability	Glass fibers Non-asbestos minerals Carbon fibers	2 – 55%	XENOY products 2240, 2250, 6301-6304, 6240, 6370 and 6380
MOLD RELEASE & FLOW PROMOTERS	Processing efficiencies	Polyolefins Esters	< 5%	All product grade numbers with an "R" or "M" Suffix as in XENOY 6240M
ORGANIC POLYMERS	Blending alloys	BPA polycarbonate Polyolefins Polyethylene terephthalate Poly (cyclohexyl methylene terephthalate) Poly (caprolactone)	1 – 50%	All XENOY products
IMPACT MODIFIERS	Impact modification	Polyacrylates Polyolefins Poly (acrylonitrile) EPDM and EPDM-based polymers Thermoplastic elastomers (LOMOD® and HYTREL®)	1 – 50%	All XENOY products
BLOWING AGENTS	Foam molding	Phenyltetrazole	< 5%	All XENOY products with an "FX" designation as in XENOY FX 6123
COLORANTS	Standard and custom colors	Dyes and Pigments (See below)	< 5%	A 4 digit color number following the grade designation as in XENOY 5220-6021
SPECIALITY RESINS	Thermal resistance	BPA/IPC/TPC Copolyester	– %	XENOY 1600 and 1602B

COLORANTS

Colored XENOY thermoplastic alloy resin formulations may contain commercially available dyes and pigments based on titanium dioxide, carbon black, phthalocyanines, cadmium (insoluble sulfides and sulfoselenides), chromium (III) and other organic and inorganic compounds. In pelletized resin these colorants and the above identified additives are encapsulated in the polymer resin matrix and are not expected to create any unusual hazards when processed according to good manufacturing and industrial hygiene practices and the enclosed guideline recommendations. (See PROCESSING FUMES.)

HAZARDOUS SUBSTANCES

OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)

NONE of the following materials, designated as Toxic and Hazardous Substances by the U.S. Department of Labor/ OSHA are used to produce XENOY resin nor are they anticipated by-products in our production process.

29 CFR 1910.
1001 Asbestos
1002 Coal tar pitch volatiles
1003 4-Nitrobiphenyl
1004 alpha-Naphthylamine
1006 Methyl chloromethyl ether
1007 3.3'-Dichlorobenzidine (and salts)
1008 bis-Chloromethyl ether
1009 beta-Naphthylamine
1010 Benzidine
1011 4-Aminodiphenyl
1012 Ethyleneimine
1013 beta-Propiolactone
1014 2-Acetylaminofluorene
1015 4-Dimethylaminoazobenzene
1016 N-Nitrosodimethlyamine
1017 Vinyl chloride
1018 Inorganic arsenic
1029 Coke oven emissions
1043 Cotton dust
1044 1,2-Dibromo-3-chloropropane
1047 Ethylene oxide

XENOY resin dust is **NOT** included on the list of Toxic and Hazardous Air Contaminants (29 CFR 1910.1000). This standard does however provide the following Permissible Exposure Limits (PEL) for Inert or Nuisance Dusts. In addition Threshold Limit Values (TLV) for Some Nuisance Particulates have been established by the American Conference of Governmental Industrial Hygienists (ACGIH).

INERT OR NUISANCE DUST: 8 hour Time-Weighted-Average		
	OSHA PEL	ACGIH (1984-85) TLV
Total Dust	15 mg/M³	10 mg/M³
Respirable Fraction	5 mg/M³	5 mg/M³

Specific XENOY resins (XENOY 6301-6304) contain carbon fiber as a reinforcing agent. Although neither toxic nor hazardous, the resin dust (as well as dust generated during regrinding /cutting of molded parts) is **ELECTRICALLY CONDUCTIVE** and as such, electrical based equipment should be adequately protected against electrical discharge/breakdown. Consult supplemental data provided for these individual products.

XENOY resin does **NOT** contain vinyl chloride, monomeric phthalate esters, nor any EPA regulated halogenated biphenyls suc as PCB's. PBB's, etc. (40 CFR 761), or chlorofluorocarbons (40 CFR 762).

TOXIC SUBSTANCES CONTROL ACT (TSCA)

XENOY Thermoplastic Alloy resin and all other chemical substances incorporated into the resin (additives, fillers, colorants and other polymeric substances) are included in the **TSCA INVENTORY OF CHEMICAL SUBSTANCES** compiled by the U.S. Environmental Protection Agency.

PHYSICAL PROPERTY DATA*

XENOY resins are semi-crystalline and are supplied in the form of cylindrical pellets averaging 3.2 mm in diamter and 3.2 mm in length.

TEMPERATURE

MELTING POINT	T_m 220 – 288°C (430 – 550°F)
INJECTION MOLDING Typical Range	230 – 315°C (445 – 600°F)
IGNITION TEMPERATURE	ASTM D-1929 (Setchkin Method)
Flash Ignition	350 – 365°C (660 – 690°F)
Self Ignition	400 – 500°C (752 – 930°F)

WEIGHT

SPECIFIC GRAVITY (H_2O = 1)	Range 1.0 to 1.9
BULK DENSITY (unfilled)	Pellets 640 kg/m³ (40 lbs/ft³)

RESIN SOLUBILITY

WATER	Insoluble

Insoluble in most common organic solvents

VOLATILES

WATER Typical Range	0.3 ± 0.1%
TETRAHYDROFURAN	300 ppm (approx. – PBT containing products only)

COLOR AVAILABILITY

NATURAL	Opaque white to dark black (dependent on filler/ reinforcement product)
PIGMENTED	Full range of opaque resins

OTHER

ODOR	None to minimal
VAPOR PRESSURE	These properties are not applicable to solid compounds such as XENOY resin
VAPOR DENSITY	
BOILING POINT	
EVAPORATION RATE	

*Typical values for general purpose grades based on material tested but may vary from sample to sample. Consult product literature for specialty grades. Typical values should not be construed as guaranteed analysis of any specific lot or as specification values.

PROCESSING FUMES

GENERAL

Virtually all thermoplastic resins emit processing fumes when heated to extrusion or injection molding temperatures. These fumes are complex mixtures of vapors, droplets and suspended particulates which are representative of the specific resin formulation. Colorants and other additives used to enhance resin properties may be volatilized. In addition, the fumes may contain thermal decomposition products from the base resin and the various additives.

The concentration and composition of processing fume components will depend upon the processing temperature, resin formulation, residence time in the processing equipment, surface area of the molded part, equipment variables (screw design, venting parameters, etc.) and the dryness of the resin.

XENOY RESIN

When processed according to General Electric recommended procedures, XENOY resin processing fumes (or resin dust from secondary operations such as regrinding) are not known or expected to cause any adverse human health effects. However, the full range of potential effects has not been completely characterized. Certain sensitive individuals and individuals with respiratory impairments may be affected by exposure to specific components in the processing fumes. Such potential effects would primarily relate to the principal exposure routes – that is irritation of the eyes, nose, throat or skin (see FIRST AID Section).

Although no specific tests have been conducted on the various resin blends in XENOY Thermoplastic alloys, we have no reason to believe the physical mix will be different from the pure components. The major fume components evolved by the various resins are listed below. These fume components do not pose an unusual health hazard at concentrations expected in the workplace. Nevertheless, potential exposure should be minimized by good housekeeping, good industrial hygiene practices and adequate ventilation.

BASE RESIN	MAJOR FUME COMPONENTS
PBT	Water, carbon dioxide, tetrahydrofuran
PC	Water, carbon dioxide, diphenyl carbonate, methylene chloride, and phenol

PBT:

	8 hour Time-Weighted Average			
	OSHA (TLV) PPM	OSHA (TLV) mg/m³	ACGIH (1982) (PEL) PPM	ACGIH (1982) (PEL) mg/m³
Tetrahydrofuran	200	590	200	590

PC:

	8 hour Time-Weighted Average			
	OSHA (TLV) PPM	OSHA (TLV) mg/m³	ACGIH (1982) (PEL) PPM	ACGIH (1982) (PEL) mg/m³
Carbon dioxide	5,000	9,000	5,000	9,000
Diphenylcarbonate	—	—	—	—
Methylene chloride	500	1,800	000	360

VENTILATION

Ventilation requirements for each particular workplace must be determined on an individual basis. Information and guidelines on ventilation standards and design techniques may be found in the following publications.

- **NIOSH Recommended Industrial Ventilation Guidelines;** GPO #017-033-00136-7. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
- **Industrial Ventilation, 18th Edition;** Available from the American Conference of Governmental Industrial Hygienists, Committee on Industrial Ventilation, P.O. Box 16153, Lansing, MI 48901.
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In general, the continuous supply of fresh air to the general workplace area together with the continuous removal of processing fume contaminated air through exhaust hoods and associated enclosed ducting will provide adequate ventilation for most operations. The exhaust hoods should be positioned to prevent routine inhalation of smoke, fumes, dust and vapors from molding and other operations.

Note: Processing fume condensates, which may include toxic contaminants, are flammable and should be periodically removed from exhaust hoods, ductwork and other surfaces. Protective clothing, including rubber gloves, should be worn during clean-up operations to prevent skin contact.

ODOR

The odor of XENOY reson processing fumes, if any, is mild and may vary somewhat with specific resin formulations. In general, the odor is not offensive to most individuals.

FIRST AID

Some individuals with specific sensitivities may exhibit eye, nose, throat or dermal irritation if overexposed to resin processing fumes.

Eye Irritation: Flush eyes thoroughly with clean, low pressure water.

Skin Irritation: Wash affected areas with soap and water.

Respiratory Irritation: Leave the exposure area and obtain fresh air. Provide appropriate protection before allowing re-entry.

In all cases, a physician should be contacted if irritation persists.

Note: Molten resin can cause severe thermal burns which may require expert emergency attention.

FIRE AND EXPLOSION HAZARDS

FLAMMABILITY

XENOY resin burns with difficulty because a substantial amount of energy is required to break down the polymer into smaller fragments which will support combustion. Generally, an external flame source is needed to initiate combustion. Precautions similar to those taken with wood and other combustible materials are recommended.

SMOKE

When burning, XENOY resin produces a sooty fire; that is, it will generate opaque black smoke (particulate carbon) reflecting the inherent combustion resistance of XENOY resins.

TOXICITY

The primary toxic product of combustion from XENOY resin is carbon monoxide. Carbon dioxide, an asphyxiant, is also produced. Some flame retardant grades will evolve trace quantities of hydrogen bromide under combustion conditions.

FIRE FIGHTING

Water is the best extinguishing medium. Carbon dioxide is not generally recommended because its lack of cooling capacity may permit re-ignition. MSHA/NIOSH approved pressure demand breathing apparatus should be used. Personnel without suitable respiratory protection should leave the area. **Caution:** Stacked cardboard resin containers will be weakened by water absorption and may collapse.

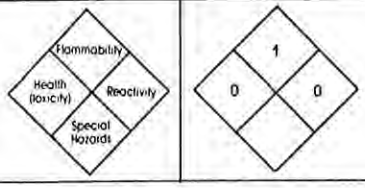
EXPLOSION

XENOY resin pellets, because of their size, do not present a dust explosion hazard.

Post-molding operations, such as regrinding and sawing, should be periodically checked for proper maintenance of dust control devices. Likely sources of ignition, such as static build-up, should be eliminated. Good housekeeping and adequate ventilation can prevent accumulation of potentially explosive dust concentrations. For additional information see **NFPA 654: "Standard for the Prevention of Dust Explosions in the Plastics Industry"** published by the National Fire Protection Association (Volume Five of the National Fire Codes).

Note: Although most XENOY grades are non-conducting (i.e. insulating materials), certain grades (XENOY 6301-6304) contain carbon fiber as a reinforcing agent. This results in their electrical nature becoming conductive. As mentioned under the HAZARDOUS SUBSTANCE Section (page 6), although neither toxic nor hazardous, this results in potential electrical discharge/breakdown issues due to dust present in the resin or generated during post-molding operations (i.e. regrinding or sawing). Special care must be utilized. Supplemental data is provided for these individual XENOY products.

NFPA 704

NFPA FIRE HAZARD CLASSIFICATION	XENOY RESIN
4 – Extreme 3 – High 2 – Moderate 1 – Slight 0 – Insignificant	

HEALTH HAZARD DATA

None of the base resins, blending resins or elastomeric impact modifiers in the physical form present in XENOY resins are hazardous substances within the meaning of the OSHA Hazard Communication Standard.

Animal toxicity tests run on several different XENOY formulations and individually on the base resins and a number of the blending/alloying resins all give results similar to those presented below which are for XENOY 2300 resin.

ORAL TOXICITY

XENOY resins have very low acute oral toxicity. The LD_{50} is greater than 5 g/kg. When administered orally to laboratory rats in a single dose of 5 g/kg, no deaths or signs of toxicity were observed. No unusual organ or tissue changes were observed in test animals sacrificed after a 14-day post-exposure observation period.

DERMAL TOXICITY/IRRITATION/SENSITIZATION

XENOY resin has low acute dermal toxicity. The minimum lethal dose is greater than 2g/kg. When several different grades, in finely ground form, were tested on intact and abraded rabbit skin (occluded wrapping, 24 hr exposure), no compound-related deaths or adverse clinical observations were noted.

XENOY resin is not a primary skin irritant and does not cause sensitization. Finely ground resin, when applied at a dose of 0.5g to abraded and non-abraded rabbit skin, did not produce any detectable irritation or other clinical signs. When tested for skin sensitization potential in guinea pigs, no skin reactions were seen with either the inductive or challenge applications of resin.

EYE IRRITATION

XENOY resin is not considered a primary skin irritant. When typical XENOY resins, in finely ground form were placed into the eyes of test rabbits, a slight transient redness occurred, consistent with the abrasive nature of the ground resin particles.

FUME INHALATION

Process fumes from typical XENOY resins are not considered to present any toxic hazard. Although no animal testing has been conducted on any specific XENOY formulations, tests have been conducted on a number of the individual components, such as PBT and PC. In these tests laboratory rats were exposed to processing fumes at concentrations exaggerating those that would occur in workplace situations. No deaths or signs of toxicity, other than eye and nasal irritation in some cases, were noted during the 6 hour exposure period. The signs of irritation disappeared shortly after termination of the exposure. There were no distinct or consistent treatment related tissue or organ changes in gross necropsies.

HEALTH HAZARDS

There are no known acute or chronic health hazards associated with exposure to XENOY resins, nor are there any medical conditions known to be generally aggravated by such exposure. See PROCESSING FUMES and VENTILATION sections.

REACTIVITY DATA

XENOY resin is a stable thermoplastic solid compound and will not undergo hazardous polymerization.

SPILL OR LEAK PROCEDURES

XENOY resin pellets spilled on floors, aisles and other working surfaces are a slipping hazard. Sweep, shovel or vacuum spilled resin into containers for reuse or disposal. A special exception is carbon fiber reinforced XENOY grades (XENOY 6301-6304). Because of the electrically conductive nature of these grades, special cleanup procedures are recommended. Consult supplemental data provided for those individual products.

RCRA

XENOY resin pellets, regrind, molded parts, extrusion purge, etc., are not hazardous wastes as defined by regulations implementing the Resource Conservation and Recovery Act (RCRA). In general, these materials may be discarded in accordance with the State and local regulations governing the disposal of other common or non-RCRA regulated waste materials.

"SUPERFUND"

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or "Superfund" levies a tax on hazardous waste materials expected to remain at a hazardous waste disposal facility after its closure (i.e., landfills). XENOY resins and items produced from these resins are not regulated as hazardous wastes and are not subject to this Superfund tax.

SPECIAL PROTECTION

In general, special protection beyond established industrial safety practices and procedures is not required for the handling or processing of XENOY resin.

Typical protection would include:

- Safety glasses with side shields
- Substantial, well insulated gloves to prevent contact with hot polymer
- Face shield and rubber gloves for cleaning processing fume deposits from exhaust hoods and other surfaces.
- Self contained breathing equipment, if needed for fire fighting.

A special exception is carbon fiber reinforced XENOY grades (XENOY 6301-6304). Because of the electrically conductive nature of these grades, special protection of electrical based equipment is needed to protect against dust (due to regrinding, cutting or other operations) which can cause electrical failure. Consult supplemental data provided for these individual products.

SPECIAL PRECAUTIONS

Special precautions beyond good industrial hygiene practice and those identified in this brochure will primarily depend upon specific workplace conditions and special hazards.

Enforce rules of good industrial hygiene practice:

- Wash hands prior to eating.
- Do not store or consume food in processing areas.
- Do not use production equipment to heat food.
- Do not smoke in processing areas.
- Provide adequate ventilation.

Incorporate the information in this brochure in individual plant safety programs.

HANDLING AND STORAGE

PACKAGING

XENOY resin is packaged in standard unit weights.

Unit Weight	Packaging Material	Configuration
50 lb	Multi-wall paper bags	40 bags/pallet
1000 lb	Corrugated cardboard	1 gaylord/pallet

Bulk shipments are available in truckload and railcar quantities. The bulk density range of XENOY resin pellets is 38 – 42 lbs/ft^3.

STORAGE

XENOY resin will not degrade during storage. Heating and/or cooling is not required although the packaged resin should be stored indoors to protect the packaging material from rain or excessive moisture. Do not stack pallets more than three units high. Periodically check storage for vertical stability. Do not store flammable materials in resin storage area. (See SPILL OR LEAK PROCEDURES).

TRANSPORTATION

For transportation purposes, XENOY resin is not defined or designated as a hazardous material by the U.S. Department of Transportation under Title 49 of the Code of Federal Regulations.

DOT Proper Shipping Name . . . . . Not applicable
DOT Hazard Class/ID Number . . . . . Not applicable
DOT Label . . . . . Not applicable
Hazardous Substance(s)/RQ's . . . . . Not applicable

Packaging materials are labeled with the product name, XENOY resin and the manufacturer, GENERAL ELECTRIC COMPANY.

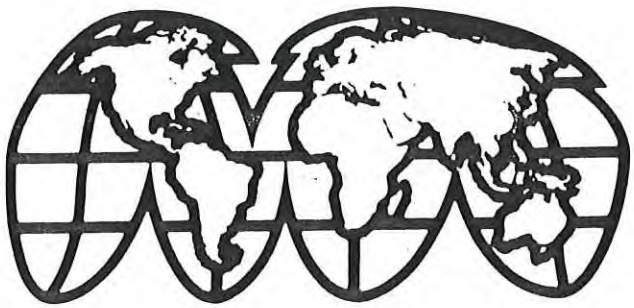
PBG-111-XN

NOVEMBER 1988

Polymer

ULTEM® resin

MATERIAL SAFETY DATA



ULTEM PRODUCTS OPERATION
PLASTICS GROUP
GENERAL ELECTRIC COMPANY
ONE PLASTICS AVENUE
PITTSFIELD, MA 01201

GENERAL ELECTRIC

ULTEM® resin

Issue Date **November 1985**

Supersedes Material Safety Data Publication Dated July 1983

INTRODUCTION

This publication provides guidelines and suggested precautions for the safe handling and processing of ULTEM® resins and supersedes all previously issued material safety data sheets on these products. General Electric Company recommends that all individuals read and understand this information prior to working with ULTEM resin and that this information be incorporated into individual plant safety programs. This brochure does not include information on the suitability of ULTEM resin for any specific application nor any precautions that may be appropriate for the use of finished products. The Material Safety Data contained in this publication include all information required to be furnished by manufacturers, distributors and importers of hazardous substances by the Occupational Safety and Health Administration (OSHA) pursuant to the Hazard Communication Standard (29 CFR 1910.1200).

USER'S RESPONSIBILITY

A brochure such as this cannot cover all possible individual situations. In addition, the conditions under which our products are processed and used are beyond our control. The products described herein are not hazardous when processed properly. A user of ULTEM resin is responsible for providing a safe workplace; therefore, all aspects of an individual operation should be examined to determine if or where precautions, in addition to those described herein, are required. Any health hazard and safety information contained herein should be passed on to customers and/or employees.

Manager – Product Safety
GENERAL ELECTRICAL COMPANY
Plastics Group

GENERAL ELECTRIC

Business Office
GENERAL ELECTRIC COMPANY
Plastics Group
ULTEM Products Operation
One Plastics Avenue
Pittsfield, Massachusetts 01201
Phone 1-800-GEPLAST

Manufacturing Location
Highway 69 South
Mt. Vernon, Indiana 47620
Phone (812) 838-7582

Emergency Telephone Numbers
(812) 838-7245 (24 Hours)
(413) 448-4929 (Day)

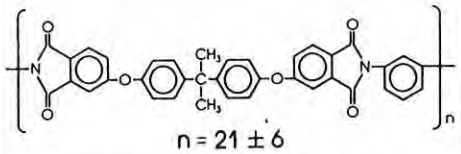
For additional non-emergency product safety information
Manager, Product Safety
General Electric Company
Plastics Technology Department
Mt. Vernon, Indiana 47620
(812) 838-7236

PRODUCT IDENTIFICATION

ULTEM® resin

The ULTEM resin family of solid organic thermoplastics includes polyetherimide homopolymers and copolymers. These materials may be formulated as specific product grades or compounded with other polymers to produce unique resin blends and alloys.

BASE RESIN (HOMOPOLYMER)

Chemical Family	Chemical Composition	Chemical Structure	Molecular Weights
POLYETHERIMIDE (PEI)	CARBON 75.0% OXYGEN 16.2 NITROGEN 4.7 HYDROGEN 4.1	 n = 21 ± 6	$\overline{M}w$ = 30,000 ± 10,000 $\overline{M}n$ = 12,000 ± 4,000

CHEMICAL NAME (As Polymer):	EMPIRICAL FORMULA	CAS REGISTRY NUMBERS
Poly (2, 2'-bis (3, 4-dicarboxyphenoxy) phenylpropane)-2-phenylene bismide)	$(C_{37}H_{24}O_6N_2)_n$	61128-46-9
SYNONYM (as product of constituent monomers)*: 1, 3-Isobenzofuranedione, 5, 5'- [(1-methylethylidene) bis (4, 1-phenyleneoxy)] bis-; polymer with 1, 3 benzenediamine	$(C_{31}H_{20}O_8 \bullet C_6H_8N_2)_x$	61128-46-9

SPECIALITY RESINS (COPOLYMERS)

COMMON NAME: ULTEM 6000 resin

CHEMICAL NAME: Disubstituted isobenzofurandiol, disubstituted bis phenyleneoxy bis copolymer with tetracarboxy carbocycle and disubstituted benzenediamine — 96557-46-9

* ULTEM is a Registered Trademark of General Electric Company.

ULTEM® resin

INGREDIENTS

Commercial and proprietary compounds are added to enhance the physical and chemical properties of the base resin. These additives include (but are not limited to) the following generic classes of compounds. Developmental products are designated with the letter D before the grade number.

The specific chemical identities and precise proportions of some ingredients are proprietary. This information will be made available to health professionals in accordance with the provisions of the OSHA Hazard Communication Standard.

TYPE OF ADDITIVE	FUNCTION OR PURPOSE	GENERIC COMPOUND(S) AND/OR CLASS(ES) EMPLOYED	TYPICAL LEVELS (IN PELLETS)	TYPICAL ULTEM PRODUCT DESIGNATION(S)
REINFORCING AGENTS	Increase strength, rigidity and dimensional stability	Glass fibers Non-asbestos minerals Carbon fibers	5 - 60%	ULTEM 2000 resin series ULTEM 3000 resin series ULTEM 7000 resin series
MOLD RELEASE & FLOW PROMOTERS	Processing Efficiencies	Hydrocarbon Resins	< 1%	All product grade numbers with "R" Suffix, as in 1000R-2310R, etc.
ORGANIC POLYMERS	Property Modification and Blending Alloys	Polycarbonates Siloxane Copolymers Polyacrylates Other Polymers	1 - 50%	All D-8000 Series Products
BLOWING AGENTS	Foam molding	Azoheterocyclics Phenyltetrazole	< 25% (Concentrate)	ULTEM FUL-C20 resin
LUBRICANTS	Wear Resistance Bearing surfaces	Perfluoralkyl Polymers Graphite Disulfides	1 - 30%	ULTEM 4000 series
COLORANTS	Standard and Custom Colors	Dyes and Pigments (See below)	< 0.3% (Transparents) < 1% (Translucents) < 15% (Opaques)	A 3 to 6 digit color number following the grade designation, as in ULTEM 1000-4026

COLORANTS

Colored ULTEM resin formulations may contain commercially available dyes and pigments based on titanium dioxide, iron oxide,carbon black, phthalocyanines, cadmium (insoluble sulfides and sulfoselenides), chromium (III) and other organic and inorganic compounds. In pelletized resin these colorants and the above identified additives are encapsulated in the polymer resin matrix and are not expected to create any unusual hazards when processed according to good manufacturing and industrial hygiene practices and the enclosed guideline recommendations. (See PROCESSING FUMES.)

FDA GRADES

Specific grades of ULTEM resin (1000, 1010, 1000R, 1010R) comply with the applicable provisions of the U.S. FDA Food Additive Regulations governing food contact (21 CFR 177.1595).

HAZARDOUS SUBSTANCES

OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)

NONE of the following materials, designated as Toxic and Hazardous Substances by the U.S. Department of Labor/ OSHA are used to produce ULTEM resin nor are they anticipated by-products in our production process.

29 CFR 1910, 1001 Asbestos
1002 Coal tar pitch volatiles
1003 4-Nitrobiphenyl
1004 alpha-Naphthylamine
1006 Methyl chloromethyl ether
1007 3,3'-Dichlorobenzidine (and salts)
1008 bis-Chloromethyl ether
1009 beta-Naphthylamine
1010 Benzidine
1011 4-Aminodiphenyl
1012 Ethyleneimine
1013 beta-Propiolactone
1014 2-Acetylaminofluorene
1015 4-Dimethylaminoazobenzene
1016 N-Nitrosodimethylamine
1017 Vinyl chloride
1018 Inorganic arsenic
1025 Lead
1029 Coke oven emissions
1043 Cotton dust
1044 1,2-Dibromo-3-chloropropane
1045 Acrylonitrile
1047 Ethylene oxide

ULTEM resin dust is **NOT** included on the list of Toxic and Hazardous Air Contaminants (29 CFR 1910.1000). This standard does however, provide the following Permissible Exposure Limits (PEL) for Inert or Nuisance Dusts. In addition, Threshold Limit Values (TLV) for Some Nuisance Particulates have been established by the American Conference of Governmental Industrial Hygienists (ACGIH).

ULTEM resin does **NOT** contain vinyl chloride, monomeric phthalate esters, nor any EPA regulated halogenated biphenyls such as PCB's, PBB's, etc. (40 CFR 761) or chlorofluorocarbons (40 CFR 762).

INERT OR NUISANCE DUST: 8 hour Time-Weighted-Average		
	OSHA PEL	ACGIH (1984-85) TLV
Total Dust	15 mg/m³	10 mg/m³
Respirable Fraction	5 mg/m³	5 mg/m³

TOXIC SUBSTANCES CONTROL ACT (TSCA)

ULTEM polyetherimide resin and all other chemical substances incorporated into the resin (additives, fillers, colorants and other polymeric substances) are included in the **TSCA INVENTORY OF CHEMICAL SUBSTANCES** compiled by the U.S. Environmental Protection Agency.

PHYSICAL PROPERTY DATA*

ULTEM resin, an amorphous solid, is supplied in the form of cylindrical pellets averaging 2.5 mm in diameter and 3.2 mm in length.

TEMPERATURE

GLASS TRANSITION	T_g (amorphous)	217 (423°F)
VICAT SOFTENING	ASTM D-1525	219 – 228°C (426 – 442°F)
INJECTION MOLDING	Typical Range	340 – 425°C (640 – 800°F)
THERMAL DECOMPOSITION	Thermogravimetric Analysis (in air)	
Onset (1% Wt. Loss)		530°C (986°F)
50% Wt. Loss		670°C (1238°F)
IGNITION TEMPERATURE	ASTM D-1929 (Setchkin Method)	
Flash Ignition		521°C (970°F)
Self Ignition		538°C (1000°F)

WEIGHT

SPECIFIC GRAVITY (H_2O = 1)	Range	1.2 to 1.6
BULK DENSITY (unfilled)	Pellets	641 kg/m³ (40 lbs/ft³)

RESIN SOLUBILITY

WATER	Insoluble
METHYLENE CHLORIDE	< 20% by Wt.

VOLATILES

WATER	Typical Range 0.5 ± 0.3% at RT

COLOR AVAILABILITY

NATURAL	Transparent amber
PIGMENTED	Broad range; transparent to opaque

OTHER

ODOR	None to minimal
VAPOR PRESSURE	These properties are not applicable to solid compounds such as ULTEM resin
VAPOR DENSITY	
BOILING POINT	
EVAPORATION RATE	

*Typical values for general purpose grades (ULTEM 1000 resin series) based on material tested but may vary from sample to sample. Consult product literature for specialty grades. Typical values should not be construed as a guaranteed analysis of any specific lot or as specification values.

ULTEM®
resin

PROCESSING FUMES

GENERAL

Virtually all thermoplastic resins emit processing fumes when heated to extrusion or injection molding temperatures. These fumes are complex mixtures of vapors, droplets and suspended particulates which are representative of the specific resin formulation. Colorants and other additives used to enhance resin properties may be volatilized. In addition, the fumes may contain thermal decomposition products from the base resin and the various additives.

The concentration and composition of processing fume components will depend upon the processing temperature, resin formulation, residence time in the processing equipment, surface area of the molded part, equipment variables (screw design, venting parameters, etc.) and the dryness of the resin.

ULTEM RESIN

When processed according to General Electric recommended procedures, ULTEM resin processing fumes (or resin dust from secondary operations such as regrinding) are not known or expected to cause any adverse human health effects. However, the full range of potential effects has not been completely characterized. Certain sensitive individuals and individuals with respiratory impairments may be affected by exposure to specific components in the processing fumes. Such potential effects would primarily relate to the principal exposure routes – that is irritation of the eyes, nose, throat or skin (see FIRST AID Section).

Thermal processing of ULTEM resin does not evolve significant levels of organic volatiles. This characteristic results from 1.) the resin production process which reduces the volatile components to trace levels and 2). the inherent thermal stability of the resin itself.

Although processing fumes are not expected to pose an unusual health hazard for the reasons cited above, potential workplace exposures should be minimized by good housekeeping, good industrial hygiene practices and adequate ventilation.

ODOR

Thermal processing of ULTEM resin is virtually odor free because of the very low concentrations of volatile components in the resin itself. Some odor may be detectable with specific ULTEM products depending on the additives used in resin formulations.

VENTILATION

Ventilation requirements for each particular workplace must be determined on an individual basis. Information and guidelines on ventilation standards and design techniques may be found in the following publications.

- **NIOSH Recommended Industrial Ventilation Guidelines;** GPO #017-033-00136-7. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
- **Industrial Ventilation, 18th Edition;** Available from the American Conference of Governmental Industrial Hygienists, Committee on Industrial Ventilation, P.O. Box 16153, Lansing, MI 48901.
- **Fundamentals Governing the Design and Operation of Local Exhaust Systems;** (ANSI-792.2) Available from American National Standards Institute, 1430 Broadway, New York, NY 10018.

In general, the continuous supply of fresh air to the general workplace area together with the continuous removal of processing fume contaminated air through exhaust hoods and associated enclosed ducting will provide adequate ventilation for most operations. The exhaust hood should be positioned to prevent routine inhalation of smoke, fumes, dust and vapors from molding and other operations.

Note: Processing fume condensates, which may include toxic contaminants, are flammable and should be periodically removed from exhaust hoods, ductwork and other surfaces. Protective clothing, including rubber gloves, should be worn during clean-up operations to prevent skin contact.

FIRST AID

Some individuals with specific sensitivities may exhibit eye, nose, throat or dermal irritation if overexposed to processing fumes.

Eye Irritation: Flush eyes thoroughly with clean, low pressure water.

Skin Irritation: Wash affected areas with soap and water.

Respiratory Irritation: Leave the exposure area and obtain fresh air. Provide appropriate protection before allowing re-entry.

In all cases, a physician should be contacted if irritation persists.

Note: Molten resin can cause severe thermal burns which may require expert emergency attention.

FIRE AND EXPLOSION HAZARDS

FLAMMABILITY

ULTEM resins burn with difficulty because a substantial amount of energy is required to break down the polymer into smaller fragments which will support combustion. Generally, a continuous external flame source is needed to initiate and sustain combustion. In the absence of flashover fire conditions, an ULTEM resin fire will tend to extinguish itself. Precautions similar to those taken with wood and other combustible materials are recommended.

SMOKE

ULTEM resin, when exposed to an external flame, will form a surface char and emit low levels of smoke reflecting the inherent combustion resistance of polyetherimide.

TOXICITY

The primary toxic product of combustion from ULTEM polyetherimide is carbon monoxide. Carbon dioxide, an asphyxiant, is also produced. Under combustion conditions, ULTEM resin does **not** produce bromine, phosgene, acrolein, hydrogen chloride or sulfur dioxide.

FIRE FIGHTING

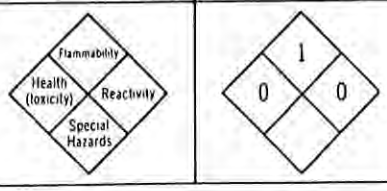
Water is the best extinguishing medium. Carbon dioxide is not generally recommended because its lack of cooling capacity may permit re-ignition. MSHA/NIOSH approved pressure demand breathing apparatus should be used. Personnel without suitable respiratory protection should leave the area. **Caution:** Stacked cardboard resin containers will be weakened by water absorption and may collapse.

EXPLOSION

ULTEM resin pellets, because of their size, do not present a dust explosion hazard.

Post-molding operations, such as regrinding and sawing, should be periodically checked for proper maintenance of dust control devices. Likely sources of ignition, such as static build-up, should be eliminated. Good housekeeping and adequate ventilation can prevent accumulation of potentially explosive dust concentrations. For additional information see **NFPA 654: "Standard for the Prevention of Dust Explosions in the Plastics Industry"** published by the National Fire Protection Association (Volume Five of the National Fire Codes).

NFPA 704

NFPA FIRE HAZARD CLASSIFICATION	ULTEM RESIN
4 - Extreme 3 - High 2 - Moderate 1 - Slight 0 - Insignificant	

HEALTH HAZARD DATA

None of the base resins, blending resins or elastomeric impact modifiers in the physical form present in ULTEM resins are hazardous substances within the meaning of the OSHA Hazard Communication Standard.

ORAL TOXICITY

ULTEM resins have very low acute oral toxicity. When administered orally to laboratory rats in single doses up to 10 grams/kilogram no deaths or signs of toxicity attributable to the resins were observed. No unusual organ or tissue changes were observed in test animals sacrificed after a 14-day post-exposure observation period.

DERMAL TOXICITY/IRRITATION

ULTEM resins have no demonstrable acute dermal toxicity. When applied in finely ground form on intact and abraded rabbit skin at concentrations up to 2000 mg/kg (max. dose administered, occluded wrapping, 24 hour exposure), no resin related deaths or adverse clinical observations were noted.

ULTEM resins are not primary skin irritants. No adverse reactions (erythema, eschar or edema/reddening, swelling or other injuries) were observed when 0.5 gram of finely ground resin was applied to both the intact and abraded skin of laboratory rabbits.

MUTAGENICITY

When ULTEM resin was tested in the Salmonella bacterial mutagenicity assay (Ames test) no mutagenic activity was detected.

EYE IRRITATION

ULTEM resins, in the form normally sold or used, is not a primary eye irritant. When typical ULTEM resin, in finely ground form, was placed into the eyes of test rabbits, a slight transient redness resulted, consistent with the abrasive nature of ground resin particles.

FUME INHALATION

Processing fumes from typical ULTEM resins are not considered toxic. In acute exposure tests, laboratory rats were exposed to processing fumes at concentrations exaggerating those that would be likely to occur in workplace situations. No deaths or signs of toxicity were noted during the 6-hour fume exposure tests. Neither were there any distinct or consistent treatment-related tissue or organ changes noted in gross necropsies performed after 14-day post-exposure observations.

HEALTH HAZARDS

There are no known acute or chronic health hazards associated with exposure to ULTEM resin, nor are there any medical conditions known to be generally aggravated by such exposure. See PROCESSING FUMES and VENTILATION section.

REACTIVITY DATA

ULTEM polyetherimide resin is a stable thermoplastic solid compound and will not undergo hazardous polymerization.

SPILL OR LEAK PROCEDURES

ULTEM resin pellets spilled on floors, aisles and other working surfaces are a slipping hazard. Sweep, shovel or vacuum spilled resin into containers for reuse or disposal.

RCRA

ULTEM resin pellets, regrind, molded parts, extrusion purge, etc., are not hazardous waste as defined by regulations implementing the Resource Conservation and Recovery Act (RCRA). In general, these materials may be discarded in accordance with the State and local regulations governing the disposal of other common or non-RCRA regulated waste materials.

"SUPERFUND"

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or "Superfund" levies a tax on hazardous waste materials expected to remain at a hazardous waste disposal facility after its closure (i.e., landfills). ULTEM resins and items produced from these resins are not regulated as hazardous wastes and are not subject to this Superfund tax.

SPECIAL PROTECTION

In general, special protection beyond established industrial safety practices and procedures is not required for the handling or processing of ULTEM resin.

Typical protection would include:

- Safety glasses with side shields
- Substantial, well insulated gloves to prevent contact with hot polymer
- Face shield and rubber gloves for cleaning processing fume deposits from exhaust hoods and other surfaces.
- Self contained breathing equipment, if needed for fire fighting.

A special exception is carbon fiber reinforced ULTEM grades (ULTEM resin 7000 series). Because of the electrically conductive nature of these grades, special protection of electrical based equipment in needed to protect against dust (due to regrinding, cutting or other operation) which can cause electrical failure. Consult supplemental data provided for these individual products.

SPECIAL PRECAUTIONS

Special precautions beyond good industrial hygiene practice and those identified in this brochure will primarily depend upon specific workplace conditions and special hazards.

Enforce rules of good industrial hygiene practice:

- Wash hands prior to eating.
- Do not store or consume food in processing areas.
- Do not use production equipment to heat food.
- Do not smoke in processing areas.
- Provide adequate ventilation.

Incorporate the information in this brochure in individual plant safety programs.

HANDLING AND STORAGE

PACKAGING

ULTEM resin is packaged in standard unit weights.

Unit Weight	Packaging Material	Configuration
50 lb (25 kg)	Multi-wall paper bags	40 bags/pallet

Bulk shipments are available in truckload and railcar quantities. The bulk density range of ULTEM resin pellets is 40 – 50 lbs/ft^3.

STORAGE

ULTEM resin will not degrade during storage. Heating and/or cooling is not required although the packaged resin should be stored indoors to protect the packaging material from rain or excessive moisture. Do not stack pallets more than three units high. Periodically check storage for vertical stability. Do not store flammable materials in resin storage area. (See SPILL OR LEAK PROCEDURES).

TRANSPORTATION

For transportation purposes, ULTEM resin is not defined or designated as a hazardous material by the U.S. Department of Transportation under Title 49 of the Code of Federal Regulations.

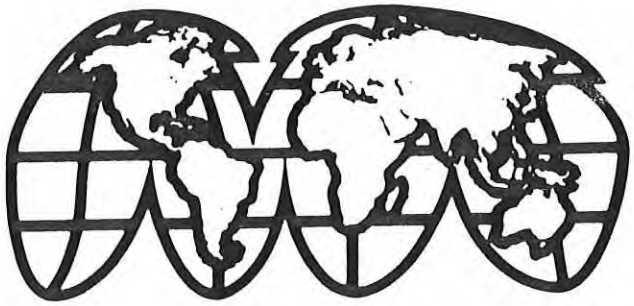
DOT Proper Shipping Name . . . . . Not applicable
DOT Hazard Class/ID Number . . . . . Not applicable
DOT Label . . . . . Not applicable
Hazardous Substance(s)/RQ's . . . . . Not applicable

Packaging materials are labeled with the product name, ULTEM resin, and the manufacturer, GENERAL ELECTRIC COMPANY.

NOVEMBER 1985
Polymer

VALOX® resin

MATERIAL SAFETY DATA



COMPOSITE POLYMERS OPERATIONS
PLASTICS GROUP
GENERAL ELECTRIC COMPANY
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PITTSFIELD, MA 01201

GENERAL ELECTRIC

VALOX® resin

Issue Date **November 1985**

Supersedes Material Safety Data Publication Dated July 1983

INTRODUCTION

This publication provides guidelines and suggested precautions for the safe handling and processing of VALOX® resins and supersedes all previously issued material safety data sheets on these products. General Electric Company recommends that all individuals read and understand this information prior to working with VALOX resin and that this information be incorporated into individual plant safety programs. This brochure does not include information on the suitability of VALOX resin for any specific application nor any precautions that may be appropriate for the use of finished products. The Material Safety Data contained in this publication include all information required to be furnished by manufacturers, distributors and importers of hazardous substances by the Occupational Safety and Health Administration (OSHA) pursuant to the Hazard Communication Standard (29 CFR 1910.1200.).

USER'S RESPONSIBILITY

A brochure such as this cannot cover all possible individual situations. In addition, the conditions under which our products are processed and used are beyond our control. The products described herein are not hazardous when processed properly. A user of VALOX resin is responsible for providing a safe workplace; therefore, all aspects of an individual operation should be examined to determine if or where precautions, in addition to those described herein, are required. Any health hazard and safety information contained herein should be passed on to customers and/or employees.

Manager – Product Safety
GENERAL ELECTRICAL COMPANY
Plastics Group

GENERAL ELECTRIC

Business Office
GENERAL ELECTRIC COMPANY
Plastics Group
Composite Polymers Operations
One Plastics Avenue
Pittsfield, Massachusetts 01201
Phone 1-800-GEPLAST

Manufacturing Location
Highway 69 South
Mt. Vernon, Indiana 47620
Phone (812) 838-7578

Emergency Telephone Numbers
(812) 838-7245 (24 Hours)
(413) 448-4929 (Day)

For additional non-emergency product safety information
Manager, Product Safety
Plastics Technology Department
Mt. Vernon, Indiana 47620
General Electric Company
(812) 838-7236

PRODUCT IDENTIFICATION

VALOX® resin

The VALOX resin family of organic thermoplastic resins include compositions based on polybutylene terephthalate (PBT) and polyethlyene terephthalate (PET) homopolymers and speciality resin formulations based on blends with other polymers such as polyacrylates and polycarbonates.

BASE RESINS (HOMOPOLYMERS)

COMMON NAME: PBT

CHEMICAL NAMES: Poly (butylene terephthalate)
Poly (tetramethylene terephthalate)

Poly (oxy-1, 4-butanediyloxycarbonyl-1, 4-phenylenecarbonyl)	$(C_{12}H_{12}O_4)_n$
1, 4 Benzenedicarboxylic acid, polymer with 1, 4-butanediol	$(C_8H_6O_4 \bullet C_4H_{10}O_2)_x$
1, 4 Benzenedicarboxylic acid, dimethlyester, polymer with 1, 4-butanediol	$(C_{10}H_{10}O_4 \bullet C_4H_{10}O_2)_x$

CAS REGISTRY NUMBERS: 30965-26-5
24968-12-5
26062-94-2

COMMON NAME: PET

CHEMICAL NAMES: Poly (ethylene terephthalate)

Poly (oxy-1, 2-ethanediyloxy-carbonyl-1, 4-phenylene carbonyl)	$(C_{10}H_8O_4)_n$

CAS REGISTRY NUMBER: 25038-59-9

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INGREDIENTS

Commercial and proprietary compounds are added to enhance the physical and chemical properties of the base resin. These additives include (but are not limited to) the following generic classes of compounds. Most standard and developmental (designated PDR-XXX) products contain more than one type of additive.

The specific chemical identities and precise proportions of some ingredients are proprietary. This information will be made available to health professionals in accordance with the provisions of the OSHA Hazard Communication Standard.

TYPE OF ADDITIVE	FUNCTION OR PURPOSE	GENERIC COMPOUND(S) AND/OR CLASS(ES) EMPLOYED	TYPICAL LEVELS (IN PELLETS)	TYPICAL VALOX PRODUCT DESIGNATION(S)
THERMAL STABILIZERS	Inhibit thermal degradation and discoloration	Organic phosphites Epoxides Hindered phenols Thioesters	0.1 – 5%	All products, including those designated as PDR, MDR, or DR and including the 300, 400, 500, 600, 700, 800, 10XX and 9XXX Series.
ULTRAVIOLET STABILIZERS	Extend outdoor weathering life	Substituted benzotriazoles Benzophenones	< 2%	VALOX 311-XXXX and all other product grade numbers with "UV" Suffix, as in VALOX 357-UV-XXXX.
REINFORCING AGENTS	Increase strength, rigidity and dimensional stability	Glass fibers Non-asbestos minerals	2 – 55%	All VALOX resin products (including FV series) except 295 and 300 series.
FLAME RETARDANTS	Improve ignition resistance and reduce rate of flame spread	Antimony oxide and salts Decabromodiphenyl ether Brominated polymers	5 – 30%	DR-48, 310-SEO, 350-399 450-499, 550-599, 750-799 850-899, 420-SEO, 600, 683, 620, 699, 9530
MOLD RELEASE & FLOW PROMOTERS	Processing Efficiencies	Polyolefins Esters	< 5%	All product grade numbers with an "R" or "M" suffix as in 310R or 310M.
ORGANIC POLYMERS	Impact modifiers and Blending alloys	BPA Polycarbonates Polyacrylates Polyolefins	1 – 50%	All products except DR-51, 295, 300-304, 310, 312, 315, 405, 412, 414, 420, 701, 736, 746, 1045, 9230, 9245, 9335, 9530
BLOWING AGENTS	Foam molding	Phenyltetrazole	< 5% (Concentrate)	All grades with FVC prefix as in FVC 60.
COLORANTS	Standard and Custom Colors	Dyes and Pigments (See below)	< 2%	A four digit color number following the grade designation as in VALOX 420-1051.

COLORANTS

Colored VALOX resin formulations may contain commercially available dyes and pigments based on titanium dioxide, carbon black, phthalocyanines, cadmium (insoluble sulfides and sulfoselenides), chromium (III) and other organic and inorganic compounds. In pelletized resin these colorants and the above identified additives are encapsulated in the polymer resin matrix and are not expected to create any unusual hazards when processed according to good manufacturing and industrial hygiene practices and the enclosed guideline recommendations. (See PROCESSING FUMES.)

FDA GRADES

Specific grades of VALOX resin (301, 303, 310, 312, 315) comply with the applicable provisions of U.S. FDA Food Additive Regulations governing food contact (21 CFR 177.1660 as amended).

HAZARDOUS SUBSTANCES

OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)

NONE of the following materials, designated as Toxic and Hazardous Substances by the U.S. Department of Labor/ OSHA are used to produce VALOX resin nor are they anticipated by-products in our production process.

29 CFR 1910, 1001 Asbestos
1002 Coal tar pitch volatiles
1003 4-Nitrobiphenyl
1004 alpha-Naphthylamine
1006 Methyl chloromethyl ether
1007 3.3'-Dichlorobenzidine (and salts)
1008 bis-Chloromethyl ether
1009 beta-Naphthylamine
1010 Benzidine
1011 4-Aminodiphenyl
1012 Ethyleneimine
1013 beta-Propiolactone
1014 2-Acetylaminofluroene
1015 4-Dimethylaminoazobenzene
1016 N-Nitrosodimethlyamine
1017 Vinyl chloride
1018 Inorganic arsenic
1025 Lead
1029 Coke oven emissions
1043 Cotton dust
1044 1,2-Dibromo-3-chloropropane
1045 Acrylonitrile
1047 Ethylene oxide

VALOX resin dust is **NOT** included on the list of Toxic and Hazardous Air Contaminants (29 CFR 1910.1000). This standard does however provide the following Permissible Exposure Limits (PEL) for Inert or Nuisance Dusts. In addition Threshold Limit Values (TLV) for Some Nuisance Particulates have been established by the American Conference of Governmental Industrial Hygienists (ACGIH).

VALOX resin does **NOT** contain vinyl chloride, monomeric phthalate esters, nor any EPA regulated halogenated biphenyls such as PCB's, PBB's, etc. (40 CFR 761), or chlorofluorocarbons (40 CFR 762).

INERT OR NUISANCE DUST: 8 hour Time-Weighted-Average		
	OSHA PEL	ACGIH (1984-85) TLV
Total Dust	15 mg/m³	10 mg/m³
Respirable Fraction	5 mg/m³	5 mg/m³

TOXIC SUBSTANCES CONTROL ACT (TSCA)

VALOX resin and all other chemical substances incorporated into the resin (additives, fillers, colorants and other polymeric substances) are included in the **TSCA INVENTORY OF CHEMICAL SUBSTANCES** compiled by the U.S. Environmental Protection Agency.

PHYSICAL PROPERTY DATA*

VALOX resins are semi-crystalline and are supplied in the form of cylindrical pellets averaging 3.2mm in diameter and 3.2mm in length.

TEMPERATURE

MELTING POINT T_m	220 – 228°C (430 – 442°F)
INJECTION MOLDING Typical Range	230 – 260°C (445 – 500°F)
THERMAL DECOMPOSITION	Thermogravimetric Analysis (in air)
Initial (Onset)	365 – 400°C (689 – 752°F)
50% Wt. Loss	430 – 460°C (806 – 860°F)
IGNITION TEMPERATURE	ASTM D-1929 (Setchkin Method)
Flash Ignition	360 – 365°C (680 – 689°F)
Self Ignition	360 – 375°C (680 – 707°F)

WEIGHT

SPECIFIC GRAVITY (H_2O = 1)	Range 1.2 to 1.9
BULK DENSITY (unfilled)	Pellets 641 kg/m³ (40 lbs/ft³)

RESIN SOLUBILITY

WATER	Insoluble

Insoluble in most common organic solvents

VOLATILES

WATER	0.3 ± 0.1%
TETRAHYDROFURAN	300 ppm (approx.)

COLOR AVAILABILITY

NATURAL	Opaque White
PIGMENTED	Full range of opaque resins

OTHER

ODOR	None
VAPOR PRESSURE	These properties are not applicable to solid compounds such as VALOX resin
VAPOR DENSITY	
BOILING POINT	
EVAPORATION RATE	

*Typical values for general purpose grades, such as VALOX 310 resin. Consult product literature for specific grades. Typical values should not be construed as a guaranteed analysis for any specific lot or as specification values.

PROCESSING FUMES

GENERAL

Virtually all thermoplastic resins emit processing fumes when heated to extrusion or injection molding temperatures. These fumes are complex mixtures of vapors, droplets and suspended particulates which are representative of the specific resin formulation. Colorants and other additives used to enhance resin properties may be volatilized. In addition, the fumes may contain thermal decomposition products from the base resin and the various additives.

The concentration and composition of processing fume components will depend upon the processing temperature, resin formulation, residence time in the processing equipment, surface area of the molded part, equipment variables (screw design, venting parameters, etc.) and the dryness of the resin.

VALOX RESIN

When processed according to General Electric recommended procedures, VALOX resin processing fumes (or resin dust from secondary operations such as regrinding) are not known or expected to cause any adverse human health effects. However, the full range of potential effects has not been completely characterized. Certain sensitive individuals and individuals with respiratory impairments may be affected by exposure to specific components in the processing fumes. Such potential effects would primarily relate to the principal exposure routes – that is irritation of the eyes, nose, throat or skin (see FIRST AID Section).

The major fume components evolved by PBT based VALOX resins at recommended processing conditions include water and tetrahydrofuran. These fume components do not pose an unusual health hazard at concentrations expected in the workplace. Nevertheless, potential exposures should be minimized by good housekeeping, good industrial hygiene practice and adequate ventilation.

8 hour Time-Weighted Average				
	OSHA (PEL)		1984-85 ACGIH (TLV)	
	PPM	mg/m^3	PPM	mg/m^3
Tetrahydrofuran	200	590	200	590

VENTILATION

Ventilation requirements for each particular workplace must be determined on an individual basis. Information and guidelines on ventilation standards and design techniques may be found in the following publications.

- **NIOSH Recommended Industrial Ventilation Guidelines;** GPO #017-033-00136-7. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
- **Industrial Ventilation, 18th Edition;** Available from the American Conference of Governmental Industrial Hygienists, Committee on Industrial Ventilation, P.O. Box 16153, Lansing, MI 48901.
- **Fundamentals Governing the Design and Operation of Local Exhaust Systems;** (ANSI-792.2) Available from American National Standards Institute, 1430 Broadway, New York, NY 10018.

In general, the continuous supply of fresh air to the general workplace area together with the continuous removal of processing fume contaminated air through exhaust hoods and associated enclosed ducting will provide adequate ventilation for most operations. The exhaust hood should be positioned to prevent routine inhalation of smoke, fumes, dust and vapors from molding and other operations.

Note: Processing fume condensates, which may include toxic contaminants, are flammable and should be periodically removed from exhaust hoods, ductwork and other surfaces. Protective clothing, including rubber gloves, should be worn during clean-up operations to prevent skin contact.

ODOR

The odor of VALOX resin processing fumes, if any, is mild and may vary somewhat with specific resin formulations. In general, the odor is not offensive to most individuals.

FIRST AID

Some individuals with specific sensitivities may exhibit eye, nose, throat or dermal irritation if overexposed to processing fumes.

Eye Irritation: Flush eyes thoroughly with clean, low pressure water.

Skin Irritation: Wash affected areas with soap and water.

Respiratory Irritation: Leave the exposure area and obtain fresh air. Provide appropriate protection before allowing re-entry.

In all cases, a physician should be contacted if irritation persists.

Note: Molten resin can cause severe thermal burns which may require expert emergency attention.

FIRE AND EXPLOSION HAZARDS

FLAMMABILITY

VALOX resins burn with difficulty because a substantial amount of energy is required to break down the polymer into smaller fragments which will support combustion. Generally, an external flame source is needed to initiate combustion. Precautions similar to those taken with wood and other combustible materials are recommended.

SMOKE

When burning, VALOX resins produce a sooty fire; that is, it will generate opaque black smoke (particulate carbon) reflecting the inherent combustion resistance of VALOX resins.

TOXICITY

The primary toxic product of combustion from VALOX resins is carbon monoxide. Carbon dioxide, an asphyxiant, is also produced. Some flame retardant grades will evolve trace quantities of hydrogen bromide under combustion conditions. VALOX resins do **not** produce combustion products such as hydrogen cyanide, phosgene, hydrogen chloride or sulfur dioxide.

FIRE FIGHTING

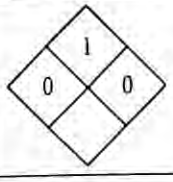
Water is the best extinguishing medium. Carbon dioxide is not generally recommended because its lack of cooling capacity may permit re-ignition. MSHA/NIOSH approved pressure demand breathing apparatus should be used. Personnel without suitable respiratory protection should leave the area. **Caution:** Stacked cardboard resin containers will be weakened by water absorption and may collapse.

EXPLOSION

VALOX resin pellets, because of their size, do not present a dust explosion hazard.

Post-molding operations, such as regrinding and sawing, should be periodically checked for proper maintenance of dust control devices. Likely sources of ignition, such as static build-up, should be eliminated. Good housekeeping and adequate ventilation can prevent accumulation of potentially explosive dust concentrations. For additional information see **NFPA 654: "Standard for the Prevention of Dust Explosions in the Plastics Industry"** published by the National Fire Protection Association (Volume Five of the National Fire Codes).

NFPA 704

NFPA FIRE HAZARD CLASSIFICATION	VALOX RESIN
4 - Extreme 3 - High 2 - Moderate 1 - Slight 0 - Insignificant	 

HEALTH HAZARD DATA

None of the base resins, blending resins or elastomeric impact modifiers in the physical form present in PBT and PET-based resins are hazardous substances within the meaning of the OSHA Hazard Communication Standard. The following information for PBT-based VALOX resins is similar to other polyester resins such as PET.

ORAL TOXICITY

VALOX resins have very low acute oral toxicity. When administered orally to laboratory rats in a single dose of 5g/kg, no deaths or signs of toxicity were observed. No unusual organ or tissue changes were observed in test animals sacrificed after a 14-day post-exposure observation period. No deaths or signs of toxicity were observed in similar acute oral tests in dogs at 5g/kg dosages.

DERMAL TOXICITY/IRRITATION/SENSITIZATION

VALOX resins have no demonstrable dermal toxicity. When several different grades, in finely ground form, were tested on intact and abraded rabbit skin at concentrations up to 2000 mg/kg (occluded wrapping, 24-hour exposure), no compound-related deaths or adverse clinical observations were noted.

VALOX resins are not primary skin irritants and do not cause local sensitization in animal tests. Finely ground resin, when applied at a does of 0.5g to abraded and non-abraded rabbit skin, did not produce any detectable irritation or other clinical signs. When tested for skin sensitization potential in guinea pigs, no skin reactions were seen in either the inductive or challenge applications of resin.

EYE IRRITATION

VALOX resins are not considered primary eye irritants. When typical VALOX resins, in finely ground form, were placed into the eyes of test rabbits a slight transient redness occurred, consistent with the abrasive nature of the ground resin particles.

FUME INHALATION

Processing fumes from typical VALOX resins are not considered toxic. In acute inhalation tests, laboratory rats were exposed to processing fumes at concentrations exaggerating those that would occur in workplace situations. No deaths or signs of toxicity were noted during the 6-hour fume exposure periods. There were no distinct or consistent treatment-related tissue or organ changes noted in gross necropsies performed after 14-day post-exposure observations.

HEALTH HAZARDS

There are no known acute or chronic health hazards associated with exposure to VALOX resins, nor are there any medical conditions known to be generally aggravated by such exposure. See PROCESSING FUMES and VENTILATION section.

REACTIVITY DATA

VALOX resin is a stable thermoplastic solid compound and will not undergo hazardous polymerization.

SPILL OR LEAK PROCEDURES

VALOX resin pellets spilled on floors, aisles and other working surfaces are a slipping hazard. Sweep, shovel or vacuum spilled resin into containers for reuse or disposal.

RCRA

VALOX resin pellets, regrind, molded parts, extrusion purge, etc., are not hazardous waste as defined by regulations implementing the Resource Conservation and Recovery Act (RCRA). In general, these materials may be discarded in accordance with the State and local regulations governing the disposal of other common or non-RCRA regulated waste materials.

"SUPERFUND"

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or "Superfund" levies a tax on hazardous waste materials expected to remain at a hazardous waste disposal facility after its closure (i.e., landfills). VALOX resins and items produced from these resins are not regulated as hazardous wastes and are not subject to this Superfund tax.

SPECIAL PROTECTION

In general, special protection beyond established industrial safety practices and procedures is not required for the handling or processing of VALOX resin.

Typical protection would include:

- Safety glasses with side shields
- Substantial, well insulated gloves to prevent contact with hot polymer
- Face shield and rubber gloves for cleaning processing fume deposits from exhaust hoods and other surfaces.
- Self contained breathing equipment, if needed for fire fighting.

SPECIAL PRECAUTIONS

Special precautions beyond good industrial hygiene practice and those identified in this brochure will primarily depend upon specific workplace conditions and special hazards.

Enforce rules of good industrial hygiene practice:

- Wash hands prior to eating.
- Do not store or consume food in processing areas.
- Do not use production equipment to heat food.
- Do not smoke in processing areas.
- Provide adequate ventilation.

Incorporate the information in this brochure in individual plant safety programs.

HANDLING AND STORAGE

PACKAGING

VALOX resin is packaged in standard unit weights.

Unit Weight	Packaging Material	Configuration
50 lb	Multi-wall paper bags	40 bags/pallet
1000 lb	Corrugated cardboard	1 gaylord/pallet

Bulk shipments are available in truckload and railcar quantities. The bulk density range of VALOX resin pellets is 38 – 42 lbs/ft^3.

STORAGE

VALOX resin will not degrade during storage. Heating and/or cooling is not required although the packaged resin should be stored indoors to protect the packaging material from rain or excessive moisture. Do not stack pallets more than three units high. Periodically check storage for vertical stability. Do not store flammable materials in resin storage area. (See SPILL OR LEAK PROCEDURES).

TRANSPORTATION

For transportation purposes, VALOX resin is not defined or designated as a hazardous material by the U.S. Department of Transportation under Title 49 of the Code of Federal Regulations.

DOT Proper Shipping Name . . . . . .Not applicable
DOT Hazard Class/ID Number . . . . . .Not applicable
DOT Label . . . . . .Not applicable
Hazardous Substance(s)/RQ's . . . . . .Not applicable

Packaging materials are labeled with the product name, VALOX resin and the manufacturer, GENERAL ELECTRIC COMPANY.

Atlan Plastics, Inc.
3116 Towerwood : Dallas, Texas 75234
Phone: (800) 442-9304/(800) 527-0445

Thermoplastic Raw Materials

MATERIAL SAFETY DATA SHEET

Product Information:

Product Name	CAS Registry No. N/A
Common Name Nylon	Chemical Formula N/A

FIRE AND EXPLOSION DATA

Extinguishing Data
[X] Water-spray [X] Water-fog [X] Water-stream [X] CO_2 [X] Dry Chemical [X] Foam [X] Earth or sand

SpecialFire Fighting Procedures
[ ] Do not Enter Building [ ] Allow fire to burn [ ] Water may cause frothing [ ] Use approved respirator

Unusual Fire and Explosion Hazards
[ ] Dust explosion hazard [ ] Sensitive to shock [ ] Contamination [ ] Temp. [ ] Other (specify)
NONE

REACTIVITY DATA

Stability
[X] Stable [ ] Unstable

Conditions contributing to instability
[X] Thermal decomp. [ ] Photo degrad. [ ] Poly-merization [ ] Con.

Incompatibility-Avoid contact with
[X] Strong acids [ ] Strong alkalis [X] Strong oxidizers [ ] Other (specify)

Hazardous Deomposition Products-Thermal and Other
CO, N_xH_y, Minor: amonia, aliphatic amines, ketone, HCN

Conditions to Avoid
[X] Heat above 650°F [X] Open flames [ ] Sparks [ ] Ignition sources [ ] Other (specify)

SPILL OR LEAK

Steps to be taken if material is released or spilled
[ ] Flush with water [ ] Absorb with sand or inert material [ ] Neutralize [X] Sweep or scoop up and remove
[ ] Dispose of immediately [ ] Keep upwind evacuate enclosed spaces [ ] Prevent spread or spill [ ] Other (specify)

Waste Diposal Method-Consult federal, state, or local authoities for proper procedures. Controled burial or incinderate in accordance with local, state, and federal regulations.

Continued on reverse side

HEALTH HAZARD INFORMATION

Toxicity

This is a polymeric material. All constituents are encapsulated within the polymer system, and therefore, present no likelihood of exposure under normal conditions of processing and handling.

Effects of Exposure

Irritation ☐ Skin ☐ Severe ☐ Moderate ☒ None
Irritation ☐ Eye ☐ Severe ☐ Moderate ☐ Mild ☒ None (transient)

Corrosivity ☐ Skin ☐ 4 hrs. (DOT) ☐ 24 hrs. (CPSC) ☒ None
☐ Eye ☐ May cause blindness ☒ None

Sensitization
☐ Skin ☐ Respiratory ☐ Allergen
NONE

Inhalation effects
☐ Narcotic effect ☐ Cyanosis ☐ Asphyxiant
NONE

Lung Effects (specify):
NONE

Other (specify): ☐ Repeated contact skin defatter ☐ Other (specify):
NONE

Emergency First Aid

Ingestion
☐ Induce vomiting ☐ Do not induce vomiting ☐ Give plenty of water ☐ Get medical attention ☐ Other (specify):
NONE

Dermal
☒ Flush with soap and water ☐ Get medical attention ☐ Contaminated clothing-remove and launder ☐ Contaminated shoes-destroy ☐ Other (specify)

Eye Contact
☒ Flush with plenty of water for at least 15 minutes ☐ Get medical attention ☐ Other (specify):

Inhalation
☒ Remove to fresh air ☐ If not breathing give artificial respiration ☐ Give oxygen ☐ Get medical attention ☐ Other (specify):

Special Protection Information

Ventilation Reqirements-Always maintain exposure below permissible exposure limits.
☐ Consult an industrial hygienist or environmental health specialist ☒ Local exhaust ☒ Use with adequate ventilation
☐ Check for air contaminant and oxygen deficiency ☐ Other (specify):

Eye
☒ Safety Glasses ☐ Face Shield ☐ Goggles

Hand (glove type) ☐ Butyl Rubber ☐ Polyvinyl Alcohol ☐ Other (specify)
☐ Polyvinyl chloride ☐ Neoprene ☐ Natural rubber ☐ Polyethylene GLOVES FOR HOT POLYMER

Respirator type-Use only NIOSH/MESA approved equipment.
NONE

Other Protective Equipment
NONE

Precaution

Precautionary Labeling
NONE

Other Handling and Storage Conditions
AVOID CONTAMINATION. STORE IN COOL, DRY PLACE.

☒ New ☐ Revised Date MAY 1986

IMPORTANT! The information presented herein, while not guaranteed, was prepared by competent technical personnel and is true and accurate to the best of our knowledge. NO WARRANTY, OR GUARANTY, EXPRESS OR IMPLIED, IS MADE REGARDING PERFORMANCE, STABILITY OR OTHERWISE. This information is not intended to be all-inclusive as to the manner and conditions of use, handling and storage. Other factors may involve other or additional safety or performance considerations. While our technical personnel will be happy to respond to questions regarding safe handling and use procedures, safe handling and use remains the responsibility of the customer. No suggestions for use are intended as, and nothing herein shall be construed as, a recommendation to infringe any existing patents or to violate any Federal, State or local laws.

Polymer

FINA OIL & CHEMICAL COMPANY
MATERIAL SAFETY DATA SHEET

PRODUCT: POLYSTYRENE (IMPACT)HIGH
DATE OF ISSUE: 02-25-88
SUPERCEDES: 02-19-88

MSDS NUMBER: P83
PRODUCT CODE: 003145

SECTION I - IDENTIFICATION

MANUFACTURERS NAME
FINA OIL AND CHEMICAL CO.
ADDRESS
P.O. BOX 2159, DALLAS, TX 75221
TRADE NAME
IMPACT POLYSTYRENE, POLYSTYRENE
CAS REGISTRY NUMBER
9003-53-6
CHEMICAL FAMILY
POLYMER
OTHER THIS MSDS COVERS ALL IMPACT POLYSTYRENE GRADES MADE BY FINA.

EMERGENCY TELEPHONE NUMBER
(409) 962-4421
CHEMTREC TELEPHONE NUMBER
(800) 424-9300
CHEMICAL NAME
POLYSTYRENE
CHEMICAL FORMULA
((C6H5)CHCH2)N
DOT IDENTIFICATION NUMBER
N. E.

RECEIVED
MAY-24-1990
CMI-NOREN INC.

SECTION II - HAZARDOUS INGREDIENTS

MATERIAL OR COMPONENT	VOL %	TLV
NOT A HAZARDOUS MATERIAL.		
MEETS FDA REQUIREMENTS FOR FOOD CONTAINERS. CFR 177.1640 (A)(2)		

SECTION III - PHYSICAL DATA

BOILING POINT (DEG F)
N. AP.
VAPOR PRESSURE (MMHG)
N. AP.
VAPOR DENSITY (AIR=1)
N. AP.
SOLUBILITY IN WATER
INSOLUBLE
APPEARANCE AND ODOR
TRANSLUCENT, ODORLESS.

SPECIFIC GRAVITY (WATER=1)
1.04
PERCENT VOLATILE (VOL%)
NIL
EVAPORATION RATE
N. AP.
MELT POINT
270 DEG F

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED)
N. AP.

FLAMMABLE LIMITS - LOWER N. AP. UPPER N. AP.

FIRE EXTINGUISHING MEDIA: DRY CHEMICAL, FOAM, WATER, AND HALON

SPECIAL FIRE FIGHTING PROCEDURES: AVOID INHALATION OF VAPORS.

UNUSUAL FIRE/EXPLOSION HAZARDS: FIRE MAY PRODUCE IRRITATING GASES AND DENSE SMOKE.

ABBREVIATIONS: N.E. = NOT ESTABLISHED, N.AP. = NOT APPLICABLE
N.AV. = NOT AVAILABLE

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
NOT A CARCINOGEN.
NTP: NO
IARC: NO
OSHA: NO

ACUTE EFFECTS OF OVEREXPOSURE

INHALATION	NEGLIGIBLE HAZARD AT ROOM TEMPERATURE. IRRITATING VAPORS TO RESPIRATORY SYSTEM MAY FORM WHEN POLYMER IS PROCESSED AT HIGH TEMPERATURES.
SKIN CONTACT & ABSORPTION	MOLTEN OR HEATED MATERIAL IN SKIN CONTACT CAN CAUSE SEVERE BURNS.
EYE CONTACT	VAPORS MAY BE FORMED WHEN POLYMER IS PROCESSED AT HIGH TEMPERATURE. THESE VAPORS MAY BE IRRITATING TO THE EYE.
INGESTION	N. AP.

EMERGENCY FIRST AID PROCEDURES

INHALATION	REMOVE PERSON TO FRESH AIR.
SKIN CONTACT & ABSORPTION	FOR SERIOUS BURNS, GET MEDICAL ATTENTION. IN CASE OF SKIN CONTACT WITH HOT POLYMER, IMMEDIATELY IMMERSE IN OR FLUSH WITH CLEAN, COLD WATER.
EYE CONTACT	FLUSH WITH WATER IF IRRITATION OCCURS.
INGESTION	N. AP.

CHRONIC EFFECTS OF OVEREXPOSURE

N. AP.

FINA OIL & CHEMICAL COMPANY
MATERIAL SAFETY DATA SHEET

PRODUCT: POLYSTYRENE (IMPACT)

SECTION VI - REACTIVITY DATA

STABILITY
STABLE

CONDITIONS TO AVOID
N. AP.

INCOMPATIBILITY (MATERIALS TO AVOID)
N. AP.

HAZARDOUS DECOMPOSITION PRODUCTS
CARBON DIOXIDE, CARBON MONOXIDE, DENSE SMOKE

HAZARDOUS POLYMERIZATION
N. AP.

CONDITIONS TO AVOID
N. AP.

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	PELLETS ON THE FLOOR COULD PRESENT A SERIOUS SLIPPING PROBLEM. GOOD HOUSEKEEPING MUST BE MAINTAINED AT ALL TIMES TO AVOID THIS HAZARD. SWEEP, SHOVEL, OR VACUUM MATERIAL INTO CLEAN CONTAINERS.
WASTE DISPOSAL METHOD	TRANSFER TO AN APPROVED DISPOSAL AREA IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS.

SECTION VIII - SPECIAL PROTECTION EQUIPMENT

RESPIRATORY PROTECTION
USE OF NIOSH-APPROVED RESPIRATORS RECOMMENDED WHEN HANDLING HOT MATERIAL.

PROTECTIVE CLOTHING
GLOVES REQUIRED WHEN HANDLING HOT MATERIAL.

EYE PROTECTION
SAFETY GLASSES

VENTILATION
PROVIDE ADEQUATE VENTILATION WHEN PROCESSING THE POLYMER AT ELEVATED TEMPERATURES.

OTHER PROTECTIVE EQUIPMENT
N. AP.

SECTION IX - HANDLING AND STORAGE PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING	THE HANDLING OF PELLETS MAY CAUSE NUISANCE DUST TO BE FORMED. TAKE NECESSARY PRECAUTIONS FOR PROTECTION OF PERSONNEL.

OTHER PRECAUTIONS
N. AP.

LEGAL DISCLAIMER: WHILE THE INFORMATION HEREIN IS BELIEVED TO BE RELIABLE, NO GUARANTEE IS MADE AS TO ITS ACCURACY OR COMPLETENESS. THE CONDITIONS OF USE, HANDLING, STORAGE, AND DISPOSAL, AND THE SUITABILITY OF THE PRODUCT FOR PARTICULAR USES ARE BEYOND OUR CONTROL. CONSEQUENTLY, ALL RISKS INVOLVING THE USE OF THE PRODUCT ARE ASSUMED BY THE USER. WE EXPRESSLY DISCLAIM ALL WARRANTIES OF EVERY KIND AND NATURE, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Polymers [redacted]

Vulcan CHEMICALS

MATERIAL SAFETY DATA SHEET

24 Hour Emergency Phone (316) 524-5751

Division of Vulcan Materials Company / P. O. Box 530390 • Birmingham, AL 35253-0390

I - IDENTIFICATION

CHEMICAL NAME	CHEMICAL FORMULA	MOLECULAR WEIGHT
Sodium Hydroxide, Anhydrous	NaOH	40.00

TRADE NAME: Caustic Soda, Anhydrous, Beads and Solid

SYNONYMS: Caustic, Beads, Bead Caustic, Soda Lye

DOT IDENTIFICATION NO.: UN 1823

II- PRODUCT AND COMPONENT DATA

COMPONENT(S) CHEMICAL NAME	CAS REGISTRY NO.	% (wt.) Approx.	OSHA PEL
Sodium Hydroxide	1310-73-2	100	2 mg/m³ Ceiling

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APR 02 1992
CMI-NORTH INC.

* Denotes chemical subject to reporting requirements of Section 313 of Title III of the 1986 Superfund Amendments and Reauthorization Act (SARA) and 40 CFR Part 372

III - PHYSICAL DATA

APPEARANCE AND ODOR: White solid or bead; odorless	SPECIFIC GRAVITY: 2.13 gm/cc
BOILING POINT: N/A	VAPOR DENSITY IN AIR (Air = 1): N/A
VAPOR PRESSURE: N/A	% VOLATILE, BY VOLUME: 0
EVAPORATION RATE: 0	SOLUBILITY IN WATER: 100%

IV - REACTIVITY DATA

STABILITY	CONDITIONS TO AVOID
Stable	Mixture with water, acid or incompatible materials can cause splattering and release of large amounts of heat (See Section VIII). Will react in the presence of moisture with some metals forming flammable hydrogen gas.

INCOMPATIBILITY (Materials to avoid)
Chlorinated and fluorinated hydrocarbons (i.e. chloroform, difluoroethane), acetaldehyde, acrolein, aluminum, chlorine trifluoride, hydroquinone, maleic anhydride, phosphorous pentoxide and tetrahydrofuran.

HAZARDOUS DECOMPOSITION PRODUCTS
Will not decompose

HAZARDOUS POLYMERIZATION
Will not occur

[redacted] Polymer

V – FIRE AND EXPLOSION HAZARD DATA

FLASHPOINT (Method used)	FLAMMABLE LIMITS IN AIR
N/A	N/A

EXTINGUISHING AGENTS

N/A NFPA Hazard Ratings: Health 3, Flammability 0, Reactivity 1

UNUSUAL FIRE AND EXPLOSION HAZARDS

Firefighters should wear self contained positive-pressure breathing apparatus, and avoid skin contact. Refer to Reactivity Data, Section IV.

VI – TOXICITY AND FIRST AID

EXPOSURE LIMITS (When exposure to this product and other chemicals is concurrent, the exposure limit must be defined in the workplace.)

ACGIH: 2 mg/m^3 Ceiling
OSHA: 2 mg/m^3 Ceiling

Effects described in this section are believed not to occur if exposures are maintained at or below appropriate TLVs.
Because of the wide variation in individual susceptibility, these exposure limits may not be applicable to all persons and those with medical conditions listed below.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

May aggravate existing skin and/or eye conditions on contact.

ACUTE TOXICITY Primary route(s) of exposure: ☒ Inhalation ☒ Skin ☐ Ingestion

Inhalation: Inhalation of dust or mist can cause mild irritation at 2 mg/m^3. More severe burns and tissue damage at the upper respiratory tract, can occur at higher concentrations. Pneumonitis can result from severe exposures.

Skin: Major potential hazard - Bead or liquid contact with the skin can cause severe burns with deep ulcerations. Contact with dust or mist can cause multiple burns with temporary loss of hair at burn site. Solutions of up to 4% in water may not cause irritation and burning for several hours, while 25 to 50% solutions can cause these effects in less than 3 minutes.

Eyes: Major potential hazard - Beads in the eye can cause severe destruction and blindness. These effects can occur rapidly effecting all parts of the eye. Mist or dust can cause irritation with high concentrations causing destructive burns.

Ingestion: Ingestion of sodium hydroxide can cause severe burning and pain in lips, mouth, tongue, throat and stomach. Severe scarring of the throat can occur after swallowing. Death can result from ingestion.

FIRST AID

Inhalation: Move person to fresh air. If breathing stops, administer artificial respiration. Get medical attention immediately.

Skin: Remove contaminated clothing and immediately wash skin thoroughly for a minimum of 15 minutes with large quantities of water (preferably a safety shower). Get medical attention immediately.

Eyes: Wash eyes immediately with large amounts of water (preferably eyewash fountain), lifting the upper and lower eyelids occasionally. Continue washing for a minimum of 15 minutes. Get medical attention immediately.

Ingestion: If person is conscious, give large quantities of water to dilute caustic. Do not induce vomiting. Get medical attention immediately. Do not give anything by mouth to an unconscious person.

CHRONIC TOXICITY

No known chronic effects.

Carcinogenicity: No studies were identified relative to sodium hydroxide and carcinogenicity.

Sodium hydroxide is not listed on the IARC, NTP or OSHA carcinogen lists.

Reproductive Toxicity: No studies were identified relative to sodium hydroxide and reproductive toxicity.

VII - PERSONAL PROTECTION AND CONTROLS

RESPIRATORY PROTECTION

Where concentrations exceed or are likely to exceed 2 mg/m^3 use a NIOSH/MSHA approved high-efficiency particulate filter with full facepiece or self-contained breathing apparatus. Follow any applicable respirator use standards or regulations.

VENTILATION

As necessary to maintain concentration in air below 2 mg/m^3 at all times.

SKIN PROTECTION

Wear neoprene, PVC, or rubber gloves; PVC rain suit; rubber boots with pant legs over boots.

EYE PROTECTION

Chemical goggles which are dust and splashproof. When mixing solutions, wear face shield or hood to protect face from splashing.

HYGIENE

Avoid contact with skin and avoid breathing dust. Do not eat, drink, or smoke in work area. Wash hands prior to eating, drinking, or using bathroom. Any protective clothing, clothing or shoes which become contaminated with caustic should be removed immediately and thoroughly laundered before reuse.

OTHER CONTROL MEASURES

Safety shower and eyewash station must be located in immediate work area. To determine the exposure level(s), monitoring should be performed regularly.
NOTE: Protective equipment and clothing should be selected, used, and maintained according to applicable standards and regulations. For further information, contact the clothing or equipment manufacturer or the Vulcan Chemicals Technical Service Department.

Polymer

VIII - STORAGE AND HANDLING PRECAUTIONS

Follow protective controls set forth in Section VII when handling this product.
Store in closed, properly labeled containers indoors in a dry area. Do not remove or deface labels or tags.
When dissolving in water, use warm water but not exceeding 100°F. Slowly add caustic to surface of water with constant stirring to avoid violent spattering. Full protective equipment as outlined in Section VII should be worn. Large amount of heat will be evolved.
Contact of caustic soda cleaning solutions with food and beverage products in enclosed vessels or spaces may produce lethal concentrations of carbon monoxide gas. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276.
Do not reuse bags, drums or boxes without recycling or reconditioning in accordance with any applicable federal, state or local laws.
SARA Title III Hazard Categories: Immediate Health.

IX - SPILL, LEAK AND DISPOSAL PRACTICES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Cleanup personnel must wear proper protective equipment (refer to Section VII). Reclaim into closed containers for normal use or disposal. Remaining material may be diluted with water and neutralized. Neutralization products both liquid and solid must be recovered for disposal. Prevent runoff into ground or surface waters or sewers. Reportable Quantity (RQ) is 1000 lbs. Notify National Response Center (800/424-8802) of uncontrolled spills in excess of RQ.

WASTE DISPOSAL METHOD

Recovered solids or liquids may be sent to a licensed reclaimer or disposed of in a permitted waste management facility. Consult federal, state, or local disposal authorities for approved procedures.

X - TRANSPORTATION

DOT HAZARD CLASSIFICATION

Corrosive

PLACARD REQUIRED

Corrosive

LABEL REQUIRED

Corrosive. Label as required by OSHA Hazard Communication Standard, and any applicable state and local regulations.

Medical Emergencies

Call collect 24 hours a day for emergency toxicological information 415/821-5338

Other Emergency information

Call 316/524-5751 (24 hours)

For any other information contact:

Vulcan Chemicals
Technical Service Department
P.O. Box 530390
Birmingham, AL 35253-0390
800/873-4898
8 AM to 5 PM Central Time
Monday Through Friday

DATE OF PREPARATION: November 1, 1991

NOTICE: Vulcan Chemicals believes that the information contained on this Material Safety Data Sheet is accurate. The suggested procedures are based on experience as of the date of publication. They are not necessarily all-inclusive nor fully adequate in every circumstance. Also, the suggestions should not be confused with nor followed in violation of applicable laws, regulation, rules or insurance requirements.

NO WARRANTY, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS OR OTHERWISE IS MADE.

UNION CARBIDE

UNION CARBIDE CHEMICALS AND PLASTICS COMPANY INC.
Industrial Chemicals Division

MATERIAL SAFETY DATA SHEET

10/10/90

EFFECTIVE DATE: 08/21/89

Union Carbide urges each customer or recipient of this MSDS to study it carefully to become aware of and understand the hazards associated with the product. The reader should consider consulting reference works or individuals who are experts in ventilation, toxicology, and fire prevention, as necessary or appropriate to use and understand the data contained in this MSDS.

To promote safe handling, each customer or recipient should: (1) notify its employees, agents, contractors and others whom it knows or believes will use this material of the information in this MSDS and any other information regarding hazards or safety; (2) furnish this same information to each of its customers for the product; and (3) request its customers to notify their employees, customers, and other users of the product of this information.

I. IDENTIFICATION

PRODUCT NAME: CARBOWAX POLYETHYENE GLYCOL 600

CHEMICAL NAME: Polyethylene Glycol

CHEMICAL FAMILY: Oxyalkylene Polymer

FORMULA: HO-(CH2CH20)n-H

MOLECULAR WEIGHT: 570 - 630

SYNONYMS: Polyoxyethylene 600

CAS # and 25322-68-3
CAS NAME: Poly(oxy-1,2-ethanediyl),a-hydro-w-hydroxy-

II. PHYSICAL DATA (Determined on typical material)

BOILING POINT, 760 mm Hg: >200C (>392F) (Decomposes)

FREEZING POINT: 20 C to 25 C (68 F to 77 F)

SPECIFIC GRAVITY(H2O =1):
1.130 at 20/20 C

VAPOR PRESSURE AT 20'C:
<0.01 mm Hg

VAPOR DENSITY (air = 1):
>1

SOLUBILITY IN WATER by wt:
100%

EVAPORATION RATE
(Butyl Acetate = 1): Nil

APPEARANCE AND ODOR: Liquid (slight haze); mild odor.

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CARBOWAX is a Trademark of Union Carbide Chemicals & Plastics Technology Corp.
EMERGENCY PHONE NUMBER: 1-800-UCC-HELP (Number available at all times) or 304-744-3487

UNION CARBIDE CHEMICALS AND PLASTICS COMPANY INC.
Industrial Chemicals Division
39 Old Ridgebury Road, Danbury, CT. 06817-0001

USED: MELT OUT TANK OIL

PRODUCT NAME: CARBOWAX POLYETHYENE GLYCOL 600

III. INGREDIENTS

MATERIAL	%	TLV (Units)	HAZARD
Polyethylene Glycol	100	None established	See Section V

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (test method(s)): >350 F, Pensky-Martens closed cup ASTM D 93
475 F, Cleveland open cup ASTM D 92

FLAMMABLE LIMITS IN AIR, % by volume: LOWER: 1.1 (Est)
UPPER: 6.9

EXTINGUISHING MEDIA: Apply alcohol-type or all-purpose-type foams by manufacturers' recommended techniques for large fires. Use CO2 or dry chemical media for small fires.

SPECIAL FIRE FIGHTING PROCEDURES: Do not direct a solid stream of water or foam into hot, burning pools; this may cause frothing and increase fire intensity. Use self-contained breathing apparatus and protective clothing.

UNUSUAL FIRE AND EXPLOSION HAZARDS: None

V. HEALTH HAZARD DATA

TLV AND SOURCE: None established by ACGIH or OSHA.

EFFECTS OF SINGLE OVEREXPOSURE:

SWALLOWING: No evidence of adverse effects from available information.

SKIN ABSORPTION: No evidence of adverse effects from available information.

INHALATION: No evidence of adverse effects from available information.

SKIN CONTACT: No evidence of adverse effects from available information.

EYE CONTACT: No evidence of adverse effects from available information.

EFFECTS OF REPEATED OVEREXPOSURE:
No evidence of adverse effects from available information.

OTHER EFFECTS OF OVEREXPOSURE:
Overexposure to vapors generated at high temperatures may result in eye and respiratory tract irritation and in the inhalation of harmful amounts of material.

EMERGENCY AND FIRST AID PROCEDURES:

SWALLOWING: No harmful effects expected.

SKIN: Wash with soap and water.

PRODUCT NAME: CARBOWAX POLYETHYENE GLYCOL 600

INHALATION: No emergency care anticipated.

EYES: Flush with water.

NOTES TO PHYSICIAN: Toxicology studies have shown this material to be of very low acute toxicity and non-irritating. There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition.

VI. REACTIVITY DATA

STABILITY: Stable

CONDITIONS TO AVOID: None

INCOMPATIBILITY (materials to avoid):
Normally unreactive; however, avoid strong bases at high temperatures, strong acids, strong oxidizing agents and materials reactive with hydroxyl compounds.

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS:
Burning can produce carbon monoxide and/or carbon dioxide.

HAZARDOUS POLYMERIZATION: Will Not Occur

CONDITIONS TO AVOID: None

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
Small spills should be flushed with large quantities of water. Larger spills should be collected for disposal.

WASTE DISPOSAL METHOD: Incinerate in a furnace where permitted under appropriate Federal, State, and local regulations. See Section IX.

VIII. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type):
None should normally be necessary. If personnel experience respiratory discomfort or irritation, NIOSH approved half-mask respirator equipped with organic vapor cartridge and dust/mist pre-filter recommended.

VENTILATION: General (mechanical) room ventilation is expected to be satisfactory.

PROTECTIVE GLOVES: PVC - coated

EYE PROTECTION: Safety glasses

OTHER PROTECTIVE EQUIPMENT:
Eye bath and safety shower.

PRODUCT NAME: CARBOWAX POLYETHYENE GLYCOL 600

IX. SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

Normal precautions common to good manufacturing practice should be followed in handling and storage.

FOR INDUSTRY USE ONLY

OTHER PRECAUTIONS:

DISPOSAL – Laboratory studies show that, at very low concentrations in water, this material can be biodegraded in a biological wastewater treatment system.

This product may contain trace amounts of ethylene oxide (CAS No. 75-21-8), a condition which creates the potential for accumulation of ethylene oxide in the head space of shipping and storage containers and in enclosed areas where the product is being handled or used. Ethylene oxide is considered by OSHA, IARC, and NTP as a potential carcinogen for humans. OSHA considers that, at excess levels, ethylene oxide may present reproductive, mutagenic, genotoxic, neurologic and sensitization hazards in humans. If this product is handled with adequate ventilation, the presence of these trace amounts is not expected to result in any short or long term hazard.
This product may not be exempt from OSHA's ethylene oxide standard, 29CFR1910.1047. Users should comply with all applicable provisions. Personnel should be monitored to determine levels of exposure to ethylene oxide. If necessary, protective measures should be taken. The OSHA permissible exposure limit for ethylene oxide is 1 ppm TWA8, the action level is 0.5 ppm TWA8, the ACGIH TLV is 1 ppm TWA8 and OSHA has established an excursion limit of 5 ppm (15 minute average).

WARNING: Sudden release of hot organic chemical vapors or mists from process equipment operating at elevated temperature and pressure, or sudden ingress of air into vacuum equipment, may result in ignitions without the presence of obvious ignition sources. Published "autoignition" or "ignition" temperature values cannot be treated as safe operating temperatures in chemical processes without analysis of the actual process conditions.

Any use of this product in elevated-temperature processes should be thoroughly evaluated to establish and maintain safe operating conditions. Further information is available in a technical bulletin entitled "Ignition Hazards of Organic Chemical Vapors."

X. REGULATORY INFORMATION

STATUS ON SUBSTANCE LISTS:

The concentrations shown are maximum or ceiling levels (weight %) to be used for calculations for regulations. Trade Secrets are indicated by "TS".

FEDERAL EPA

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center of release of quantities of Hazardous Substances equal to or greater than the reportable quantities (RQs) in 40 CFR 302.4.

Components present in this product at a level which could require reporting under the statute are:

CHEMICAL	CAS NUMBER	UPPER BOUND CONCENTRATION %
Ethylene Oxide	75-21-8	.0005
Dioxane	123-91-1	.0005

Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires emergency planning based on Threshold Planning Quantities (TPQs) and release reporting based on Reportable Quantities (RQs) in 40 CFR 355 (used for SARA 302, 304, 311 and 312).

Components present in this product at a level which could require reporting under the statute are:

*** NONE ***

PRODUCT NAME: CARBOWAX POLYETHYENE GLYCOL 600

Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III
requires submission of annual reports of release of toxic chemicals that appear in 40 CFR 372 (for SARA 313). This information must be included in all MSDSs that are copied and distributed for this material.

Components present in this product at a level which could require reporting under the statute are:

*** None ***

STATE RIGHT-TO-KNOW

CALIFORNIA Proposition 65

This product contains trace levels of ACETALDEHYDE, DIOXANE, ETHYLENE OXIDE AND FORMALDEHYDE which the state of California has found to cause cancer, birth defects or other reproductive harm.

MASSACHUSETTS Right-To-Know, Substance List (MSL) Hazardous Substances and Extraordinarily Hazardous Substances on the MSL must be identified when present in products.

Components present in this product at a level which could require reporting under the statute are:

EXTRAORDINARILY HAZARDOUS SUBSTANCES (=> 0.0001%)

CHEMICAL	CAS NUMBER	UPPER BOUND CONCENTRATION %
Acetaldehyde	75-07-0	.0006
Dioxane	123-91-1	.0005
Ethylene Oxide	75-21-8	.0005
Formaldehyde	50-00-0	.0004

PENNSYLVANIA Right-To-Know, Hazardous Substance List Hazardous Substances and Special Hazardous Substances on the List must be identified when present in products.

Components present in this product at a level which could require reporting under the statute are:

*** NONE ***

Toxic Substances Control Act(TSCA) STATUS:

The ingredients of this product are on the TSCA inventory.

CALIFORNIA SCAQMD RULE 443.1 VOC'S:

Not presently available

OTHER REGULATORY INFORMATION:

*** None Known ***

NOTE ----

The opinions expressed herein are those of qualified experts within Union Carbide Chemicals and Plastics Company. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and of these opinions and the conditions of the use of the product are not within the control of Union Carbide Chemicals and Plastics Company, it is the user's obligation to determine the conditions of safe use of the product.

REVISED SECTIONS: This MSDS was revised to include a warning statement on the potential for vapors and mists to spontaneously ignite under certain conditions. Refer to Section IX - Other Precautions.

PC: 18227
F NUMBER: N0038A

GE Plastics
Material Safety Data Sheet

General Electric Company
Parkersburg Center, Fifth & Avery Sts.
Parkersburg, WV 26102

The following information has been compiled from current sources which are believed to be accurate and reliable. Since it is not possible to anticipate all conditions under which this information and the subject products will be used, it should not be assumed that all acceptable safety measures are defined, or that other additional procedures may not be required under individual circumstances. User should insure that the information is relevant to each particular condition or application. GE Plastics makes no warranty, either express or implied, including merchantability and fitness.

DATE: 03/01/89
MSDS NO: PL-0117-89B

EMERGENCY TELEPHONE NUMBERS

MEDICAL	**(304) 863-7284 (24 Hour)**
CHEMTREC	**(800) 424-9300**
OTHER	**(304) 424-5411**

PRODUCT IDENTIFICATION CYCOLAC T

TRADE NAME	Cycolac T
COMMON NAME	ABS polymer
CHEMICAL NAME	Acrylonitrile-butadiene-styrene terpolymer
CAS NUMBER	9003-56-9
FORMULA	Not applicable

RECEIVED
MAY 17 1990
CMI-NOREN INC.

HAZARDOUS INGREDIENTS

CHEMICAL NAME Styrene
CAS NUMBER 100-42-5
OSHA PEL 50 ppm TWA8 ACGIH TLV 50 ppm TWA8
ACGIH STEL 100 ppm OSHA CEIL 100 ppm

These materials are high-molecular-weight polymers not expected to be chemically active under recommended conditions of use. Trace amounts of residual monomers, including acrylonitrile and styrene, suspected carcinogens, are present and may be released under suggested processing temperature ranges. For Hazard Communication purposes under OSHA Standard 29CFR 1910.1200 styrene monomer is listed as a possible carcinogen based upon an evaluation from IARC. (See Health Hazard Information)

PHYSICAL AND CHEMICAL PROPERTIES

STATE	Solid pellets
ODOR	Faint
MELTING POINT	218-262°F (103-128°C)
BOILING POINT	Unknown
VAPOR PRESSURE (mmHg)	Unknown
VAPOR DENSITY (AIR=1)	Unknown
SPECIFIC GRAVITY	1.02-1.17
WATER SOLUBILITY	Insoluble

These materials do not exhibit a sharp melting point, but soften gradually over a wide temperature range.

PHYSICAL HAZARD INFORMATION

FLASH POINT	660 degrees F (349 degrees C)
LOWER FLAMMABLE LIMIT	Unknown
UPPER FLAMMABLE LIMIT	Unknown
AUTO IGNITION TEMP	946 degrees F (508 degrees C)

EXTINGUISHING MEDIA: Dry Chemical, water spray, carbon dioxide, foam, water fog or spray.

FIRE AND EXPLOSION HAZARD: Hazards from burning are intense heat and very high levels of dense, black smoke containing carbon monoxide, carbon dioxide, and hydrogen cyanide.

FIREFIGHTING: Do not use high pressure water stream or other method that creates dust. Firefighters should be provided the necessary protective clothing and use a self-contained breathing apparatus approved by NIOSH or MSHA for all fires.

HEALTH HAZARD INFORMATION

PRECAUTIONARY INFORMATION: Fumes emitted from the hot plastic during converting operations may condense on cool overhead metal surfaces or structures. That condensate, usually in the form of a soft, grease-like, semi-solid, may contain substances which can be irritating and toxic. Avoid contact of that material with the skin. Wear rubber or other impermeable protective gloves when cleaning contaminated surfaces. Typical volatile emissions from polymers under recommended process conditions, in addition to the materials previously discussed, may be water vapor and trace amounts of such materials as ethyl benzene, phenol, acrolein, acetophenone, alpha-methylstyrene, 4-vinyl cyclohexene, and cumene. Wash hands with soap and water before eating or smoking and at the end of each work day.

SYMPTOMS OF OVEREXPOSURE

***Acute**

Inhalation: Fumes produced during the melt-processing of these plastics may produce acute health effects in some individuals, especially irritation of the eyes, nose and throat, and in cases of severe over-exposure, nausea and headache.

Skin Contact: Fumes emitted from hot plastic during converting operations may condense on cool overhead metal surfaces or structures. This condensate, usually in the form of a soft, grease-like, semi-solid, may contain substances which can be irritating and toxic.

Eye Contact: Fumes from hot melt-processing may cause irritation.

Ingestion: Not acutely toxic. Not a probable route of exposure.

***Chronic**

No known human chronic effects.

RESTRICTIVE MEDICAL CONDITIONS: Unknown

PRIMARY ROUTES OF EXPOSURE

INHALATION	Yes	INGESTION	Unlikely
SKIN ABSORPTION	No	SKIN AND EYE CONTACT	Yes

TOXICITY INFORMATION
Oral LD50 (Rat): > 5 gm/kg (Estimated)

The oral LD50 represents the product containing the maximum concentration of controlled ingredients.

FIRST AID PROCEDURES

INHALATION: If affected by fumes, remove to fresh air. Refer to a physician for treatment.

SKIN CONTACT: Molten plastic causes severe burns. Cool rapidly with water and immediately obtain medical attention to remove the cooled plastic.

EYE CONTACT: Flush immediately with large amounts of water for at least 15 minutes. If irritation persists, contact physician.

INGESTION: Not probable. Keep person warm and at rest. Obtain medical attention.

EXPOSURE LIMITS
Not applicable

CARCINOGENIC STATUS
OSHA REGULATED: Not Regulated
NATIONAL TOXICOLOGY PROGRAM: Not Tested
INTERNATIONAL AGENCY FOR RESEARCH ON CANCER: Listed

The Carcinogenic Status classifications do not apply to the product which has not been tested or reported on by the listed agencies, but rather refer to trace amounts of styrene monomer in the product. For Hazard communication purposes under OSHA STANDARD 29 CFR 1910.1200, styrene monomer is listed as a possible carcinogen based upon an evaluation by IARC. Neither the current epidemiology data from workers exposed to styrene monomer nor the current data from long-term animal toxicology studies provides an adequate basis to conclude that styrene monomer is carcinogenic. Testing by the National Toxicology Program is in progress, but results are not yet available.

Certain heavy metal salts, present as color pigments and based upon cadmium, chromium, copper, lead, or mercury metals, may be present in some color codes. Those ingredients are essentially mixed into the plastic and are unlikely to contribute either to pollution of soils and waters or to personnel handling hazards.

REACTIVITY: Stable.

INCOMPATIBILITIES: Strong oxidizing agents.

CONDITIONS TO AVOID: Do not exceed 550°F (288°C). Purgings should be collected only as small, flat thin shapes or in thin strands to allow for rapid cooling. Precautions should be taken against auto-ignition of hot, thick masses of the plastic. Quench in water. Grinder dust is an explosion hazard.

HAZARDOUS DECOMPOSITION PRODUCTS: Styrene monomer, ammonia, acrylamide, aromatic and aliphatic hydrocarbon fragments and carbon monoxide may be present. Primary toxic products of combustion are carbon monoxide, and hydrogen cyanide. Carbon dioxide, an asphyxiant, is also produced.

PRECAUTIONS FOR SAFE HANDLING AND STORAGE

STORAGE, HANDLING, AND SHIPPING: Instruct all pertinent personnel to read and become familiar with all labels and instructions on the packages. Avoid storing containers near foodstuffs due to the possibility of odor and taste contamination of the food. Do not store containers near heating devices, hot pipes, etc. The head-space of boxes, bulk-trucks or hopper cars may accumulate low concentrations of residual monomers which can be toxic or explosive. Open all containers under conditions of good ventilation, away from flames or ignition sources; and avoid breathing the trapped fumes. With proper ventilation these products can be stored or processed without exposing employees to unacceptable monomer levels. The gaseous emissions from the vents of vented-barrel presses and extruders should not be discharged into the work areas. These materials should be exhausted, under controlled ventilation, to the outside of the building, or may be discharged into a closed process-wastewater system (no open trenches or manholes), or can be trapped by a suitable catalytic conversion device (consult the manufacturer of such device to determine its suitability with these plastics.)

SPILLS/LEAKS/RELEASES: For spills, leaks or releases of the pellets, remove from all floor areas to allow for stable footing and preventing slips by personnel.

WORKPLACE RELEASE: For spills or leaks of the pellets, remove from all floor areas to allow for stable footing and preventing slips by personnel.

SOIL RELEASE: Collect for re-use or appropriate disposal.

WATER RELEASE: Notification of government agency may be appropriate.

AIR RELEASE: Not likely to be released to the air.

WASTE DISPOSAL: Landfill waste plastic if codes permit, or incinerate if codes and equipment permit. Incinceration equipment should be capable of handling large volumes of dense, black smoke and withstand the corrosive effects of acid gases. These pellet materials are not considered hazardous waste under Title 40, CFR Part 261 (Hazardous Wastes under the Resources Conservation Recovery Act), reference Sections 261.31, .32. .33(e) and .33(f). They do not have the characteristics of a hazardous material as defined under Sections 261.21, .22, .23 and .24.

ENGINEERING CONTROLS AND PERSONAL PROTECTIVE EQUIPMENT

VENTILATION: Recommended; sufficient to control fumes.

PERSONAL PROTECTIVE EQUIPMENT

DEGREE OF EXPOSURE	EYE	SKIN	RESPIRATORY	OTHERS
CLOSED SYSTEM (REMOTE)	A	D	NONE	NONE
OCCASIONAL (INFREQUENT)	A	D	NONE	NONE
REPEATED & PROLONGED	A	D	G	NONE
SPILLS (GROSS CONTACT)	A	D	G	NONE

KEY FOR PERSONAL PROTECTIVE EQUIPMENT

A SAFETY GLASSES	H FULL FACE W/CANISTER
B CHEMICAL GOGGLES	I FULL FACE W/SUPPLIED AIR
C GAS TIGHT GOGGLES	J FACESHIELD
D ORDINARY WORK CLOTHES	K GLOVES
E IMPERVIOUS CLOTHING	L APRON
F IMPERVIOUS AND GAS TIGHT	M BOOTS
G HALF MASK W/CARTRIDGE	N NONE

RESPIRATORY PROTECTION: Under conditions of excessive fume concentration, a NIOSH or MSHA approved device with an OVAG (organic vapor acid gas) rating or fresh air supply should be used.

GLOVES: Use for hot material.

MSDS SUMMARY

MSDS GENERAL WARNING: FUMES PRODUCED DURING MELT-PROCESSING MAY CAUSE EYE, SKIN, AND RESPIRATORY TRACT IRRITATION. MOLTEN PLASTIC MAY CAUSE THERMAL BURNS.

UN NUMBER: None

DOT HAZARD CLASS: Not regulated

OSHA PHYSICAL HAZARD LIST

PYROPHORIC	No	OXIDIZER	No
EXPLOSIVE	No	PEROXIDE	No
FLAMMABLE	No	COMPRESSED GAS	No
COMBUSTIBLE	No		

RCRA WASTE NUMBER: Not applicable

DATE OF ISSUE	DATE REVISED	REPLACES
10/12/88	03/01/89	PL-0117-89A

CYCOLAC is a registered trademark of the General Electric Company and its affiliates.

NATURAL RESOURCES COMMISSION
LARRY DEVUYST
PAUL EISELE
MARLENE J. FLUHARTY
GORDON E. GUYER
'ID HOLLI
STEWART MYERS
RAYMOND POUPORE

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING
P.O. BOX 30028
LANSING, MI 48909

ROLAND HARMES, Director

November 7, 1991

Mr. Terry Franklin, Vice President
CMI - Noren
14680 Apple Drive
Fruitport, MI 49415

Dear Mr. Franklin:

This letter is in reference to your Permit to Install application for the prototype plastic injection molding facility, located at 14680 Apple Drive, Fruitport, Michigan. This application, identified as No. 542-91, has been evaluated and approved by the Air Quality Division, pursuant to the delegation of authority from the Michigan Air Pollution Control Commission.

This approval is based upon and subject to compliance with all administrative rules of the Commission and conditions stipulated in the attached supplement. Please review these conditions thoroughly so that you may plan for and take the actions necessary to ensure compliance with all of these conditions. Also note that Condition No. 1 requires you to apply, in writing, for a permit to operate within 30 days after completion of construction.

You are advised that contaminants discharged to the surface waters and/or groundwaters; materials disposed of on land; hazardous waste storage, treatment, and disposal; and resource recovery facilities must be approved by other divisions of the Department of Natural Resources. Additionally, your plant environment must be in compliance with all applicable requirements of the Departments of Public Health and Labor.

Thank you for your cooperation. Please contact me if you have any questions regarding this permit.

Sincerely,

Gregory M. Edwards

Gregory M. Edwards, Supervisor
Chemical Process Unit
Permit Section
Air Quality Division
517-373-7048

GME:dlr
Enclosure
cc: Joe Holmes

R1026
9/91

SUPPLEMENT TO PERMIT NO. 542-91

CMI - Noren
Fruitport, Michigan

August 7, 1991

GENERAL CONDITIONS

1. Rule 208(2) - Not more than 30 days after completion of the installation, Applicant shall apply, in writing, for a Permit to Operate. Completion of the installation is deemed to occur not later than commencement of a trial operation pursuant to Rule 201(4). Written application should be sent to: Chief, Permit Unit, Air Quality Division, Department of Natural Resources, P.O. Box 30028, Lansing, Michigan 48909.

2. Rule 201(4) - Trial operation of the equipment is permitted until the Michigan Air Pollution Control Commission acts upon the Permit to Operate. Operation of the equipment shall permanently cease upon denial of the Permit to Operate by the Commission.

3. Rule 208(3)(a) and (c) - Applicant shall demonstrate compliance with all Commission rules and with all general and special conditions of this permit prior to issuance of the Permit to Operate.

4. Rule 201 - Applicant shall not reconstruct, alter, modify, expand, or relocate this equipment unless plans, specifications, and an application for a Permit to Install are submitted to and approved by the Commission.

5. Rule 901 - Operation of this equipment shall not result in the emission of an air contaminant which causes injurious effects to human health or safety, animal life, plant life of significant value, or property, or which causes unreasonable interference with the comfortable enjoyment of life and property.

6. Rule 208(3)(b) - Operation of this equipment shall not interfere with the attainment or maintenance of the air quality standard for any air contaminant.

7. Operation of this equipment shall not result in significant deterioration of air quality.

8. Rule 912 - Applicant shall provide notification of any abnormal conditions or malfunction of process or control equipment covered by this application, resulting in emissions in violation of the Commission rules or of any permit conditions for more than two hours, to the District Supervisor. Such notice shall be made as soon as reasonably possible, but not later than 9:00 a.m. of the next working day. Applicant shall also, within 10 days, submit to the District Supervisor, a written detailed report, including probable causes, duration of violation, remedial action taken, and the steps which are being undertaken to prevent a reoccurrence.

19. Applicant shall not substitute any raw materials for those described in this permit application which would result in an appreciable change in the quality or any appreciable increase in the quantity of the emission of an air contaminant without prior notification to and approval by the Air Quality Division.

GE:dlr

CMI-TECH CENTER INC.
1600 W. Eight Mile Rd. Ferndale, MI 48220
A SUBSIDIARY OF CMI INTERNATIONAL INC.

AIR QUALITY DIVISION
AUG 19 1992
PERMIT SECTION

August 6, 1992

(313) 399-9600

Mr. Greg Edwards
Michigan Department of Natural Resources
Air Quality Division
Stevens T. Mason Building
P.O. Box 30028
Lansing, Michigan 48909

RE: Relocation of Prototype Nylon Plastic Injection Molding Facility - Application No. 542-91

Dear Mr. Edwards,

This letter is to inform you of the relocation of a prototype nylon plastic injection molding facility from CMI-Noren, Inc. located at: 14680 Apple Drive, Ottawa County, Fruitport, Michigan 49415, to CMI-Tech Center, Inc. located at: 1600 W. Eight Mile Road, Oakland County, Ferndale, Michigan 48220.

The transfer involves no more than moving the current equipment, materials and personnel to the Ferndale site. All processes will remain unchanged. (Ref: Application No. 542-91).

Enclosed with the application is a layout of the Ferndale site with the building to house the prototype facility highlighted in blue.

Thank you for your cooperation, and should you have any questions, please contact me directly.

Sincerely,

Jeffrey Norton

Jeffrey Norton
Environmental Engineer

JN/klk
cc: Dr. Gary Ruff
Diane Zekind

NATURAL RESOURCES COMMISSION
LARRY DEVUYST
PAUL EISELE
GORDON E. GUYER
JAMES P. HILL
DAVID HOLLI
O. STEWART MYERS
JOEY M. SPANO

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING
P.O. BOX 30028
LANSING, MI 48909

ROLAND HARMES, Director

March 18, 1992

Mr. James Warren, Plant Engineer
CMI-Noren, Inc.
14638 Apple Drive
Fruitport, MI 49415

Dear Mr. Warren:

This is in response to your letter of December 3, 1991, regarding the use of a different material in the melt tank associated with the prototype plastic injection molding process, located at Apple Drive, Friutport, Michigan. This process is covered by Permit to Install No. 542-91 issued on August 7, 1991. This request, to use vegetable oil in lieu of Carbowax, is hereby approved.

The permit remains subject to compliance with the administrative rules of the Michigan Air Pollution Control Commission and conditions stipulated in the supplement to the permit dated August 7, 1991.

Please contact me if you have any further questions on this matter.

Sincerely,

Gregory M Edwards

Gregory M. Edwards, Supervisor
Chemical Process Unit
Permit Section
Air Quality Division
517-373-7048

/ge
cc: Dan Kakkuri, AQD-Grand Rapids

File 542-91

AIR QUALITY DIVISION

DEC 4 1991

PERMIT SECTION

CMI-NOREN, INC.
14638 Apple Drive Fruitport, MI 49415
A SUBSIDIARY OF CMI INTERNATIONAL INC.

[616] 842-3500

December 3, 1991

Mr. Gregory M. Edwards
Michigan Department of Natural Resources
Air Quality Division
Stevens T. Mason Building
P.O. Box 30028
Lansing, Mi 48909

Re: CMI-Noren Permit to Install

Dear Mr. Edwards:

This letter is to confirm your discussions with Martin Stromberger of RMT, Inc., our consultant, regarding the permit to install CMI Noren's prototype polymer injection facility located in Fruitport, Michigan. I understand that, during your August 14, 1991, telephone conversation with Mr. Stromberger, you indicated that the MDNR permit to install for the prototype facility had dbeen approved at that time, that the supporting paperwork would not be sent to CMI Noren until substantially later, and that CMI could proceed with the prototype prior to receiving the paperwork. Consistent with these discussions, CMI plans to conduct permitted activities for the prototype facility under the permit to install unless we hear otherwise from you.

Additionally, as Mr. Stromberger and you discussed, we are intending to make a change to the raw materials to be used in the prototype operation, and this letter is to notify you of that change. Vegetable oil will be substituted for the Carbowax material originally intended for use in the melt-out tank. A copy of the MSDS for the new material is attached.

RMT has evaluated the thermal decomposition products of this new material as compared to Carbowax. Their initial search indicates that the termal decomposition products of vegetable oil may include simple hydrocarbons, such as alcohols or organic acids. As you may

recall, Carbowax thermal decomposition products included acetaldehyde, formaldehyde, and other compounds. RMT's telephone conversation with the vegetable oil manufacturer indicated that vegetable oil is generally thermally stable up to temperatures of approximately 250 C degrees . We intend to heat the material to temperatures up to 200 C degrees. Therefore, no hazardous thermal decomposition products would be expected, resulting in a favorable emissions scenario. Because of the favorable environmental characteristics of vegetable oil as compared to Carboxwax, we intend to replace the Carboxwax with the vegetable oil unless we receive notice from the MDNR that such a change is inappropriate.

Please call me with any questions.

Sincerely,

CMI-Noren, Inc.

James Warren
Plant Engineer

JW/p
Enc.

xc: Joe Holmes 12/9/91 w note

1/23/92 - no response, so assumed OK.

MATERIAL SAFETY DATA SHEET

BUCKEYE LUBRICANTS
20801 Salisbury Rd.
Bedford, Ohio 44146
Phone (216) 581 3600 Fax (216) 581-2734

HEALTH _1_ FLAMMABILITY _1_ REACTIVITY _0_ PROTECTION _E_

SECTION 1 - IDENTITY AND EMERGENCY INFORMATION

Trade Name: MELT-LUBE P-NE Emergency Phone #: (216) 581-3600
Chemical name and synonyms: NA
Chemical Family: VEGETABLE OIL WITH ADDITIVES
Other Product Info: PRORIETARY FORMULATION

SECTION 2 - HAZARDOUS INGREDIENTS

Ingredient	CAS Number	%	Nature of Hazard
NONE INDICATED			

SECTION 3 - PHYSICAL DATA

Boiling point (F): _>425F_ Melting point (F): _NA__ pH: _NA__

Vapor density (Air=1): _>1.0_ Vapor pressure (mm Hg): _<0.01_

Evaporation rate (BuAc=1): _<1.0_ % Volatile (by volume): _ND__

Specific gravity (H2O=1): _<1.0_ Solubility in water: _DISPERSIBLE_

Appearance and odor: CLEAR, AMBER COLORED LIQUID. MODERATE VISCOSITY. MILD ODOR.

SECTION 4 - FIRE AND EXPLOSION HAZARD DATA

Flash point (method): _>500F_ (C.O.C.)
Flammable limits in air (LEL/UEL): _ND / ND___
Extinguishing media: Foam, CO2, or dry chemical.
Special fire fighting procedures: Treat as oil fire. Do not direct water stream into pools of burning liquid as this may cause fire to spread.

Unusual hazards: NONE

SECTION 5 - REACTIVITY DATA

Stability: _STABLE___
Conditions to avoid: Avoid open flames, sparks, and extreme heat.
Materials to avoid: Avoid strong acids, strong bases, and oxidizing agents, especially when this product is hot.
Hazardous decomposition products: CO and CO2 gasses.
Hazardous polymerization: _WILL NOT_ occur.
Conditions to avoid: NONE

SECTION 6 - HEALTH HAZARD DATA

Route of exposure:

Eyes: Splash, mist, vapor.

Effects of overexposure: Redness, irritation.

Emergency procedures: Flush well with water. If irritation persists contact physician.

Skin: Splash, immersion, mist.

Permissable exposure limit: Not determined.

Effects of overexposure: Redness, irritation.

Emergency procedures: Wash thoroughly with soap and water.

Inhalation: Mist, vapor.

Permissable exposure limit: 10 mg/cubic meter as oil mist.

Effects of overexposure: Shortness of breath, dizziness.

Emergency procedures: Remove to fresh air. Give artificial respiration if necessary.

Oral: Swallowing.

Threshold limit value: Not determined.

Effects of overexposure: Nausea, vomiting, diarrhea.

Emergency procedures: Drink large amounts of water. Contact physician or Poison Control immediately.

Effects of chronic exposure: None anticipated.

Carcinogenicity: Non-carcinogenic.

Medical conditions aggravated by exposure: None determined.

SECTION 7 - PRECAUTIONS FOR SAFE HANDLING AND USE

In case of spill or leak: Collect with fire-retardant absorbent material for disposal.

Waste disposal method: Incinerate or in landfill in accordance with Federal, State, and Local regulations.

Conditions to avoid: Do not allow to freeze - store indoors.

Other precautions: Avoid open flames, sparks, and extreme heat.

SECTION 8 - PERSONAL PROTECTION INFORMATION

Eyes: Standard industrial safety glasses or goggles.

Skin: Normal clothing is adequate. Insulated work gloves should be provided when working with heated material. At room temperature, standard-issue cotton or leather gloves are adequate.

Inhalation: Normal ventilation adequate under normal conditions and use.

Special ventilation: None required under normal conditions.

Clothing: Insulated apron is recommended for working with heated material. Wash soiled clothing before reusing.

Special equipment required: None with normal applications and conditions.

SECTION 9 SHIPPING AND TRANSPORTATION INFORMATION

D.O.T. Proper shipping name: NOT DETERMINED

D.O.T. Hazard Class: NOT DETERMINED

Special precautions: AVOID EXTREME HEAT, OPEN FLAME, AND SPARKS.

Date of last revision: 10-10-91

The data contained in this form is the best presently available information.

Notes: Buckeye Lubricants shall in no event be responsible for any damage whatsoever, directly or indirectly, resulting from the publication or use of or reliance upon data contained herein. No warranty, either expressed or implied, of merchantibility or fitness of any nature with respect to the product or to the data is made herein.

No response to 5-20-92 fax

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES

TRANSMITTAL

TO: Jill Koebbe

FOR ACTION AS INDICATED

- ☐ SIGNATURE
- ☐ APPROVAL
- ☐ ACTION
- ☐ COMMENTS
- ☒ INFORMATION
- ☐ RETURN W/YOUR RECOMMENDATIONS
- ☐ REPLY-MY SIGNATURE
- ☐ REPLY-COPY TO ME
- ☐ PLEASE SUMMARIZE
- ☐ PLEASE INVESTIGATE
- ☐ FORWARDED PER REQUEST
- ☐ NOTE AND FORWARD
- ☐ NOTE AND FILE
- ☐ NOTE AND RETURN
- ☐ PLEASE PHONE ME
- ☐ PLEASE SEE ME

REMARKS:

Sounds ok to me. I'm not planning to respond. Any problems?

FROM Greg

DATE 4/14

R 1147 Rev. 2/79

CMI-NOREN, INC.
14638 Apple Drive Fruitport, MI 49415
A SUBSIDIARY OF CMI INTERNATIONAL INC.

AIR QUALITY DIVISION
APR 13 1992
PERMIT SECTION

[616] 842-3500

April 8, 1992

Mr. Gregory M. Edwards
Michigan Department of Natural Resources
Air Quality Division
Stevens T. Mason Building
P.O. Box 30028
Lansing, MI 48909

Re: CMI-Noren melt out oil (Permit to Install 542-91)

Dear Mr. Edwards,

As you may recall, we have been using vegetable oil for our melt out system. The use of vegetable oil was a MDNR approved change from Carbowax. We now intend to change to a white mineral oil.

We are developing the melt out process and are searching for the best performing oil that is environmentally sound. The white mineral oil is stable up to 440 degrees F and we plan to operate at 375 degrees F. Above 440 degrees F, the only known decomposition products are carbon monoxide and carbon dioxide. Since this oil is environmentally favorable in comparison with Carbowax and vegetable oil, we intend to replace the vegetable oil with the mineral oil unless we receive notice from the MDNR that such a change is inappropriate.

A copy of the data and MSDS sheets are included. Please call me with any questions.

Sincerely,

Rick A. Borns

Rick A. Borns
Process Development Manager
Polymer Composite Components

vc: Jill Koebbe

c.c. D. Trumble
R. Fors
file:oil2

RMT INC

RMT, Inc.
744 Heartland Trail
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608-831-4444
FAX: 608-831-3334

AIR QUALITY DIVISION
JUL 12 1991
PERMIT SECTION

July 11, 1991

Mr. Gregory M. Edwards
Senior Engineering Specialist
Air Quality Division
Michigan Department of Natural Resources
Stevens T. Mason Building
Lansing, MI 48909

Dear Mr. Edwards:

Enclosed are the Material Safety Data Sheets you requested for the mold release compounds to be used at the proposed CMI-Norēn prototype facility in Fruitport, Michigan. Also enclosed are calculation sheets indicating that volatile organic compound emissions from the use of these materials should be relatively minimal, a maximum of 36 pounds per year.

With the dispersion modeling results we sent to Dorothy Bailey recently, I believe you should now have all the information necessary to complete your evaluation of the CMI-Norēn permit application.

Please call me with questions.

Sincerely,

Martin Stromberg

Martin J. Stromberger, P.E.
Manager, Industrial Hygiene and
Air Pollution Engineering

nsr

cc: Terry Franklyn
Dave Preston
Brent King

Enclosures

xc: Joe Holmes

2197.03:MSD:edwards

HMIS RATING	
Health	1
Flammability	0
Reactivity	0

MATERIAL SAFETY DATA SHEET

(Complies with OSHA Communication Standard 29 CFR 1910.1200 Dept. of Labor)
Form approved OMB No. 1218-0072
OSHA 174 - Sept. 1985

NFPA Rating	
Health	3
Flammability	0
Reactivity	1

IDENTITY: ZINC STEARATE
2-122

Marketer's Name Must Appear Below — DOT Shipping - Consumer Commodity ORM-D

Manufacturer's Name: PLASTIC PROCESS EQUIPMENT, INC.
Address: 7950 EMPIRE PARKWAY
MACEDONIA, OH 44056

Emergency Telephone Number: (216)468-1511
Telephone Number for Information: (216)468-1511
Date Prepared: 1/31/90 Checked: ✓

Section II - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity, Common Names(s))	OSHA PEL	ACGIH TLV	STEL	%(optional)
*1,1,1 TRICHLOROETHANE (71-55-6)	350	350	450	50-60
*ACETONE (67-64-1)	1000	750	1000	1-10
*ZINC STEARATE (557-05-1)	15MG/M^3 (DUST)	10MG/M^3 (DUST)	-	1-10
CHLORODIFLUOROMETHANE (75-45-6)	1000	1000	1250	30-40

*All chemical compounds marked with an Asterisk(*) are toxic chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372. You must notify each person to whom this mixture or trade name product is sold. This statement must remain a part of this Material Safety Data Sheet.

Section III - Physical/Chemical Characteristics

Boiling Point — Range	-41.4°F TO 190°F	Specific Gravity (H_2O = 1)	1.2
Vapor Pressure PSIG @ 70°F	ND	Melting Point — PH — Liquid	NA
Vapor Density (AIR = 1) — Heavier than Air	4.0	Evaporation Rate (Butyl Acetate = 1)	>1
Solubility in Water: NIL		Appearance and Odor: CLEAR/SOLVENT ODOR	

Section IV - Fire and Explosion Hazard Data

Flash Point (Method Used): BASED ON ACETONE -4 °F T.C.C.	Flammable Limits	LEL 2.6	UEL 12.8

Extinguishing Media: Use water fog, dry chemical or carbon dioxide

Special Fire Fighting Procedures: Aerosol cans may rupture when heated

Unusual Fire and Explosion Hazards: Heated cans may burst

Section V - Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable	X	High Temperatures

Incompatibility (Materials to Avoid) NOT COMPATIBLE WITH ACTIVE METALS.
THE ABOVE SOLVENTS ARE INCOMPATIBLE WITH STRONG OXIDIZERS.

Hazardous Decomposition or Byproducts IN FIRE WILL DECOMPOSE TO WATER, CARBON DIOXIDE, HALOGEN ACIDS AND PHOSGENE AND HYDROCLORIC AND HYDROFLUORIC ACIDS AND CARBONYL HALIDES.

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will not Occur	X	None

Section VI - Health Hazard Data

Route(s) of Entry: Inhalation? Yes Skin? Yes Ingestion? Yes

Health Hazards (Acute and Chronic)
May cause dizziness or narcosis in high vapor concentrations. Will cause defatting of skin. Effects are reversible.
Long term exposure (years) to high concentrations of vapor may cause lung, liver or kidney damage. The solvents listed have been reported to affect the central nervous system.

Carcinogenicity: NTP? Presently not on any list. IARC Monographs? OSHA Regulated?

Signs and Symptoms of Exposure
Inhalation - Difficulty in breathing. Skin-redness. Ingestion-vomiting.

Medical Conditions
Generally Aggravated by Exposure: Heart Disease; Respiratory Disorders.

Emergency and First Aid Procedures
Give oxygen - Do not induce vomiting - Gastric lavage - Wash eyes and skin with water.

Section VII - Precautions for Safe Handling and Use

Steps to be Taken in Case Material is Released or Spilled:
Use absorbent sweeping compound to soak up material. Put into container. Dispose as hazardous waste.

Waste Disposal Method
Dispose as hazardous waste in accordance with EPA RCRA.

Precautions to be Taken in Handling and Storing
Keep away from heat, sparks, or open flame. Store at temperatures below 120°F.

Other Precautions When spraying more than one half can continuously or more than one can consecutively, use NIOSH approved respirator.

SectionVIII - Control Measures

Respiratory Protection (Specify Type)
Self contained breathing apparatus if above TLV limit exceeding.

Ventilation	Local Exhaust: Yes	Special: None	
	Mechanical (General): None	Other: None	
Protective Gloves: None required if spraying		Eye Protection: Wear eye protection	

Other Protective Clothing or Equipment
Long sleeve and long pants

Work/Hygienic Practices: Do not smoke while using. Wash hands after use.

MATERIAL SAFETY DATA SHEET
(Complies with OSHA Communication Standard 29 CFR 1910 .00 Dept. of Labor)
Form approved OMB No. 1218-0072
OSHA 174 - Sept. 1985

Health	
Flammability	
Reactivity	

IDENTITY:

MSP-16
MOLD SAVER

Marketer's Name Must Appear Below — DOT Shipping - Consumer Commodity ORM-D

Manufacturer's Name: PLASTIC PROCESS EQUIPMENT, INC.	Emergency Telephone Number: 216-468-1511
Address: 7950 EMPIRE PKWY.	Telephone Number for Information: 216-468-1511
MACEDONIA, OH 44056	Date Prepared: 8/30/89

Section II - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity, Common Names(s))	OSHA PEL	ACGIH TLV	STEL	%(o
* 1,1,1 TRICHLOROETHANE (71-55-6)	350	350	450	
* PERCHLOROETHYLENE (127-18-4)	100	50	200	
PROPANE/ISOBUTANE (74-98-6)	1000	1000	ASPHYXIANT	
NON HAZARDOUS				

*All chemical compounds marked with an Asterisk(*) are toxic chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372. You must notify each person to whom this mixture or trade product is sold. This statement must remain a part of this Material Safety Data Sheet.

Section III - Physical/Chemical Characteristics

Boiling Point Range	-40°F TO 253°F.	Specific Gravity (H_2O = 1)	1.0
Vapor Pressure PSIG @ 70°F	55	Melting Point PH Liquid	NA
Vapor Density (AIR = 1) Heavier than Air	4.0	Evaporation Rate (Butyl Acetate = 1)	<3
Solubility in Water: NIL		Appearance and Odor: CLEAR/SOLVENT ODOR	

Section IV - Fire and Explosion Hazard Data

Flash Point (Method Used): -40°F T.C.C.	Flammable Limits	LEL: 1.8	UEL: 12.0

Extinguishing Media: USE WATER FOG, DRYCHEMICAL OR CARBON DIOXIDE

Special Fire Fighting Procedures: AEROSOL CANS MAY RUPTURE WHEN HEATED

Unusual Fire and Explosion Hazards: HEATED CANS MAY BURST

MSDS P-16

Stability	Stable	x	High Temperatures

Incompatibility (Materials to Avoid)
The above solvents are incompatible with strong oxidizers & active metals.

Hazardous Decomposition or Byproducts
In fire will decompose to water, carbon dioxide, halogen acids and phosgene.

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will not Occur	x	None

Section VI - Health Hazard Data

Route(s) of Entry: Inhalation? Yes Skin? Yes Ingestion? Yes

Health Hazards (Acute and Chronic)
May cause dizziness or narcosis in high vapor concentrations. Will cause defatting of skin. Effects are reversible.
Long term exposure (years) to high concentrations of vapor may cause lung, liver or kidney damage. The solvents listed have been reported to affect the central nervous system.

Carcinogenicity: NTP? Presently not on any list. IARC Monographs? OSHA Regulated?

Signs and Symptoms of Exposure
Inhalation - Difficulty in breathing. Skin-redness. Ingestion-vomiting.

Medical Conditions
Generally Aggravated by Exposure: Heart Disease; Respiratory Disorders.

Emergency and First Aid Procedures
Give oxygen - Do not induce vomiting - Gastric lavage - Wash eyes and skin with water.

Section VII - Precautions for Safe Handling and Use

Steps to be Taken in Case Material is Released or Spilled:
Use absorbent sweeping compound to soak up material. Put into container. Dispose as hazardous waste.

Waste Disposal Method
Dispose as hazardous waste in accordance with EPA RCRA.

Precautions to be Taken in Handling and Storing
Keep away from heat, sparks, or open flame. Store at temperatures below 120°F.

Other Precautions When spraying more than one half can continuously or more than one can consecutively, use NIOSH approved respirato

SectionVIII - Control Measures

Respiratory Protection (Specify Type)
Self contained breathing apparatus if above TLV limit exceeding.

Ventilation	Local Exhaust: Yes	Special	None
	Mechanical (General): None	Other	None
Protective Gloves	None required if spraying	Eye Protection	Wear eye protection

Other Protective Clothing or Equipment
Long sleeve and long pants

Work/Hygienic Practices: Do not smoke while using. Wash hands after use.

REV

MATERIAL SAFETY DATA SHEET
(Complies with OSHA Communication Standard 29 CFR 1910.1200 Dept. of Labor)
Form approved OMB No. 1218-0072
OSHA 174 - Sept. 1985

Health	2
Flammability	3
Reactivity	0

IDENTITY:

MC-16

MOLD CLEANER

Marketer's Name Must Appear Below — DOT Shipping - Consumer Commodity ORM-D

Manufacturer's Name: PLASTIC PROCESS EQUIPMENT, INC.
Address: 7950 EMPIRE PARKWAY
MACEDONIA, OH 44056

Emergency Telephone Number: 216 468-1511
Telephone Number for Information: 216 468-1511
Date Prepared: 8/31/89

Section II - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity, Common Names(s))	OSHA PEL	ACGIH TLV	STEL	%(opti
*TOLUENE (108-88-3)	200	100	150	17
*1,1,1 TRICHLOROETHANE (71-55-6)	350	350	450	80
CARBON DIOXIDE (124-38-9)	5000	5000	30000	3

THE ACCEPTABLE CEILING CONCENTRATION FOR TOLUENE IS 300 PPM. ACCEPTABLE MAXIMUM PEAK ABOVE THE ACCEPTABLE CEILING CONCENTRATION FOR AN 8 HOUR SHIFT IS 500 PPM FOR 10 MINUTES FOR TOLUENE.

*All chemical compounds marked with an Asterisk(*) are toxic chemicals subject to the reporting requirements of Section 313 of Title III of the S
fund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372. You must notify each person to whom this mixture or trade
product is sold. This statement must remain a part of this Material Safety Data Sheet.

Section III - Physical/Chemical Characteristics

Boiling Point Range	162°F TO 233°F	Specific Gravity (H_2O = 1)	1.2
Vapor Pressure PSIG @ 70°F	50	Melting Point PH Liquid	NA
Vapor Density (AIR = 1) Heavier than Air	4.0	Evaporation Rate (Butyl Acetate = 1)	3
Solubility in Water NIL		Appearance and Odor CLEAR/SOLVENT ODOR	

Section IV - Fire and Explosion Hazard Data

Flash Point (Method Used) ND	Flammable Limits ND	LEL	UEL

Extinguishing Media: USE WATER FOG, DRY CHEMICAL OR CARBON DIOXIDE

Special Fire Fighting Procedures: AEROSOL CANS MAY RUPTURE WHEN HEATED

Unusual Fire and Explosion Hazards: HEATED CANS MAY BURST

Stability			
	Unstable		
	Stable	X	High Temperatures

Incompatibility (Materials to Avoid)
The above solvents are incompatible with strong oxidizers & active metals.

Hazardous Decomposition or Byproducts
In fire will decompose to water, carbon dioxide, halogen acids and phosgene.

Hazardous Polymerization			
	May Occur		Conditions to Avoid
	Will not Occur	X	None

Section VI - Health Hazard Data

Route(s) of Entry: Inhalation? Yes Skin? Yes Ingestion? Yes

Health Hazards (Acute and Chronic)
May cause dizziness or narcosis in high vapor concentrations. Will cause defatting of skin. Effects are reversible."
Long term exposure (years) to high concentrations of vapor may cause lung, liver or kidney damage. The solvents listed have been reported to affect the central nervous system.

Carcinogenicity: NTP? Presently not on any list. IARC Monographs? OSHA Regulated?

Signs and Symptoms of Exposure
Inhalation - Difficulty in breathing. Skin-redness. Ingestion-vomiting.

Medical Conditions
Generally Aggravated by Exposure: Heart Disease; Respiratory Disorders.

Emergency and First Aid Procedures
Give oxygen - Do not induce vomiting - Gastric lavage - Wash eyes and skin with water.

Section VII - Precautions for Safe Handling and Use

Steps to be Taken in Case Material is Released or Spilled:
Use absorbent sweeping compound to soak up material. Put into container. Dispose as hazardous waste.

Waste Disposal Method
Dispose as hazardous waste in accordance with EPA RCRA.

Precautions to be Taken in Handling and Storing
Keep away from heat, sparks, or open flame. Store at temperatures below 120°F.

Other Precautions When spraying more than one half can continuously or more than one can consecutively, use NIOSH approved respirator

SectionVIII - Control Measures

Respiratory Protection (Specify Type)
Self contained breathing apparatus if above TLV limit exceeding.

Ventilation			
	Local Exhaust: Yes	Special: None	
	Mechanical (General): None	Other: None	
Protective Gloves: None required if spraying		Eye Protection: Wear eye protection	

Other Protective Clothing or Equipment
Long sleeve and long pants

Work/Hygienic Practices: Do not smoke while using. Wash hands after use.

REV. 4

HMIS RATING	
Health	1
Flammability	0
Reactivity	0

MATERIAL SAFETY DATA SHEET

(Complies with OSHA Communication Standard 29 CFR 1910.1200 Dept. of Labor)
Form approved OMB No 1218-0072
OSHA 174 - Sept. 1985

NFPA Rating	
Health	3
Flammability	0
Reactivity	1

IDENTITY: PAINTABLE
P-201

Marketer's Name Must Appear Below — DOT Shipping - Consumer Commodity ORM-D

Manufacturer's Name PLASTIC PROCESS EQUIPMENT, INC.	Emergency Telephone Number (216)468-1511
Address 7950 EMPIRE PARKWAY	Telephone Number for Information (216)468-1511
MACEDONIA, OH 44056	Date Prepared 1/31/90 Checked ✓

Section II - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity, Common Names(s))	OSHA PEL	ACGIH TLV	STEL	%(optional)
*1,1,1 TRICHLOROETHANE (71-55-6)	350	350	450	50-60
*ACETONE (67-64-1)	1000	750	1000	1-10
CHLORODIFLUOROMEHTANE (75-45-6)	1000	1000	1250	35-45
NON-HAZARDOUS	-	-	-	1-10

*All chemical compounds marked with an Asterisk(*) are toxic chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372. You must notify each person to whom this mixture or trade name product is sold. This statement must remain a part of this Material Safety Data Sheet.

Section III - Physical/Chemical Characteristics

Boiling Point Range	-41.4°F TO 190°F	Specific Gravity (H_2O = 1)	1.2
Vapor Pressure PSIG @ 70°F	ND	Melting Point PH Liquid	NA
Vapor Density (AIR = 1) Heavier than Air	4.0	Evaporation Rate (Butyl Acetate = 1)	>1
Solubility in Water NIL		Appearance and Odor CLEAR/SOLVENT ODOR	

Section IV - Fire and Explosion Hazard Data

Flash Point (Method Used) BASED ON ACETONE -4°F T.C.C.	Flammable Limits	LEL 2.6	UEL 12.8

Extinguishing Media: Use water fog, dry chemical or carbon dioxide

Special Fire Fighting Procedures: Aerosol cans may rupture when heated

Unusual Fire and Explosion Hazards: Heated cans may burst

Section V - Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable	X	High Temperatures

Incompatibility (Materials to Avoid) NOT COMPATIBLE WITH ACTIVE METALS.
THE ABOVE SOLVENTS ARE INCOMPATIBLE WITH STRONG OXIDIZERS.

Hazardous Decomposition or Byproducts IN FIRE WILL DECOMPOSE TO WATER, CARBON DIOXIDE, HALOGEN ACIDS AND PHOSGENE AND HYDROCHLORIC AND HYDROFLUORIC ACIDS AND POSSIBLY CARBONYL HALIDES.

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will not Occur	X	None

Section VI - Health Hazard Data

Route(s) of Entry: Inhalation? Yes Skin? Yes Ingestion? Yes

Health Hazards (Acute and Chronic)
May cause dizziness or narcosis in high vapor concentrations. Will cause defatting of skin. Effects are reversible.
Long term exposure (years) to high concentrations of vapor may cause lung, liver or kidney damage. The solvents listed have been reported to affect the central nervous system.

Carcinogenicity: NTP? Presently not on any list. IARC Monographs? OSHA Regulated?

Signs and Symptoms of Exposure
Inhalation - Difficulty in breathing. Skin-redness. Ingestion vomiting.

Medical Conditions
Generally Aggravated by Exposure: Heart Disease; Respiratory Disorders.

Emergency and First Aid Procedures
Give oxygen - Do not induce vomiting - Gastric lavage - Wash eyes and skin with water.

Section VII - Precautions for Safe Handling and Use

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Waste Disposal Method
Dispose as hazardous waste in accordance with EPA RCRA.

Precautions to be Taken in Handling and Storing
Keep away from heat, sparks, or open flame. Store at temperatures below 120°F.

Other Precautions When spraying more than one half can continuously or more than one can consecutively, use NIOSH approved respirator.

SectionVIII - Control Measures

Respiratory Protection (Specify Type)
Self contained breathing apparatus if above TLV limit exceeding.

Ventilation	Local Exhaust: Yes	Special: None	
	Mechanical (General): None	Other: None	

Protective Gloves: None required if spraying
Eye Protection: Wear eye protection

Other Protective Clothing or Equipment
Long sleeve and long pants

Work Hygienic Practices: Do not smoke while using. Wash hands after use.

COMPUTATION SHEET

RMT INC.

SHEET 1 OF 2

744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
CMI - Noren	MJS	7/11/91	DJF	7/11/91	2197.03

CMI - Noren intends to use the following materials as mold release and treatment compounds at their prototype facility:

Title	Use	Maximum Usage Rate
Zinc Stearate	- Mold release	2 - 8oz. cans/month
Mold Saver	- Mold preservative	1 - 8oz can/month
Paintable	- Mold coating	1 - 8oz can/month
Mold Cleaner	- Mold cleaner	1 - 8oz can/month

The usage rate of these materials is much lower than for typical plastic injection operations since the nylon to be used @ CMI - Noren has excellent release characteristics.

Estimated Emission Rates

8oz. = 0.0625 gal

Zinc Stearate

0.125 gal/mo × 10.08 lb/gal = 1.25 lb/month ✓
(2 8oz cans)

1.25 lb/month × 0.90 lb volatiles/lb material = 1.13 ✓ lb volatile/mo.

1.13 × 12 mo/year = 13.5 lb volatiles/year ✓

50% of this is methyl chloroform (1,1,1 - trichloroethane)

COMPUTATION SHEET

RMT INC.

SHEET 2 OF 2

744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
CMI - Noren	MJS	7/11/91	DJF	7/11/91	2197.03

Mold Saver, Paintable, Mold Cleaner (1 8oz can each)

- Assume 100 % volatile

0.1875 gal/mo × 10.08 lb/gal = 1.89 lb volatile/mo

1.89 lb volatile/mo × 12 mo/year = 22.7 lb volatiles/year

Total = 36.2 lb volatiles/year

most of this is methyl Chloroform (1,1,1-TCA)

NATURAL RESOURCES COMMISSION
LARRY DEVUYST
PAUL EISELE
MARLENE J. FLUHARTY
GORDON E. GUYER
DAVID HOLLI
O. STEWART MYERS
RAYMOND POUPORE

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING
P.O. BOX 30028
LANSING, MI 48909

ROLAND HARMES, Director

November 7, 1991

Mr. Terry Franklin, Vice President
CMI - Noren
14680 Apple Drive
Fruitport, MI 49415

Dear Mr. Franklin:

This letter is in reference to your Permit to Install application for the prototype plastic injection molding facility, located at 14680 Apple Drive, Fruitport, Michigan. This application, identified as No. 542-91, has been evaluated and approved by the Air Quality Division, pursuant to the delegation of authority from the Michigan Air Pollution Control Commission.

This approval is based upon and subject to compliance with all administrative rules of the Commission and conditions stipulated in the attached supplement. Please review these conditions thoroughly so that you may plan for and take the actions necessary to ensure compliance with all of these conditions. Also note that Condition No. 1 requires you to apply, in writing, for a permit to operate within 30 days after completion of construction.

You are advised that contaminants discharged to the surface waters and/or groundwaters; materials disposed of on land; hazardous waste storage, treatment, and disposal; and resource recovery facilities must be approved by other divisions of the Department of Natural Resources. Additionally, your plant environment must be in compliance with all applicable requirements of the Departments of Public Health and Labor.

Thank you for your cooperation. Please contact me if you have any questions regarding this permit.

Sincerely,

Gregory M Edwards

Gregory M. Edwards, Supervisor
Chemical Process Unit
Permit Section
Air Quality Division
517-373-7048

GME:dlr
Enclosure
cc: Joe Holmes

SUPPLEMENT TO PERMIT NO. 542-91

CMI - Noren
Fruitport, Michigan

August 7, 1991

GENERAL CONDITIONS

1. Rule 208(2) - Not more than 30 days after completion of the installation, Applicant shall apply, in writing, for a Permit to Operate. Completion of the installation is deemed to occur not later than commencement of a trial operation pursuant to Rule 201(4). Written application should be sent to: Chief, Permit Unit, Air Quality Division, Department of Natural Resources, P.O. Box 30028, Lansing, Michigan 48909.

2. Rule 201(4) - Trial operation of the equipment is permitted until the Michigan Air Pollution Control Commission acts upon the Permit to Operate. Operation of the equipment shall permanently cease upon denial of the Permit to Operate by the Commission.

3. Rule 208(3)(a) and (c) - Applicant shall demonstrate compliance with all Commission rules and with all general and special conditions of this permit prior to issuance of the Permit to Operate.

4. Rule 201 - Applicant shall not reconstruct, alter, modify, expand, or relocate this equipment unless plans, specifications, and an application for a Permit to Install are submitted to and approved by the Commission.

5. Rule 901 - Operation of this equipment shall not result in the emission of an air contaminant which causes injurious effects to human health or safety, animal life, plant life of significant value, or property, or which causes unreasonable interference with the comfortable enjoyment of life and property.

6. Rule 208(3)(b) - Operation of this equipment shall not interfere with the attainment or maintenance of the air quality standard for any air contaminant.

7. Operation of this equipment shall not result in significant deterioration of air quality.

8. Rule 912 - Applicant shall provide notification of any abnormal conditions or malfunction of process or control equipment covered by this application, resulting in emissions in violation of the Commission rules or of any permit conditions for more than two hours, to the District Supervisor. Such notice shall be made as soon as reasonably possible, but not later than 9:00 a.m. of the next working day. Applicant shall also, within 10 days, submit to the District Supervisor, a written detailed report, including probable causes, duration of violation, remedial action taken, and the steps which are being undertaken to prevent a reoccurrence.

19. Applicant shall not substitute any raw materials for those described in this permit application which would result in an appreciable change in the quality or any appreciable increase in the quantity of the emission of an air contaminant without prior notification to and approval by the Air Quality Division.

GE:dlr

NATURAL RESOURCES COMMISSION
MARLENE J. FLUHARTY
GORDON E. GUYER
O. STEWART MYERS
RAYMOND POUPORE

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING
P.O. BOX 30028
LANSING, MI 48909

Delbert Rector, Director

RECEIVED
JUN 07 1991
CMI-NOREN INC.

June 4, 1991

Mr. Terry Franklyn, Vice President
CMI-Noren
14680 Apple Dr.
Fruitport, MI 49415

Dear Mr. Franklyn:

The Air Quality Division, pursuant to the delegation of authority from the Michigan Air Pollution Control Commission, proposes to approve your request for a waiver of the permit requirements to allow for construction of a prototype plastic injection molding facility to begin installation at 14680 Apple Drive, Fruitport, Michigan, prior to final action on Permit to Install Application No. 541-91. Approval of this waiver request is contingent upon your agreement to the conditions described below as indicated by the return of this letter, signed and dated.

You are hereby notified that this approval is based upon and subject to your agreement of the following conditions:

1. All construction commenced prior to the issuance of a Permit to Install is entirely at the applicant's own risk. Any costs required to modify a building or process equipment which was installed pursuant to this waiver will not be taken into account in determining the appropriate level of control of air contaminant emissions.

2. No construction beyond the aforementioned is allowed prior to final action on the Permit to Install.

3. No trial operation of the proposed process or process equipment is allowed prior to final action on the Permit to Install.

4. No trial operation of the proposed process or process equipment is allowed pursuant to an approved Permit to Install prior to the installation and/or implementation of the air pollution control systems and/or procedures which are necessary to comply with the conditions of the Permit to Install.

5. Approval of this waiver does not relieve CMI-Noren from responsibility for any installation or operation that has occurred or may occur without issuance of necessary air use permits or other authorizations, or has occurred or may occur in non-compliance with such permits, regulations, or other requirements. Furthermore, approval of this waiver in no way precludes the State of Michigan from initiating enforcement action for any such violations.

Terry Franklyn
6/12/91

RECYCLED PAPER

6. This waiver may be terminated by written notification from the Chief, Air Quality Division, at any time. Furthermore, all authorizations granted by this waiver are terminated if the Commission denies the Permit to Install application.

If you agree to the conditions of this waiver, as noted above, sign and date below, and return the original of this letter to me, keeping a copy for your records. The waiver is approved only upon our receipt of the signed letter.

Please contact Joe Holmes, District Supervisor, at our Grand Rapids District Office at 616-456-5071, or Gregory Edwards, Permit Engineer, at 517-373-7048, if you have any questions concerning this matter.

Sincerely,

Dennis A. Armbruster, Supervisor
Permit Section
Air Quality Division
517-373-7086

AIR QUALITY DIVISION
JUN 14 1991
PERMIT SECTION

DAA:GME:slj
cc: Mr. Joe Holmes, District Supervisor
Mr. Gregory Edwards, Permit Engineer
Ms. Barbara Rosenbaum, Supervisor, Compliance and Enforcement

---

As an authorized representative of CMI-Noren, I accept this waiver and understand and agree to all conditions described above.

NAME: Terry Franklyn
TITLE: VICE PRESIDENT FOUNDRIES
DATE: JUNE 12, 1991

Return signed original to: Permit Section Supervisor
Air Quality Division
Department of Natural Resources
P.O. Box 30028
Lansing, MI 48909

NATURAL RESOURCES COMMISSION
MARLENE J. FLUHARTY
GORDON E. GUYER
O. STEWART MYERS
RAYMOND POUPORE

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING
P.O. BOX 30028
LANSING, MI 48909

Delbert Rector, Director

June 4, 1991

Mr. Terry Franklyn, Vice President
CMI-Noren
14680 Apple Dr.
Fruitport, MI 49415

Dear Mr. Franklyn:

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4. No trial operation of the proposed process or process equipment is allowed pursuant to an approved Permit to Install prior to the installation and/or implementation of the air pollution control systems and/or procedures which are necessary to comply with the conditions of the Permit to Install.

5. Approval of this waiver does not relieve CMI-Noren from responsibility for any installation or operation that has occurred or may occur without issuance of necessary air use permits or other authorizations, or has occurred or may occur in non-compliance with such permits, regulations, or other requirements. Furthermore, approval of this waiver in no way precludes the State of Michigan from initiating enforcement action for any such violations.

APPENDIX B

PROCESS EQUIPMENT LAYOUT DIAGRAMS

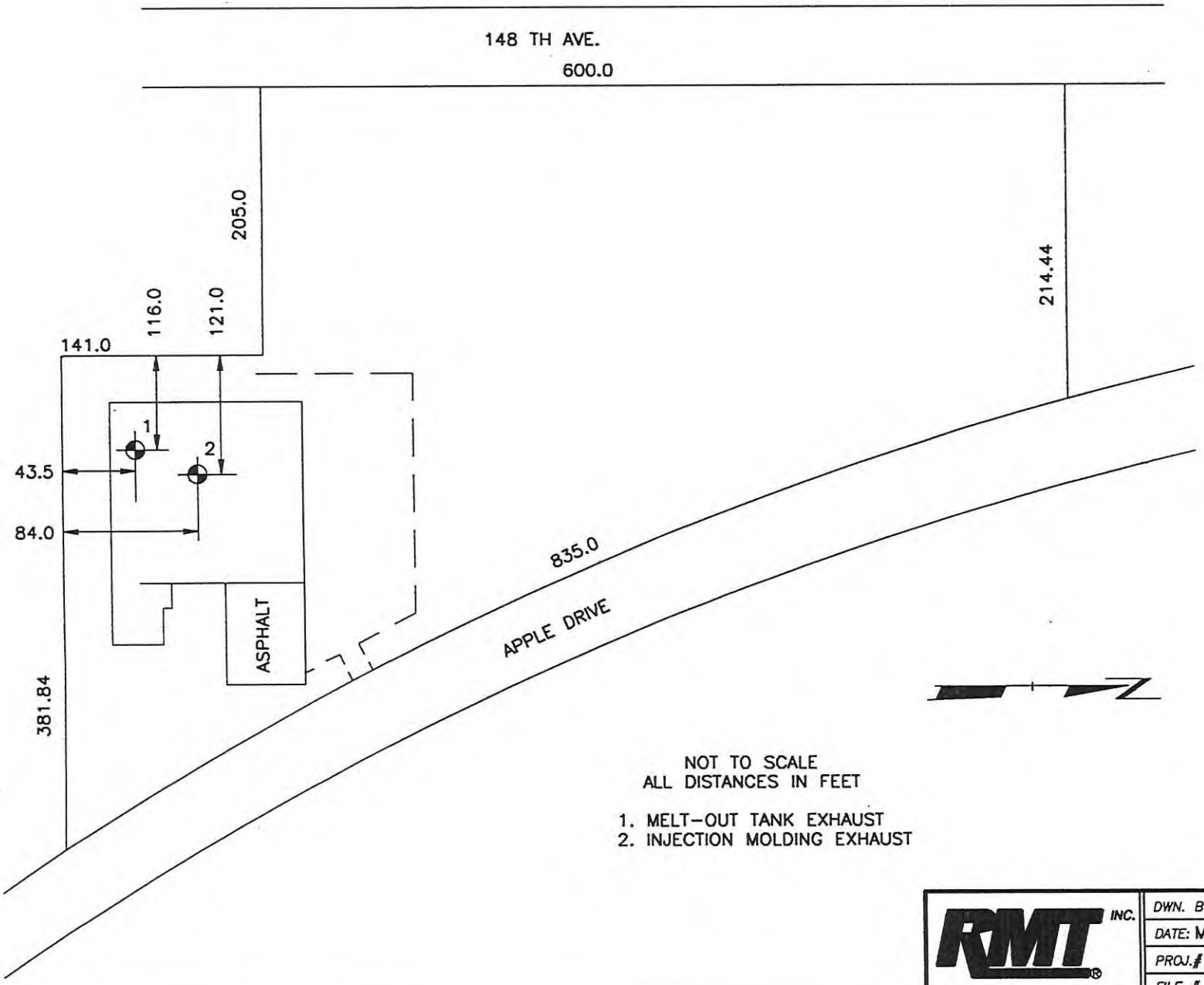
in conf. file

APPENDIX A

STATE OF MICHIGAN AIR PERMIT APPLICATION FORMS

PROTOTYPE FACILITY

CMI–NOREN PROTOTYPE INJECTION MOLDING FACILITY



NOT TO SCALE
ALL DISTANCES IN FEET

1. MELT–OUT TANK EXHAUST
2. INJECTION MOLDING EXHAUST

RMT INC.

DWN. BY:	WKB
DATE:	MAY, 1991
PROJ.#	2197.03
FILE #	21970301

LETTER OF TRANSMITTAL

RMT INC.

AIR QUALITY DIVISION

744 Heartland Trail
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608-831-4444
FAX: 608-831-3334

MAY 22 1991

PERMIT SECTION

DATE	JOB NO.
5/20/91	2197.03
ATTENTION	
RE:	

To: Greg Edwards
Air Quality Division - MDNR
Stevens T. Mason Bldg.
P.O. Box 30028
Lansing, MI 48909

WE ARE SENDING YOU ☐ Attached ☐ Under separate cover via _____ the following items:

☐ CONTRACT DOCUMENTS ☐ PURCHASE ORDER ☐ WAIVER OF LIEN ☐ LABORATORY ANALYSIS REPORT

☐ CERTIFICATES OF INSURANCE ☐ COPY OF LETTER ☐ PLANS ☐ _____

COPIES	DATE	NO.	DESCRIPTION

THESE ARE TRANSMITTED as checked below:

☐ FOR APPROVAL ☐ SIGN AND RETURN ☒ FOR YOUR USE

☐ APPROVED AS NOTED ☐ FOR REVIEW AND COMMENT ☐ AS REQUESTED

☐ APPROVED AS SUBMITTED ☐ RETURNED FOR CORRECTIONS ☐ _____

REMARKS

Greg,

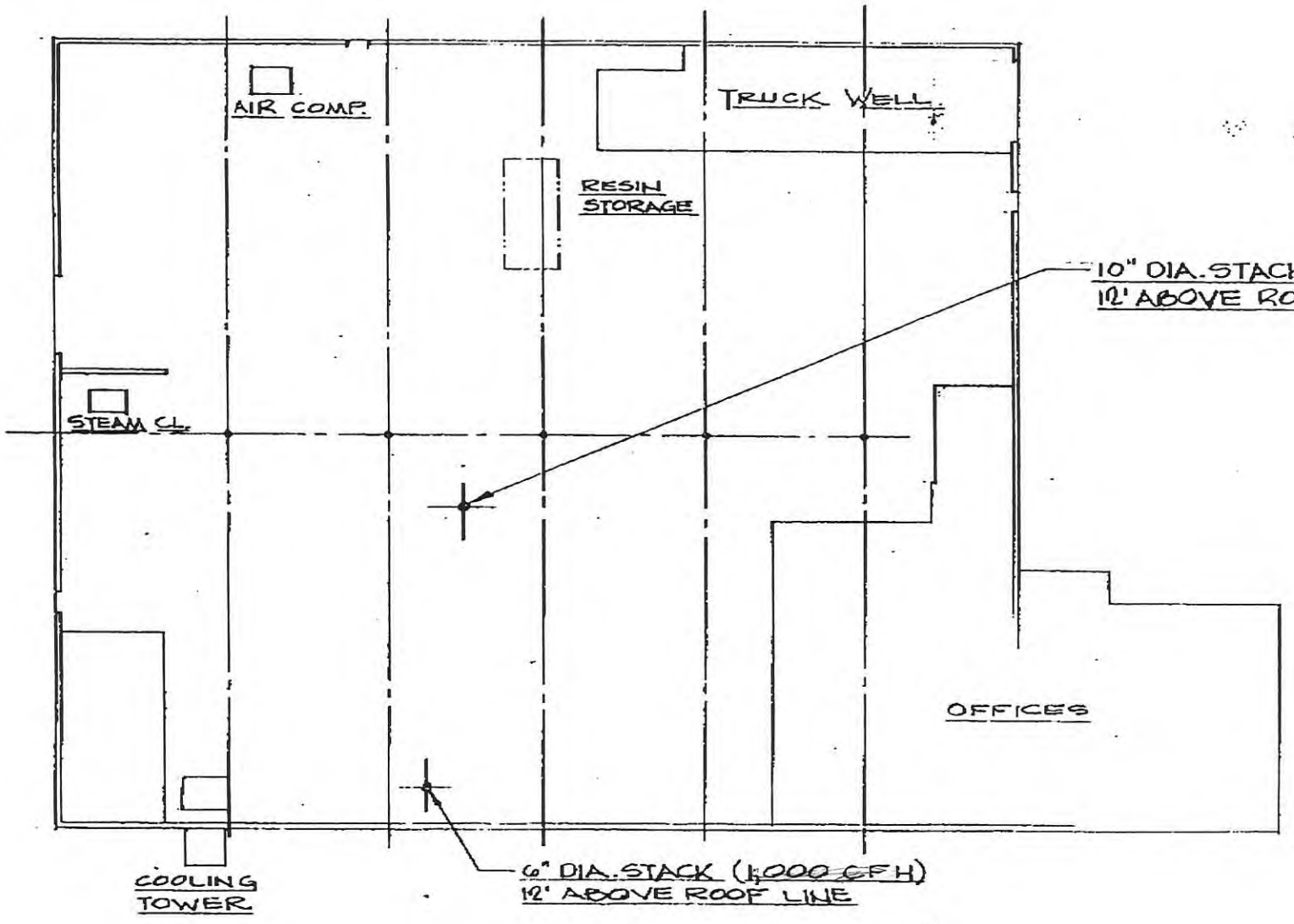
Attached is the plot plan you requested. Please call me with questions.

COPY TO _____

SIGNED: Marty Stromberger

FACILITY PLOT PLAN

STACK LOCATION SKETCH



5/28/91

RMT, Inc.
744 Heartland Trail
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608-831-4444
FAX: 608-831-3334

July 3, 1991

Ms. Dorothy Bailey
Air Quality Division
Michigan Department of Natural Resources
Stevens T. Mason Building
P.O. Box 30028
Lansing, MI 48909

Dear Ms. Bailey:

Enclosed is the dispersion modeling analysis which you requested for formaldehyde and acetaldehyde emissions from the proposed CMI-Noren facility in Fruitport, Michigan.

Please call me in our Madison, Wisconsin, office if you have any questions.

Sincerely,

David J. Fox
Environmental Specialist/Meteorologist

nsr

cc: Greg Edwards - MDNR
Dave Preston - Varnum, Riddering, et. al.
Terry Franklyn - CMI-Noren
Brent King - RMT

Enclosure

2197.03:MSD:bailey.1

CMI - Noreen
PI 542-91

Waiver request

The company submitted a waiver request for its prototype facility along with the permit application. It was anticipated that a quick permit approval might be possible, however, due to the need for dispersion modeling this permit approval will be delayed.

The company has demonstrated a hardship: it is entering a new market, with new technology, and stands to lose its investment and future business if it cannot provide test parts to potential customers.

The proposed equipment should company with all regulations.

I recommend approval of the waiver request.

GM Edwards
5-29-91

AIR QUALITY DIVISION
MAY 8 1991
PERMIT SECTION

CMI-NOREN, INC.
14638 Apple Drive Fruitport, MI 49415
A SUBSIDIARY OF CMI INTERNATIONAL INC.

(616) 842-3500

May 7, 1991

Mr. Greg Edwards
Permit Engineer
MDNR-Air Quality Division
4th Floor Stevens T. Mason Building
P.O. Box 30028
Lansing, Michigan 48909

Re: CMI-Noren, Inc. - Air-Use Permit Applications

Dear Mr. Edwards:

The purpose of this letter is to identify that CMI-Noren, Inc., has authorized RMT to prepare Air-Use Permit Applications and related documentation on its behalf, and to discuss these materials with MDNR Air Quality Division representatives.

If you have any questions regarding this letter please contact me.

Sincerely,

CMI-Noren, Inc.

Terry Franklyn
Vice President Foundries

TF/p
cc: Dennis Armbruster
File

CMI-NOREN, INC.
14638 Apple Drive Fruitport, MI 49415
A SUBSIDIARY OF CMI INTERNATIONAL INC

Not Confidential
5/29/91

CONFIDENTIAL

AIR QUALITY DIVISION

APR 29 1991

PERMIT SECTION

(616) 842-3500

April 26, 1991

HAND DELIVERED

Mr. Dennis Armbruster
Chief, Permit Section
Michigan Department of Natural Resources
Air Quality Division
Stevens T. Mason Building
P.O. Box 30028
Lansing, Michigan 48909

Re: Permit Application for Prototype and Production-Level Plastic-Injection Molding Facilities, Fruitport, Michigan

Dear Mr. Armbruster:

Enclosed for review by your staff please find three copies of applications for Permits to Install a prototype plastic-injection molding facility and a production-level plastic-injection molding facility at two sites near Fruitport, Michigan, respectively. Each copy contains executed permit application forms in Appendix A. As the enclosed application describes, CMI-Norēn, Inc. plans to construct a prototype plastic-injection molding facility near Fruitport in the near future. A site has been selected for this facility and the attached detailed plans describe proposed equipment and manufacturing processes. The prototype facility will be operated on an infrequent basis to produce small numbers of parts for the automobile industry for use in prototype vehicles.

Also enclosed is an application for CMI's proposed production-level plastic-injection molding facility at a site to be identified in the future. A number of details concerning this facility have yet to be identified and will be presented to the Michigan Department of Natural Resources, Air Quality Division as soon as this information becomes available. The production-level facility will be constructed after information concerning aspects of the plastic-injection molding process has been developed through activities at the prototype facility referenced above.

At this time, CMI-Norēn requests a waiver of approval of a Permit to Install to allow construction of the prototype facility pursuant to Michigan Air Quality Commission Rule 202. Approval of

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this waiver would allow CMI-Norēn to begin construction of the prototype facility and take advantage of an opportunity to produce a limited number of parts for use by a major automobile manufacturer in September of this year. CMI has developed and/or received the enclosed detailed information necessary to prepare the proposed prototype application during the last several weeks and has proceeded as soon as reasonably possible to make this application for the requested Permit to Install and waiver of Permit to Install approval. CMI is aware of no alternative facility that could perform the prototype work which it has contracted to perform using the proprietary processes described in the prototype application. Furthermore, the purpose of the prototype facility for which CMI-Norēn seeks this approval is to demonstrate CMI-Norēn's capability to produce the requested parts. If CMI is unable to begin construction of the proposed prototype facility in the spring of 1991, it will be unable to develop a facility in Michigan to take advantage of this opportunity to supply prototype parts and, thus, will present CMI-Norēn with a significant hardship.

CMI's prototype facility will produce only a small number of parts on an infrequent basis for use in prototype vehicles. Accordingly, emissions from the facility are expected to be insignificant. As well, development of the prototype facility will allow CMI-Norēn to prepare air emission data for consideration in the application for the CMI-Norēn production-level facility. These factors further support a decision to issue the requested waiver because the environmental impact of the prototype facility is expected to be minimal and emission information generated at the facility can be more readily used in evaluations of the production scale plant.

CMI-Norēn, Inc. hereby certifies that this letter and the attached permit applications contain confidential business information. Public disclosure of this information could adversely affect the competitive position of the Company. CMI-Norēn submits this information solely for the confidential use by the Michigan Department of Natural Resources and the Air Pollution Control Commission unless CMI-Norēn expressly agrees in writing to its disclosure, and with the understanding that it will be afforded all protection from public disclosure permitted by law.

CMI-Norēn, Inc. appreciates the consideration given by the Department to this request for waiver and for expedited review of the attached permit applications and would welcome the opportunity to meet with representatives of your staff to discuss the enclosed applications at your earliest convenience and/or to provide any additional information that would be helpful in your review. In the interim, if you have any questions concerning this letter or

CONFIDENTIAL

otherwise with respect to this matter, please do not hesitate to contact me.

Sincerely,

CMI-Norēn, Inc.

Terry Franklyn
Vice President Foundries

enclosures

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1. INTRODUCTION

CMI-Norĕn is considering the installation of a new polymer injection molding facility in the western Michigan area. To aid in the development of that facility, CMI-Norĕn is also intending to install a prototype polymer injection molding line in Fruitport, Michigan. At both the production and the prototype facilities, nylon plastic resin will be injected into molds using screw injection molding machines to produce parts of a specific dimension and design. Cavities within the parts will be formed through the use of low melting point metal cores.

The specific site for the production facility will be determined in the near future. In addition, specific exhaust stack information is presently unavailable for the production facility and will be provided at a later date as it becomes available.

RMT, Inc. (RMT), was retained by CMI-Norĕn to prepare an air permit application for its proposed new facilities.

The State of Michigan air use permit application forms for the two new facilities are contained in Appendix A.

This permit application is being submitted by:

CMI-Norĕn
14638 Apple Drive
Fruitport, MI 49415

Attn: Terry Franklin
Phone: 616-842-3500
Fax: 616-842-5872

Further information regarding this permit application package, if necessary, should be obtained by contacting:

CMI-Norĕn
14638 Apple Drive
Fruitport, MI 49415

Attn: Terry Franklin
Phone: 616-842-3500
Fax: 616-842-5872

OR

RMT, Inc.
744 Heartland Trail
P.O. Box 8923
Madison, WI 53708

Attn: Martin Stromberger
Phone: 608-831-4444
Fax: 608-831-3334

2. PERMIT APPLICATION SUMMARY

Production Facility

1. CMI-Norēn intends to install a production polymer injection molding facility consisting of six injection molding machines, 12 low melting point metal core forming machines, three metal core melt-out tanks, and ancillary equipment. The facility is to be located in the western Michigan area, at a specific site to be selected in the near future.

2. Certain equipment to be installed at the facility, including two 100 Hp boilers, a 40 Hp air compressor, and a 7½ Hp resin pellet transfer vacuum pump, appear to be exempt from air permitting requirements as indicated by Rules 282 and 285.

3. Limited information was available from contacts with raw material suppliers and the USEPA Control Technology Center, review of MSDSs, and a literature search, to generate quantitative process air emission estimates for the use of nylon, polypropylene, Electrolloy 281, and Activex 536 in the CMI-Norēn process. However, the information reviewed indicates that these process raw materials do not have a significant capability to generate air emissions, toxic or otherwise.

4. Based on emission information provided by Union Carbide, RMT estimated emissions due to the use of Carbowax in each of the three process melt-out tanks as follows:

Compound	Estimated Emission Rate (lb/hr
Methyl ethyl ketone	0.0035
Acetic acid	0.00018
Methyl formate	0.046
Dimethyl ether	0.010
Acetaldehyde	0.018
Methyl alcohol	0.00022
2-Butyl acetate	0.0048
Methyl acetate	0.012
Butyric acid	0.0038
T-Butyl alcohol	0.00049
Formic acid	0.033
Formaldehyde	0.004

Prototype Facility

5. CMI-Norēn intends to install a prototype injection molding facility at 14680 Apple Drive in Fruitport, Michigan. The prototype facility will consist of two injection molding machines, two low melting point metal core forming machines, one metal core melt-out tank, and ancillary equipment.

6. Certain equipment to be installed at the prototype facility, including one 100 Hp boiler, a 40 Hp air compressor, and a 7½ Hp resin pellet transfer vacuum pump, appear to be exempt from air permitting requirements as indicated by Rules 282 and 285.

7. Limited information was available from contacts with raw material suppliers and the USEPA Control Technology Center, review of MSDSs, and a literature search, to generate quantitative process air emission estimates for the use of nylon, polypropylene, Electrolloy 281, and Activex 536 in the CMI-Norēn prototype process. However, the information reviewed indicates that these process raw materials do not have the capability to generate significant air emissions, toxic or otherwise.

8. Based on emissions information provided by Union Carbide, RMT estimated emissions due to the use of Carbowax in the prototype melt-out tank. These emission estimates are identical to these presented in #4 above, except that only one melt-out tank will be used in the prototype facility.

9. Based on the emission data presented above, and the melt-out tank exhaust stack parameters, RMT estimated off-site ambient concentrations from the prototype facility, using a screening dispersion model. The modeling results, which are presented in Subsection 4.3.2 of this application package, indicate that maximum off-site ambient concentrations will be within the Acceptable Ambient Concentrations specified by the Michigan Air Toxics Regulations.

contain the heated Carbowax. The emissions from the prototype melt-out tank will be essentially the same as those presented in Table 3-1 for the production facility, except that only one melt-out tank will be used. Detailed emission calculations are presented in Appendix E.

4.3.3 Estimated Ambient Concentrations

Since exhaust stack parameters were available for the melt-out tanks at the prototype facility, RMT performed a screening modeling analysis (Using the USEPA SCREEN Model) to estimate off-site ambient concentrations due to the operation of the prototype facility. The Carbowax melt-out tank exhaust stack parameters used in the modeling analysis are presented in Table 4-1. The estimated ambient concentrations as a result of those exhaust parameters and the Table 3-1 emission estimates are presented in Table 4-2. Also presented in Table 4-2 are the Acceptable Ambient Concentrations (AACs) for the specific compounds evaluated as derived from Michigan Air Toxics regulations.

For all substances, predicted impacts from the SCREEN Model were compared to the short term AAC. For acetaldehyde and formaldehyde the predicted impacts from the SCREEN analysis were divided by 75 to compare with annual AACs for these substances. The 75 factor was obtained from the Michigan DNR screening table for hazardous air substances. As can be observed from Table 4-2, the estimated ambient concentration of each of the compounds listed is less than the applicable AAC.

TABLE 4-1 MELT-OUT TANK STACK EXHAUST PARAMETERS	
Building Height	18 feet
Stack Height	30 feet
Stack Diameter	0.5 feet
Exhaust Flow Rate	62.5 ~~20~~ actual cubic feet per minute
Exhaust Velocity	320 feet per minute
Exhaust Temperature	150°F (estimate)
Minimum Distance to Property Line	45 feet

TABLE 4-2

ESTIMATED AMBIENT CONCENTRATIONS BASED UPON SCREEN ANALYSIS TO PROTOTYPE MELT-OUT TANK

Compound	Maximum Modeled 1-Hour Concentration ($\mu g/m^3$)	Acceptable Ambient Concentration ($\mu g/m^3$)
Methyl ethyl ketone	1.4	5,900
Acetic acid	0.07	250
Methyl formate	18.6	2,460
Dimethyl ether *	4.0	--[c] 6.2 ann.
Acetaldehyde	7.3 (.097)[a]	1,800 (0.4)[b]
Methyl alcohol	0.089	2,620
2-Butyl acetate	1.9	7,130
Methyl acetate	4.9	6,060
Butyric acid	1.5	--[c] 2.4 annual
T-Butyl alcohol	0.20	3,030
Formic acid	13.3	94
Formaldehyde	1.6 (.022)[a]	12 (.08)[b]

[a] Value in parentheses is predicted annual impact which is obtained by dividing the hourly impact by 75.

[b] Value in parentheses represents acceptable annual concentration.

[c] No acceptable ambient concentration was available for these compounds.

* Dimethyl ether

RAT LC50 = 308 gm/m³

∴ AAC = $\frac{308 \times 1000}{500 \times 100}$ = 6.2 mg/m³

APPENDIX C

MATERIAL SAFETY DATA SHEETS

Polymer [redacted]

ZYT007

DUPONT

MATERIAL SAFETY DATA SHEET

E. I. DU PONT DE NEMOURS & CO
POLYMER PRODUCTS DEPARTMENT
1007 MARKET STREET
WILMINGTON, DE 19898

TELEPHONE NUMBERS
MEDICAL EMERGENCY 800-441-3637
PRODUCT INFORMATION 800-441-7515
TRANSPORTATION EMERGENCY 800-441-9300

MATERIAL IDENTIFICATION

PRODUCT NAME	Zytel® Nylon Resins 70G30HSLR BK099, NC010; 70G33HRL NC010; 70G33HS1L BK031, BK031S, BKB031, BLB299, GNB239, GYB253, GYB255, GYB265, GYB330, NC010; 70G33L BK031, NC010; FE5329 NC010
CHEMICAL NAME	Polyhexamethylene adipamide - Nylon 66 - plus 33% short glass fibers.
CAS REGISTRY NUMBER	32131-17-2 for base polymer
TSCA INVENTORY STATUS	All reportable ingredients are listed in the TSCA Chemical Substance Inventory.
DOT HAZARD CLASS	Not regulated
SHIPPING NAME	NA
PREPARER	D. L. Liczwek **DATE** June 6, 1990

HAZARDOUS COMPONENTS

MATERIAL	Additives not hazardous by 29CFR1910.1200
CAS NO.	NA
CONCENTRATION %	NA
OSHA PEL	NA
OSHA STEL	NA
ACGIH TLV	NA
ACGIH STEL	NA
DUPONT AEL	NA

SUBSTANCES PRESENT AT A CONCENTRATION OF 0.1% OR MORE CLASSIFIED AS A CARCINOGEN BY IARC, NTP OR OSHA: None are known.

PHYSICAL/CHEMICAL DATA

APPEARANCE	Granules
ODOR	None
MELTING POINT	250 - 260°C
SOLUBILITY IN WATER	Insoluble
VOLATILE CONTENT	1 (water)
SPECIFIC GRAVITY	1.38

RECEIVED
OCT 1 1990
CIBA-GEIGY INC.

FIRE AND EXPLOSION HAZARD DATA

FLASH IGNITION TEMPERATURE 400°C **METHOD** ASTM D1929

UNUSUAL FIRE, EXPLOSION HAZARDS Large molten masses may ignite spontaneously in air. Water quenching of such masses is good practice.

HAZARDOUS COMBUSTION PRODUCTS Primarily ammonia and carbon monoxide; small amount of hydrogen cyanide, aldehydes.

SPECIAL FIRE FIGHTING INSTRUCTIONS No special instructions.

EXTINGUISHING MEDIA Water, carbon dioxide, foam, dry chemical.

HAZARDOUS REACTIVITY

STABILITY AT ROOM TEMPERATURE Stable.

MATERIALS TO AVOID Strong acids and oxidizing agents.

CONDITIONS TO AVOID Heating above 340°C.

HAZARDOUS DECOMPOSITION PRODUCTS Cyclopentanone and carbon monoxide.

POLYMERIZATION Will not occur.

HEALTH HAZARD DATA

Read Section 12, Safety, in "Zytel® Molding Guide" Bulletin E-97221, before using Zytel®. Face mask and protective clothes recommended for abnormal processing problems.

ACUTE OR IMMEDIATE EFFECTS: ROUTES OF ENTRY AND SYMPTOMS

INGESTION Not a probable route of exposure.

SKIN Molten polymer causes thermal burns.

EYE Mechanical irritation only.

INHALATION Granules not respirable.

EMERGENCY FIRST AID

- If exposed to fumes from overheating, move to fresh air. Consult a physician if symptoms persist.
- Wash skin with soap and plenty of water.
- Flush eyes with water. Consult a physician if symptoms persist.
- If molten polymer contacts skin, cool rapidly with cold water. Do not attempt to peel polymer from skin. Obtain medical attention for thermal burn.

CHRONIC EFFECTS None known.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE None known.

PROTECTION INFORMATION

EYE Safety glasses are recommended.

SKIN Protective gloves are required when handling hot polymer. Also long sleeve cotton shirt and long pants if handling molten polymer.

VENTILATION Local exhaust at processing equipment to keep particulate below 15 mg/m^3 (OSHA limit for nuisance dusts).

RESPIRATOR None under normal processing if ventilation is adequate.

DISPOSAL

SPILL, LEAK OR RELEASE Sweep up to prevent a slipping hazard.

WASTE DISPOSAL Landfill or incineration in compliance with federal, state, and local regulations. Incineration residue will contain glass fibers.

AQUATIC TOXICITY Toxicity is expected to be low based on insolubility of polymer in water.

STORAGE CONDITIONS Cool, dry place. Keep containers tightly closed to prevent moisture absorption and contamination.

The information in this Material Safety Data Sheet relates only to the specific material(s) designated herein and does not relate to use in combination with any other material or in any process.

NA = Not applicable
NE = Not established
AEL = Du Pont Company's Acceptable Exposure Limit
< = New or revised information in this section when " < " is in right margin

SECTION 313 SUPPLIER NOTIFICATION

This product contains no known toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 and of 40 CFR 372.

STATE RIGHT TO KNOW LAWS

No substances on the state hazardous substances list, for the states indicated below, are used in the manufacture of products on this Material Safety Data Sheet, with the exceptions indicated. While we do not specifically analyze these products, or the raw materials used in their manufacture, for substances on various state hazardous substances lists, to the best of our knowledge the products on this Material Safety Data Sheet contain no such substances except for those specifically listed below:

SUBSTANCES ON THE PENNSYLVANIA HAZARDOUS SUBSTANCES LIST PRESENT AT A CONCENTRATION OF 1% OR MORE: None known.

SUBSTANCES ON THE PENNSYLVANIA SPECIAL HAZARDOUS SUBSTANCES LIST PRESENT AT A CONCENTRATION OF 0.01% OR MORE: None known.

NONHAZARDOUS INGREDIENTS PRESENT AT A CONCENTRATION OF 3% OR MORE REQUIRED TO BE LISTED BY PENNSYLVANIA: Since this product contains no hazardous substances as defined by the Pennsylvania R-T-K Regulations, a MSDS is not required by law.

WARNING: SUBSTANCES KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER: None known.

WARNING: SUBSTANCES KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM: None known.

Atlan Plastics, Inc.
3116 Towerwood : Dallas, Texas 75234
Phone: (800) 442-9304/(800) 527-0445

Thermoplastic Raw Materials

MATERIAL SAFETY DATA SHEET

Product Information:

Product Name		CAS Registry No.
		N/A
Common Name	Polypropelene	Chemical Formula N/A

FIRE AND EXPLOSION DATA

Extinguishing Data
[x] Water-spray [x] Water-fog [x] Water-stream [x] CO_2 [x] Dry Chemical [x] Foam [x] Earth or sand

SpecialFire Fighting Procedures
[ ] Do not Enter Building [ ] Allow fire to burn [ ] Water may cause frothing [x] Use approved respirator

Unusual Fire and Explosion Hazards
[ ] Dust explosion hazard [ ] Sensitive to shock [ ] Contamination [ ] Temp. [ ] Other (specify)
NONE

REACTIVITY DATA

Stability
[x] Stable [ ] Unstable

Conditions contributing to instability
[x] Thermal decomp. [ ] Photo degrad. [ ] Poly-merization [ ] Con.

Incompatibility-Avoid contact with
[ ] Strong acids [ ] Strong alkalis [ ] Strong oxidizers [ ] Other (specify)
NONE

Hazardous Deomposition Products-Thermal and Other
C, CO, CO_2

Conditions to Avoid
[x] Heat [x] Open flames [ ] Sparks [ ] Ignition sources [ ] Other (specify)

SPILL OR LEAK

Steps to be taken if material is released or spilled
[ ] Flush with water [ ] Absorb with sand or inert material [ ] Neutralize [x] Sweep or scoop up and remove
[ ] Dispose of immediately [ ] Keep upwind evacuate enclosed spaces [ ] Prevent spread or spill [ ] Other (specify)

Waste Diposal Method-Consult federal, state, or local authoities for proper procedures. Controled burial or incinderate in accordance with local, state, and federal regulations

Continued on reverse side ➤

HEALTH HAZARD INFORMATION

Toxicity

This is a polymeric material. All constituents are encapsulated within the polymer system, and therefore, present no likelihood of exposure under normal conditions of processing and handling.

Effects of Exposure

Irritation ☐ Skin ☐ Severe ☐ Moderate ☒ None
ation ☐ Eye ☐ Severe ☐ Moderate ☐ Mild ☒ None (transient)

Corrosivity ☐ Skin ☐ 4 hrs. (DOT) ☐ 24 hrs. (CPSC) ☒ None
☐ Eye ☐ May cause blindness ☒ None

Sensitization
☐ Skin ☐ Respiratory ☐ Allergen
NONE

Inhalation effects
☐ Narcotic ☐ Cyanosis ☐ Asphyxiant
effect NONE

Lung Effects (specify):
NONE

Other (specify): ☐ Repeated contact skin defatter ☐ Other (specify):
NONE

Emergency First Aid

Ingestion
☐ Induce vomiting ☐ Do not induce vomiting ☐ Give plenty of water ☐ Get medical attention ☐ Other (specify):
NONE

Dermal
☒ Flush with soap and water ☐ Get medical attention ☐ Contaminated clothing-remove and launder ☐ Contaminated shoes-destroy ☐ Other (specify)

Eye Contact
☒ Flush with plenty of water for at least 15 minutes ☐ Get medical attention ☐ Other (specify):

Inhalation
☒ Remove to fresh air ☐ If not breathing give artificial respiration ☐ Give oxygen ☐ Get medical attention ☐ Other (specify):

Special Protection Information

Ventilation Reqirements-Always maintain exposure below permissible exposure limits.
☐ Consult an industrial hygienist or environmental health specialist ☒ Local exhaust ☒ Use with adequate ventilation
☐ Check for air contaminant and oxygen deficiency ☐ Other (specify):

Eye ☐ Face Shield
☒ Safety Glasses ☐ Goggles

Hand (glove type) ☐ Butyl Rubber ☐ Polyvinyl Alcohol ☐ Other (specify)
☐ Polyvinyl chloride ☐ Neoprene ☐ Natural rubber ☐ Polyethylene GLOVES FOR HOT POLYMER

Respirator type-Use only NIOSH/MESA approved equipment.
NONE

Other Protective Equipment
NONE

Precaution

Precautionary Labeling
NONE

Other Handling and Storage Conditions
AVOID CONTAMINATION. STORE IN COOL, DRY PLACE.

☒ New ☐ Revised Date MAY 1986

IMPORTANT! The information presented herein, while not guaranteed, was prepared by competent technical personnel and is true and accurate to the best of our knowledge. NO WARRANTY, OR GUARANTY, EXPRESS OR IMPLIED, IS MADE REGARDING PERFORMANCE, STABILITY OR OTHERWISE. This information is not intended to be all-inclusive as to the manner and conditions of use, handling and storage. Other factors may involve other or additional safety or performance considerations. While our technical personnel will be happy to respond to questions regarding safe handling and use procedures, safe handling and use remains the responsibility of the customer. No suggestions for use are intended as, and nothing herein shall be construed as, a recommendation to infringe any existing patents or to violate any Federal, State or local laws.

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY *(As Used on Label and List)*
Activex 536

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name
J. M. HUBER CORPORATION

Address *(Number, Street, City, State, and ZIP Code)*
CHEMICALS DIVISION
907 Revolution Street
Havre de Grace, MD 21078

Emergency Telephone Number
(301) 939-3500

Telephone Number for Information
(301) 939-3500

Date Prepared
May 21, 1990

Signature of Preparer *(optional)*

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% *(optional)*
	None Established			

Mixture of polycarbonic acids and inorganic carbonate compounds in a polymeric carrier.

The specific chemical identity is being withheld as a trade secret.

W Rose

Section III — Physical/Chemical Characteristics

Boiling Point	N/A	Specific Gravity (H_2O = 1)	1.02-1.06
Vapor Pressure (mm Hg.)	N/A	Melting Point	140°C
Vapor Density (AIR = 1)	N/A	Evaporation Rate (Butyl Acetate = 1)	N/A

Solubility in Water
Insoluble

Appearance and Odor
Solid, Granulate, No Odor

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL
N/A	N/A	N/A	N/A

Extinguishing Media
Water, Foam, CO2, Dry Powder, ABC

Special Fire Fighting Procedures
Self contained breathing apparatus should be worn.

Unusual Fire and Explosion Hazards
In case of fire, product will develop fumes dangerous to health.

Section V — Reactivity Data

Stability			Conditions to Avoid
	Unstable		
	Stable	X	Degrades at temperatures greater than 150°C

Incompatibility (*Materials to Avoid*)
Reacts with acids to liberate CO_2 gas.

Hazardous Decomposition or Byproducts

Hazardous Polymenzation			Conditions to Avoid
	May Occur		
	Will Not Occur	X	

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? Not Normal | Skin? No | Ingestion? Possible

Health Hazards (*Acute and Chronic*)

No health effect data is available

Carcinogenicity: NTP? No | IARC Monographs? No | OSHA Regulated? No

Signs and Symptoms of Exposure
None that are known

Medical Conditions
Generally Aggravated by Exposure

None that are known

Emergency and First Aid Procedures
Wash hands immediately after use with copious amounts of soap and water. In case of eye contact, rinse thoroughly with water.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled
Spilled product should be cleaned up by mechanical means and collected in sealed drums. Clean spill area with water.

Waste Disposal Method
Dispose according to Federal, State and Local disposal and discharge laws.

Precautions to Be Taken in Handling and Storing
Store in a dry environment. Storage vessels should be well grounded.

Other Precautions

Section VIII — Control Measures

Respiratory Protection (*Specify Type*)
Dust respirator as needed or appropriate

Ventilation		
	Local Exhaust: As Necessary	Special: N/A
	Mechanical (*General*): N/A	Other: N/A

Protective Gloves
Can be worn to reduce contact with skin

Eye Protection
Should be worn as with all chemicals

Other Protective Clothing or Equipment
None

Work/Hygienic Practices
Avoid ingestion and contact with eyes.

* U.S.G.P.O.: 1986-491-529/45775

UNION CARBIDE

EFFECTIVE DATE: October, 1985

DO NOT DUPLICATE THIS FORM. REQUEST ORIGINAL.

Union Carbide Corporation urges the customer receiving this Material Safety Data Sheet to study it carefully to become aware of hazards. If any of the product involved, in the interest of safety you should (1) notify your employees, agents, and contractors of the information on this sheet, (2) furnish a copy to each of your customers for the product, and (3) request your customers to inform their employees and customers as well.

I

PRODUCT NAME: CARBOWAX® POLYETHYLENE GLYCOL 600

CHEMICAL NAME: Polyethylene Glycols

CHEMICAL FAMILY: Oxyalkylene Polymer

FORMULA: $HO-(CH_2CH_2O)n-H$

MOLECULAR WEIGHT: 570 - 630

SYNONYMS: Polyoxyethylene 600

CAS # 25322-68-3 CAS NAME Poly(oxy-1,2-ethanediyl),α-hydro-ω-hydroxy

II

BOILING POINT, 760 mm Hg	>200°C (392°F) (Decomposes)	FREEZING POINT	(68 to 77°F) 20 to 25°C
SPECIFIC GRAVITY (H_2O = 1)	1.130 at 20/20°C	VAPOR PRESSURE at 20°C.	<0.01 mm Hg
VAPOR DENSITY (air = 1)	>1	SOLUBILITY IN WATER, % by wt. at 20°C	100
APPEARANCE AND ODOR	Liquid (slight haze); mild odor.	EVAPORATION RATE (Butyl Acetate = 1)	Nil

III

MATERIAL	%	TLV	HAZARD
Polyethylene glycol	100	None established	See Section V

IV

FLASH POINT	>350°F, Pensky-Martens closed cup ASTM D 93 475°F, Cleveland open cup ASTM D 92			
FLAMMABLE LIMITS IN AIR, % by volume	LOWER	1.1 (Est)	UPPER	6.9
EXTINGUISHING MEDIA	Apply alcohol-type or all-purpose-type foams by manufacturers' recommended techniques for large fires. Use CO_2 or dry chemical media for small fires.			
SPECIAL FIRE FIGHTING PROCEDURES	Do not direct a solid stream of water or foam into hot burning pools; this may cause frothing and increase fire intensity.			
UNUSUAL FIRE AND EXPLOSION HAZARDS	None			

V

[redacted]

None established by ACGIH or OSHA.

[redacted]

SWALLOWING	No evidence of adverse effects from available information.
SKIN ABSORPTION	No evidence of adverse effects from available information.
INHALATION	No evidence of adverse effects from available information.
SKIN CONTACT	No evidence of adverse effects from available information.
EYE CONTACT	No evidence of adverse effects from available information.

[redacted]

No evidence of adverse effects from available information.

[redacted]

Overexposure to vapors generated at high temperatures may result in eye and respiratory tract irritation and in the inhalation of harmful amounts of material.

[redacted]

SWALLOWING	No harmful effects expected.
SKIN	Wash with soap and water.
INHALATION	No emergency care anticipated.
EYES	Flush with water.

(continued)

NOTES TO PHYSICIAN

Toxicology studies have shown this material to be of very low acute toxicity and non-irritant. There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition.

STABILITY		CONDITIONS TO AVOID	None
UNSTABLE	STABLE		
--	X		
INCOMPATIBILITY (materials to avoid)		Normally unreactive; however, avoid strong bases at high temperatures, strong acids, strong oxidizing agents and materials reactive with hydroxyl compounds.	
HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS		Burning can produce carbon monoxide and/or carbon dioxide.	
HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID	None
May Occur	Will Not Occur		
--	X		

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED	Small spills should be flushed with large quantities of water. Larger spills should be collected for disposal.
WASTE DISPOSAL METHOD	Incinerate in a furnace where permitted under appropriate Federal, State, and local regulations. Also, see Section IX.

(continued)

RESPIRATORY PROTECTION (specify type)	None expected to be needed.
VENTILATION	General (mechanical) room ventilation is expected to be satisfactory.

PROTECTIVE GLOVES	PVC - coated	EYE PROTECTION	Safety glasses
OTHER PROTECTIVE EQUIPMENT	Eye bath, safety shower		

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Normal precautions common to good manufacturing practice should be followed in handling and storage.

FOR INDUSTRY USE ONLY

OTHER PRECAUTIONS

DISPOSAL - Laboratory studies indicate that this material is biodegradable in a biological wastewater treatment system.

This product may contain trace amounts of ethylene oxide, a condition which creates the potential for accumulation of ethylene oxide in the head space of shipping and storage containers or in enclosed areas where the product is being handled or used. If the product is handled according to the recommendations in Section VI, VII, VIII and IX of this Material Safety Data Sheet, the presence of these trace amounts of ethylene oxide is not expected to result in any short or long term hazard. Ethylene oxide is considered by OSHA as a potential carcinogen for humans. UCC urges that users of this product confirm that their operating, storage and distribution facilities comply with the OSHA Standard (29 CFR 1910.1047). Personnel should be monitored for a sufficient period of time to determine if there is exposure to ethylene oxide above the permissible levels and, if necessary, precautionary and protective measures should be taken to keep ethylene oxide personnel exposure limits below the OSHA permissible level of 1 ppm TWA_8 and the action level of 0.5 ppm TWA_8.

The opinions expressed herein are those of qualified experts within Union Carbide Corporation. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and of these opinions and the conditions of use of the product are not within the control of Union Carbide Corporation, it is the user's obligation to determine the conditions of safe use of the product.

F-434437C - ICD
10/85 - 4M
PCC - 18227
Copyright© 1985 Union Carbide Corporation

Printed in U.S.A.

CLASSIFICATION	
WHMIS	Not controlled
SIMDUT	non contrôlé

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List)
ELECTROLLOY - 281

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name
Electrovert- Metal Dispensing Division

Address (Number, Street, City, State, and ZIP Code)
655 Main Street
E. Greenwich, RI 02818

Emergency Telephone Number
(401) 885-0300

Telephone Number for Information
(401) 885-0300

Date Prepared
October 1987

Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Bismuth (Bi) (CAS#7440-69-9)		None published		
Tin (Sn) (CAS#7440-31-5)		2mg/m^3		

Section III — Physical/Chemical Characteristics

Boiling Point	2000°F	Specific Gravity (H_2O = 1)	8.7
Vapor Pressure (mm Hg.)	N/A	Melting Point	281°F/139°C
Vapor Density (AIR = 1)	N/A	Evaporation Rate (Butyl Acetate = 1)	N/A

Solubility in Water
None

Appearance and Odor
Silver, gray metal, odorless.

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used) N/A	Flammable Limits N/A	LEL N/A	UEL N/A

Extinguishing Media
Alloy is non-flammable.

Special Fire Fighting Procedures
Do not use water near molten metal - danger of explosion.

Unusual Fire and Explosion Hazards
Use NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing if involved in fire. At very high temperatures, toxic metal oxide fumes may be evolved.

Section V — Reactivity Data

Stability			Conditions to Avoid
	Unstable		
	Stable	X	

Incompatibility (*Materials to Avoid*) Keep water and other volatile liquids away from molten metals.

Hazardous Decomposition or Byproducts N/A

Hazardous Polymerization			Conditions to Avoid
	May Occur		
	Will Not Occur	X	

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? Yes Skin? No Ingestion? Yes

Health Hazards (*Acute and Chronic*) See Attached Sheet

Carcinogenicity: None NTP? IARC Monographs? OSHA Regulated?

Signs and Symptoms of Exposure See Attached Sheet

Medical Conditions Generally Aggravated by Exposure No information available for alloy mixture.

Emergency and First Aid Procedures If molten metal contacts skin or eye, irrigate immediately with cold water, seek medical assistance.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled Normal solid clean up procedures.

Waste Disposal Method Dispose of in accordance with local, state or federal hazardous waste regulations. Waste may be saleable.

Precautions to Be Taken in Handling and Storing Be sure solid alloy is dry before adding to molten alloy.

Other Precautions Avoid making dust.

Keep away from children and their environment.

Section VIII — Control Measures

Respiratory Protection (*Specify Type*) None if alloy is used within 100°F of melting point.

Ventilation				
	Local Exhaust	None below 500°F	Special	None
	Mechanical (General)	Recommended	Other	None

Protective Gloves Heat Resistant Eye Protection Goggles

Other Protective Clothing or Equipment Long sleeved shirt or coat.

Work/Hygienic Practices Wash hands before eating or smoking. Do not smoke, eat or apply cosmetics in work area.

• U.S.G.P.O.: 1986-491-529/45775

APPENDIX D

EQUIPMENT BROCHURES

PARKER

INDUSTRIAL HIGH TEMPERATURE THERMAL LIQUID HEATER

Gas, Oil or Combination Gas/Oil Fired

Process Engineering & Equipment Co.

Pumps • Boilers • Mixers • Valves
Filters • Heat Exchangers • Pump Repair

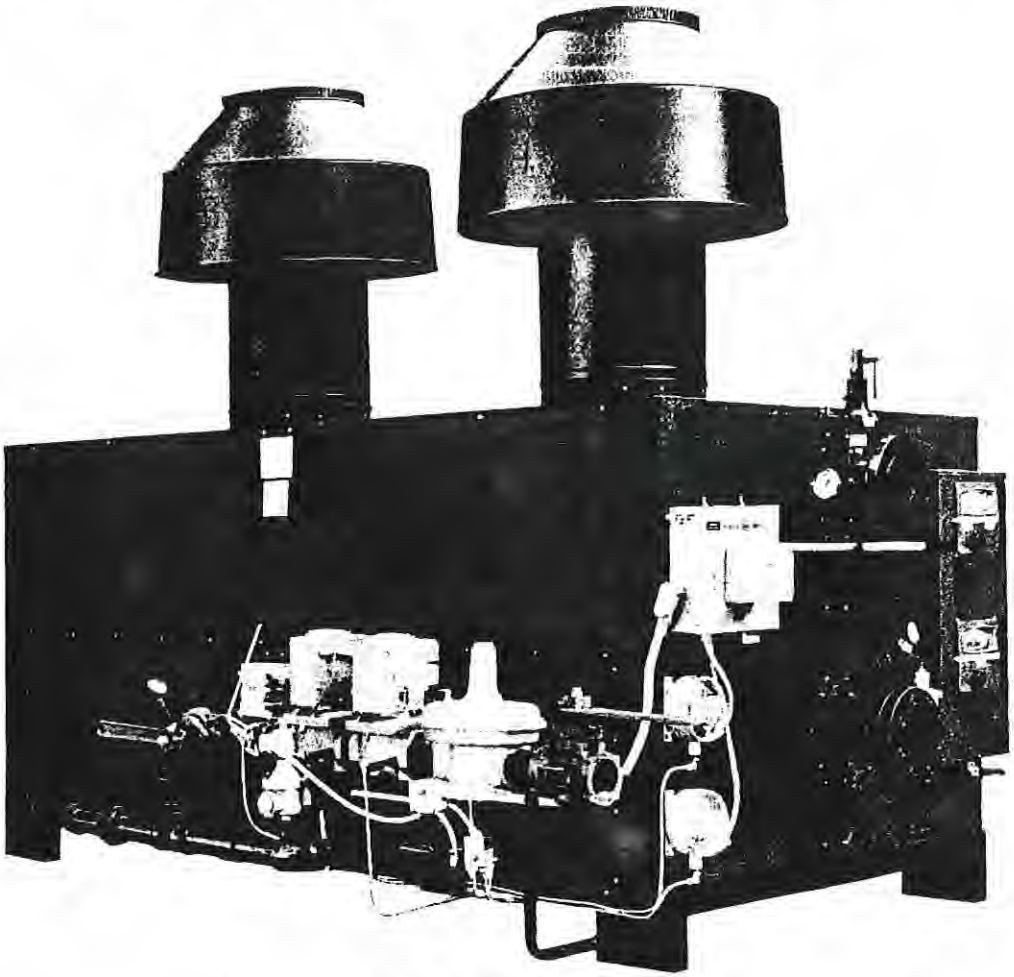
571 6 MILE RD. N.W. COMSTOCK PARK, MI 49321
P.O. BOX 2998, GRAND RAPIDS, MICHIGAN 49501

HOME OFFICE
(616) 784-7636
FAX (616) 784-5436

KALAMAZOO
(616) 324-4344
FAX (616) 324-4330

Process heating applications which require temperatures between 350° and 600° F can frequently be served more dependably, efficiently, uniformly and safely with a **Thermal Liquid System** than with steam, water, electric or direct fired systems.

Typical applications using Parker Thermal Liquid Heaters include: plastic manufacturing and molding; varnish, adhesive, paint and resin manufacturing; food processing; chemical processing; laminating presses; oil and asphalt heating, and many other specialized industrial heating processes.



GAS FIRED MODEL

A Thermal Liquid System consists of the heater, circulating pump and expansion tank with properly sized piping to the heat utilizers, such as jacketed kettles, presses, reactors, ovens, exchangers, etc.

Correctly engineered, a Thermal Liquid System is extremely trouble free. Operating pressures are very low permitting the use of standard pipe and fittings. The entire system can be open to atmosphere through the expansion tank. Thermal liquids specifically compounded for high temperature service are readily available.

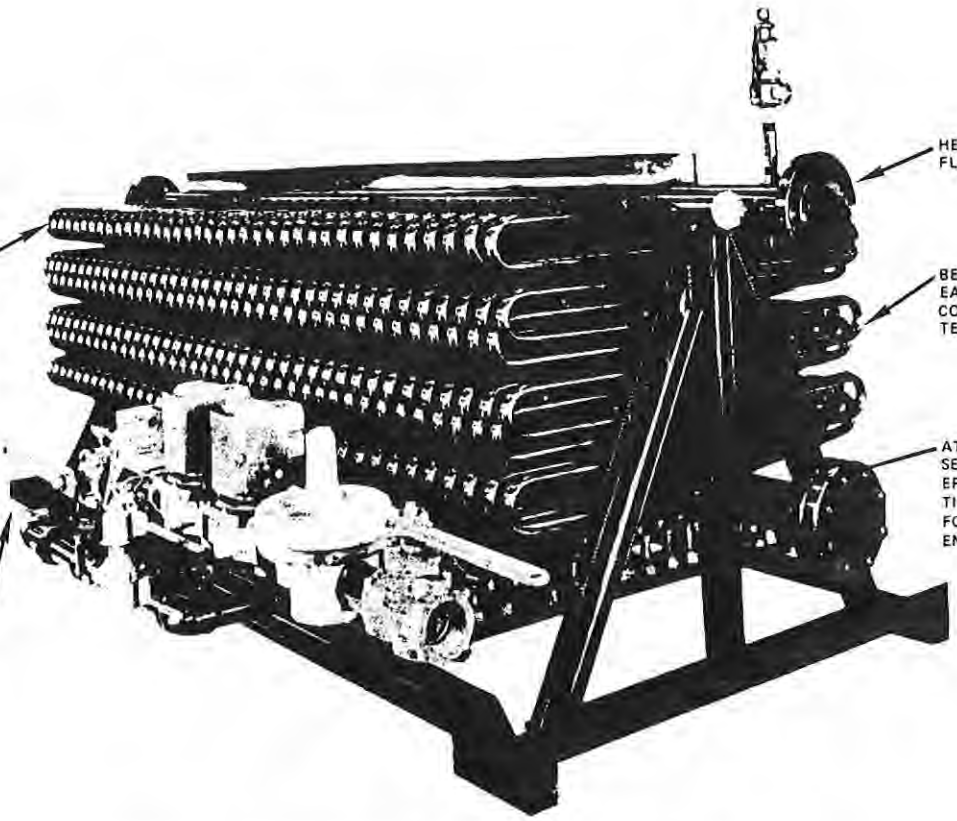
Constant research development and boiler engineering makes the Parker name synonymous with quality. Only through quantity production, utilizing the most modern tooling methods and plant facilities that also produce the nationally known Parker Industrial Steam and Hot Water Boiler, is it possible to manufacture and market at competitive prices a Thermal Liquid Heater that is so clearly superior.

Never a Compromise for Quality or Safety

Experience and Engineering Excellence

PARKER

PROVIDES MAXIMUM EFFICIENCY, DEPENDABILITY AND LONG LIFE



INTERNAL CONSTRUCTION OF A GAS FIRED MODEL

The Parker design incorporates every essential requirement a heater must have for the heating of thermal liquids.

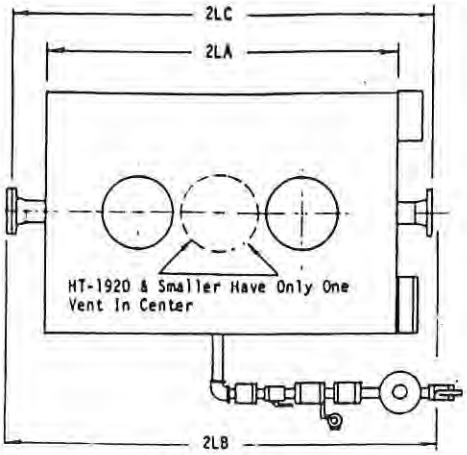
1. LARGE HEATING SURFACE: Heat transfer does not exceed 6100 BTU per square foot of heating surface. Low intensity heat transfer assures long tube life and maximum operating efficiency.
2. CONTROLLED FLOW: It is absolutely essential the thermal liquid is maintained at uniformly high velocity in every tube to prevent over heating. This is accomplished with baffles in the upper and lower headers directing the flow through a selected number of tubes in each pass.
3. WELDED CONSTRUCTION: Leakage of any kind cannot be tolerated in a thermal liquid heater. All tubes in the Parker are welded to the headers assuring the most positive leak tight joining of metals.
4. FLEXIBLE TUBE DESIGN: The bent tube design allows each tube to independently expand and contract with changes in temperature preventing concentrated metal strain whch could produce fractures. Each heavy steel tube is basically formed into a series of expansion loops.
5. DURABLE CABINET: Specifically designed and constructed for high temperature service using reinforced sheet steel effectively insulated to retain heat within the cabinet. The exterior is protected with a baked enamel finish.
6. CONTROLS: Only the best known and most reliable operating and safety controls are used, assuring dependable, safe operation. Several control systems are available to meet specific operating requirements including F.M. & I.R.I.

The purchase of a Parker Thermal Liquid Heater assures receiving not only the ultimate in quality but also a complete ready to install packaged unit, including trim with burner controls, electrically wired ready to connect to the utilities and service. Every heater is thoroughly factory fire tested and is required to meet the highest standards in all phases of mechanical and operating efficiency before shipment.

PARKER BOILER CO.
5959 BANDINI BLVD. · LOS ANGELES, CALIFORNIA 90040-2999

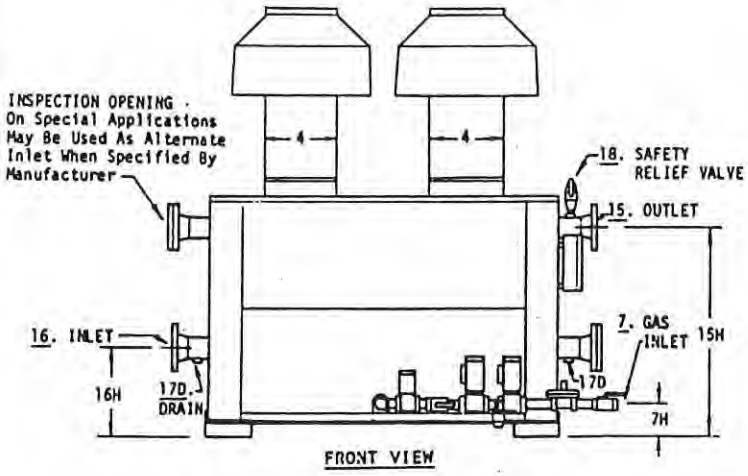
SPEC. SHEET D-207-I
APRIL 1985

PARKER INDUSTRIAL HIGH TEMPERATURE THERMAL LIQUID HEATER
HT-1296 TO HT-6250 - GAS FIRED

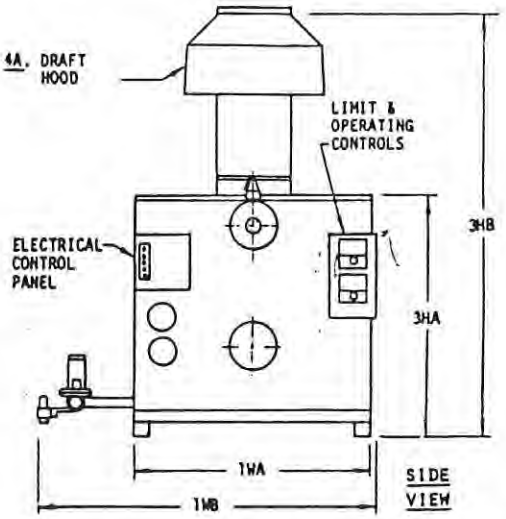


TOP VIEW

NOTE: LOCATION OF INLET DEPENDS ON NUMBER OF PASSES AS DETERMINED BY FACTORY.



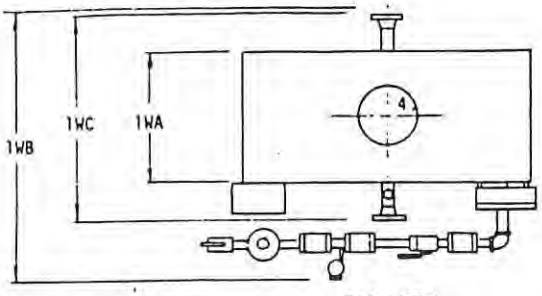
FRONT VIEW



SIDE VIEW

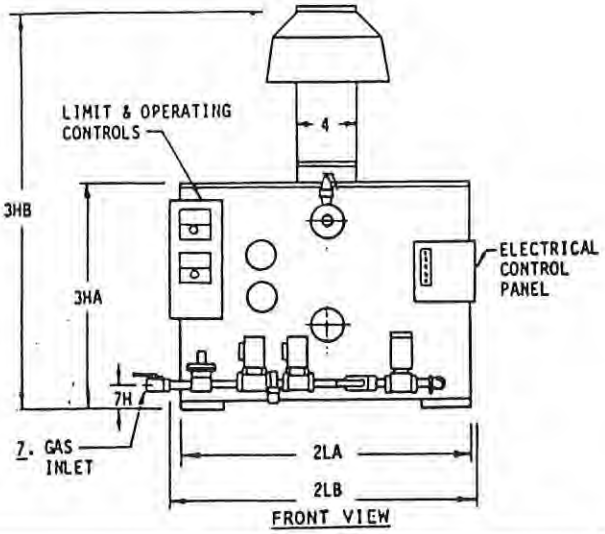
NO.	ITEM		HT-1296	HT-1536	HT-1920	HT-2304	HT-2640	HT-3120	HT-3456	HT-4032	HT-5000	HT-6250
A	B.T.U. INPUT	B.T.U. PER.HR.	1296 M	1536 M	1920 M	2304 M	2640 M	3120 M	3456 M	4032 M	5000 M	6250 M
B	B.T.U. OUTPUT	B.T.U. PER HR.	1037 M	1229 M	1536 M	1843 M	2112 M	2496 M	2765 M	3226 M	4000 M	5000 M
1WA	WIDTH-CABINET ONLY	IN.	36	42	42	42	52	58	58	58	58	58
1WB	WIDTH-OVERALL INCLUDING CONTROLS	IN.	59	65	65	67	77	84	84	84	84	84
2LA	LENGTH-CABINET ONLY	IN.	66	63	77	87	77	81	90	106	121	148
2LB	LENGTH OVERALL	IN.	85	82	96	107	97	101	110	127	142	175
2LC	MINIMUM HEADER LENGTH-LESS FITTINGS	IN.	81	78	92	103	93	97	106	123	138	171
3HA	HEIGHT-CABINET ONLY	IN.	52	52	52	52	52	56	56	56	56	56
3HB	HEIGHT OVERALL INCLUDING DRAFT HOOD(S)	IN.	92	94	95	92	92	98	98	98	100	103
4A	VENT STACK DIAMETER WITH DRAFT HOOD(S)	IN.	(1) 16	(1) 18	(1) 20	(2) 16	(2) 16	(2) 18	(2) 18	(2) 18	(2) 20	(2) 24
4B	VENT STACK DIAMETER WITH BAROMETRIC DAMPER	IN.	(1) 12	(1) 14	(1) 16	(1) 16	(1) 18	(1) 20	(1) 20	(1) 22	(1) 24	(1) 26
7A	STD. NAT. GAS INLET SIZE / MAN. PRESS. AT BURNER: 4"WC	IN.	1-1/2	2	2	2	2	2-1/2	2-1/2	3	3	3
	STD. NAT. GAS INLET SUPPLY PRESS: MAX: 14"WC; MIN: "WC		7	7	7	7	7	7	7	7	10	10
7B	HI PRESS. NAT. & LP GAS INLET SIZE / SUPP PRESS 1-10PSI	IN.	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2	2	2	2
	LPG MANIFOLD PRESS. AT BURNER: 18"WC											
7H	GAS INLET HEIGHT FROM FLOOR	IN.	7	7	7	7	7	19	19	19	19	19
14	HEATING SURFACE	SQ.FT.	193	220	285	337	364	440	493	573	668	840
15	OUTLET SIZE, 300 PSI W.N. FLANGE	IN.	3	3	3	4	4	4	4	4	4	4
15H	OUTLET HEIGHT FROM FLOOR	IN.	45	45	45	45	45	45	45	45	47	47
16	INLET SIZE, 300 PSI W.N. FLANGE	IN.	3	3	3	4	4	4	4	4	4	4
16H	INLET HEIGHT FROM FLOOR	IN.	19	19	19	19	19	19	19	19	21	21
17D	DRAIN SIZE	IN.	1	1	1	1	1	1	1	1	1	1
18	SAFETY RELIEF VALVE SIZE - 125 PSI	INLET IN.	1	1	1	1	1	1	1	1	1	1
	LIQUID CAPACITY	GAL.	27	34	43	49	53	67	75	90	110	135
	NET WEIGHT OF HEATER APPROXIMATE	LBS.	2710	2890	3400	3910	4350	4920	5500	7060	8030	9650
	CRATED SHIPPING WEIGHT OF HEATER APPROXIMATE	LBS.	2910	3140	3700	4260	4750	5345	6000	7635	8730	10,575

PARKER INDUSTRIAL HIGH TEMPERATURE THERMAL LIQUID HEATER
HT-126 TO HT-1008 - GAS FIRED

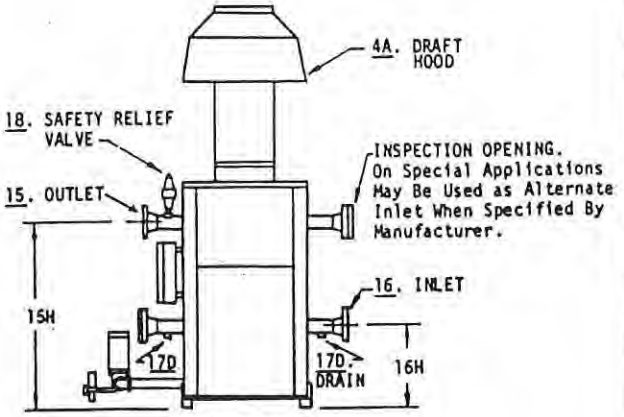


TOP VIEW

NOTE: LOCATION OF INLET DEPENDS ON NUMBER OF PASSES AS DETERMINED BY FACTORY.



FRONT VIEW



SIDE VIEW

NO.	ITEM		HT-126	HT-180	HT-247	HT-432	HT-528	HT-672	HT-864	HT-1008
A	B.T.U. INPUT	B.T.U. PER.HR.	126 M	180 M	247 M	432 M	528 M	672 M	864 M	1008 M
B	B.T.U. OUTPUT	B.T.U. PER HR.	101 M	144 M	198 M	346 M	422 M	538 M	691 M	806 M
1WA	WIDTH-CABINET ONLY	IN.	16	16	18	26	26	26	30	30
1WB	WIDTH-OVERALL INCLUDING CONTROLS	IN.	42	43	45	53	53	53	53	53
1WC	MINIMUM HEADER WIDTH - LESS FITTINGS	IN.	30	31	33	41	41	41	45	45
2LA	LENGTH-CABINET ONLY	IN.	28	32	40	39	44	58	53	58
2LB	LENGTH OVERALL	IN.	34	38	44	44	48	60	55	61
3HA	HEIGHT-CABINET ONLY	IN.	38	38	38	45	45	45	45	45
3HB	HEIGHT OVERALL INCLUDING DRAFT HOOD	IN.	66	66	68	77	77	79	81	81
4A	VENT STACK DIAMETER WITH DRAFT HOOD	IN.	6	6	8	10	10	12	14	14
4B	VENT STACK DIAMETER WITH BAROMETRIC DAMPER	IN.	5	5	6	8	8	10	10	12
7A	STD. NAT. GAS INLET SIZE / MAN. PRESS. AT BURNER: 4"WC	IN.	3/4	3/4	3/4	1	1	1	1-1/2	1-1/2
	STD. NAT. GAS INLET SUPPLY PRESS: MAX: 14"WC; MIN: 7"WC									
7B	HI PRESS. NAT. & LP GAS INLET SIZE / SUPPLY PRESS 1-10 PSI	IN.	1	1	1	1	1	1	1-1/2	1-1/2
	LPG MANIFOLD PRESS. AT BURNER: 18"WC									
7H	GAS INLET HEIGHT FROM FLOOR	IN.	6	6	6	5	5	5	5	5
14	HEATING SURFACE	SQ.FT.	21	27	40.5	67	77	106	120	133
15	OUTLET SIZE, 300 PSI W.N. FLANGE	IN.	1-1/4	1-1/4	1-1/2	1-1/2	2	2	2	2
15H	OUTLET HEIGHT FROM FLOOR	IN.	32	32	32	37	37	37	37	37
16	INLET SIZE, 300 PSI W.N. FLANGE	IN.	1-1/4	1-1/4	1-1/2	1-1/2	2	2	2	2
16H	INLET HEIGHT FROM FLOOR	IN.	15	15	15	17	17	17	17	17
17D	DRAIN SIZE	IN.	3/4	3/4	1	1	1	1	1	1
18	SAFETY RELIEF VALVE SIZE - 125 PSI	INLET-IN.	1/2	1/2	1/2	1/2	1/2	1	1	1
	LIQUID CAPACITY	GAL.	2.6	3.3	5.0	8.3	9.5	13	16	18
	NET WEIGHT OF HEATER - APPROXIMATE	LBS.	380	490	550	850	1040	1350	1540	1700
	CRATED SHIPPING WEIGHT OF HEATER - APPROXIMATE	LBS.	460	580	650	975	1180	1500	1695	1860

Intec
Sales Company, Inc.
Robert A. Gray

November 20, 1990

Mr. Buzz Larsen
C. M. I. NOREN
14638 Apple Drive
Fruitport, MI 49415
(616) 842-3500

INTEC SALES COMPANY, INC.
Equipment Quotation

2	Indoor storage silos, 40,000# capacity	[redacted]
1	Installation of silos	[redacted]
2	Conair 5000 lb. capacity Insulated Drying Hopper, including: --clean-out door --sight glasses --drain port --slide gate shut-off --blank adapter plate --lid with provisions for a Conair loader. As described in enclosed Bulletin FDB-9. Price Each: [redacted]	[redacted]

(616) 392-5253 P.O. Box 2295 Holland, Michigan 49422-2295 FAX (616) 392-5638

2 Conair CD600-A Compu-Dry Dehumidifying Dryer, including:
--microprocessor control
--user friendly programmable microprocessor
--utilizes a 8051 series microprocessor chip
--built-in "Hardware Watchdog Timer" shuts down dryer to prevent overheating in the rare event of a microprocessor failure
--non-volatile memory - zero power RAM
--independent heater safety switches provide fail-safe protection against over-temperature condition
--process temperature readout
--regeneration temperature readout
--process high temperature lockout
--process low temperature lockout
--process temperature alarm band
--auto start-up timer
--diagnostics
--percent of heater on time monitor
--desiccant carousel indexing monitor alarm
--regeneration low temperature alarm
--temperature probe malfunction alarm (all probes)
--automatic cartridge regeneration
--tubular type heaters
--solid state temperature controllers
--dust-tight control enclosure with fused disconnect
--overload protection
--casters
--10' delivery and return hoses
Voltage: 240 or 480/3/60 (specify one).
As described in enclosed Bulletin FDB-3.
Price Each: [redacted]

2 Conair 7-1/2 hp Pump/Motor Assembly, including:
--positive displacement vacuum pump
--cartridge-type pump protection filter
--vacuum relief valve
--TEFC motor
--NEMA-1 pump control enclosure
--magnetic starter mounted on a pump base with a full enclosure belt guard
--muffler
--36" length of flex vacuum hose.
Voltage: TEFC motor - 240 or 480/3/60 (specify one);
NEMA-1 pump control - 115/1/60.
As described in enclosed Bulletin FLB-3.
Price Each: [redacted]

2 Conair Dust Collector for use with a 7-1/2 hp Pump/Motor, including:
--floor stand
--three-way valve assembly
--manual dump dust pan.
As described in the enclosed Bulletin FLB-3.
Price Each: [redacted]

10 Conair 15" diameter Selectronic 4 Single-Tube Vacuum Loader for use with a 7-1/2 hp Pump/Motor Assembly, and Selectronic 4 Control, including:
--screen filter
--three-way vacuum breaker valve
--automatic level control
--metallic weighted discharge
--flange-mounted microprocessor control with adjustable load timer
--sufficient tubing to accomplish a 12' vertical lift
--vertical or horizontal feed tube (specify one).
As described in enclosed Bulletin FLB-3.
Price Each: $1,315.00 [redacted]

Note: Vacuum/material conveying system does not include hardware.

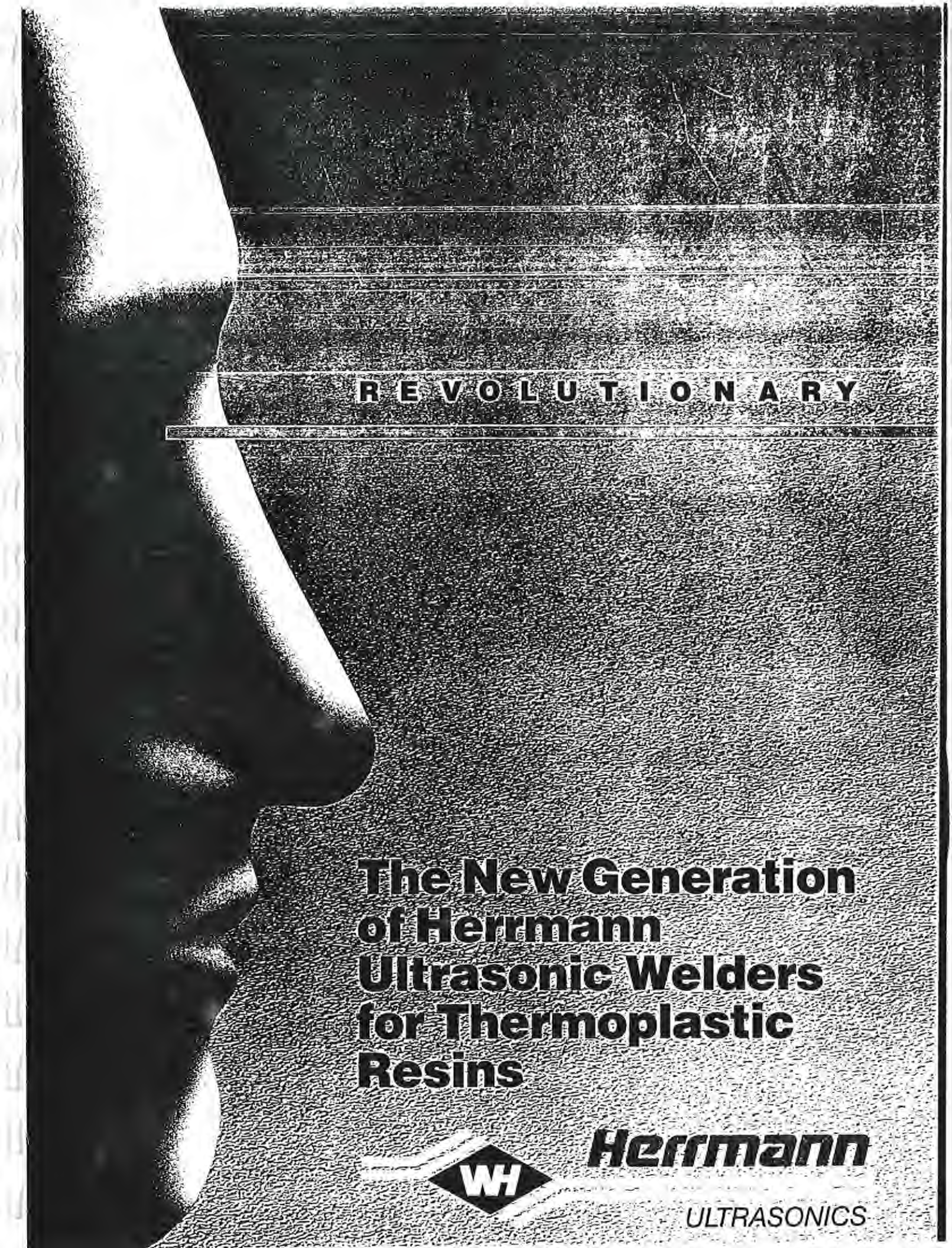
TERMS: If order is...

--more than $20,000 - 30% with order
70% Net 30 days

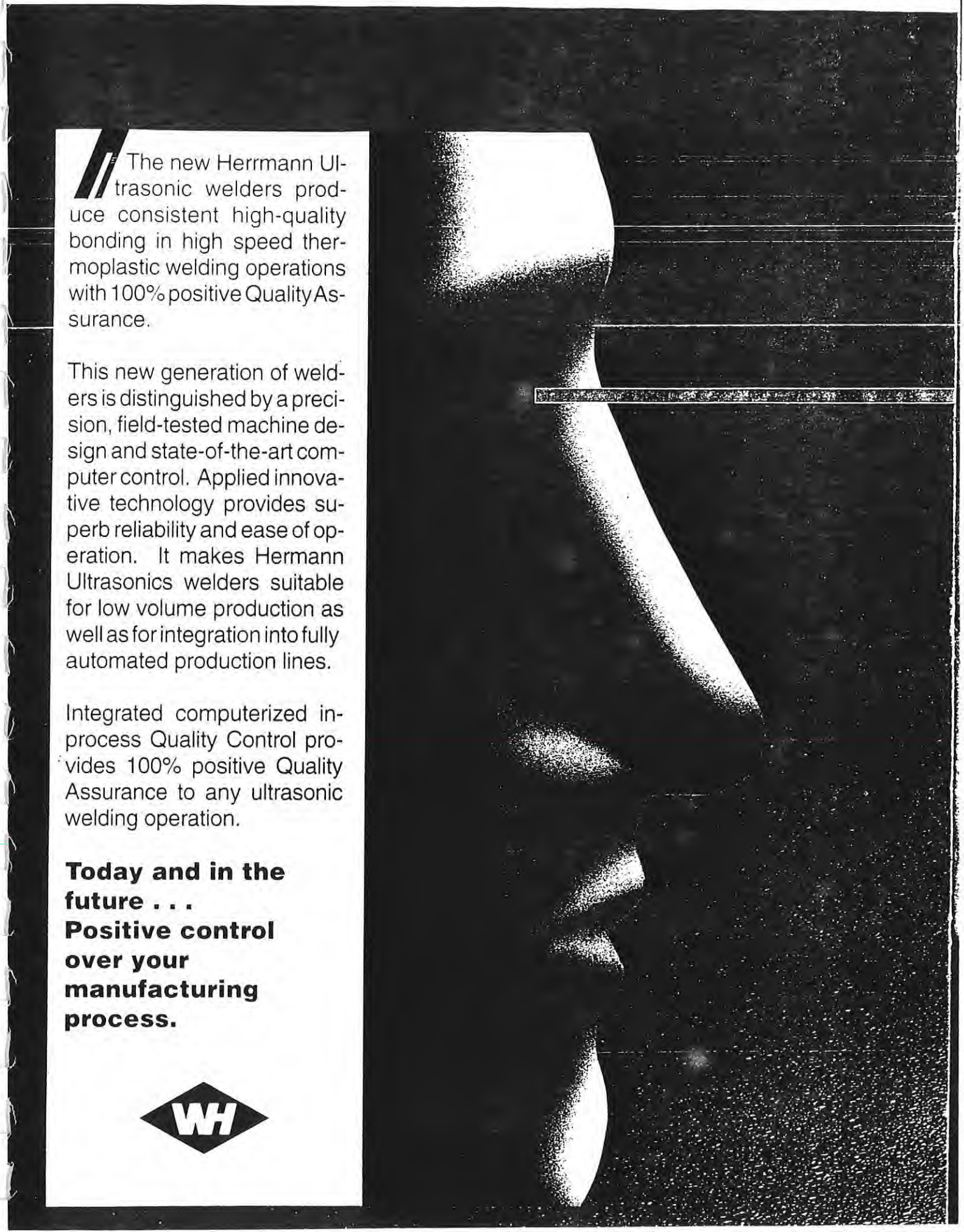
--over $100,000 - 30% with order
60% upon shipment
10% Net 30 days

NOTE: PLEASE CONTACT YOUR INTEC SALES REPRESENTATIVE FOR INFORMATION ON THE CONAIR LEASING PROGRAM.

This quotation remains valid for a period of 30 days.


REVOLUTIONARY
The New Generation of Herrmann Ultrasonic Welders for Thermoplastic Resins
Herrmann
ULTRASONICS

Innovative Technology of Herrmann



The new Herrmann Ultrasonic welders produce consistent high-quality bonding in high speed thermoplastic welding operations with 100% positive Quality Assurance.

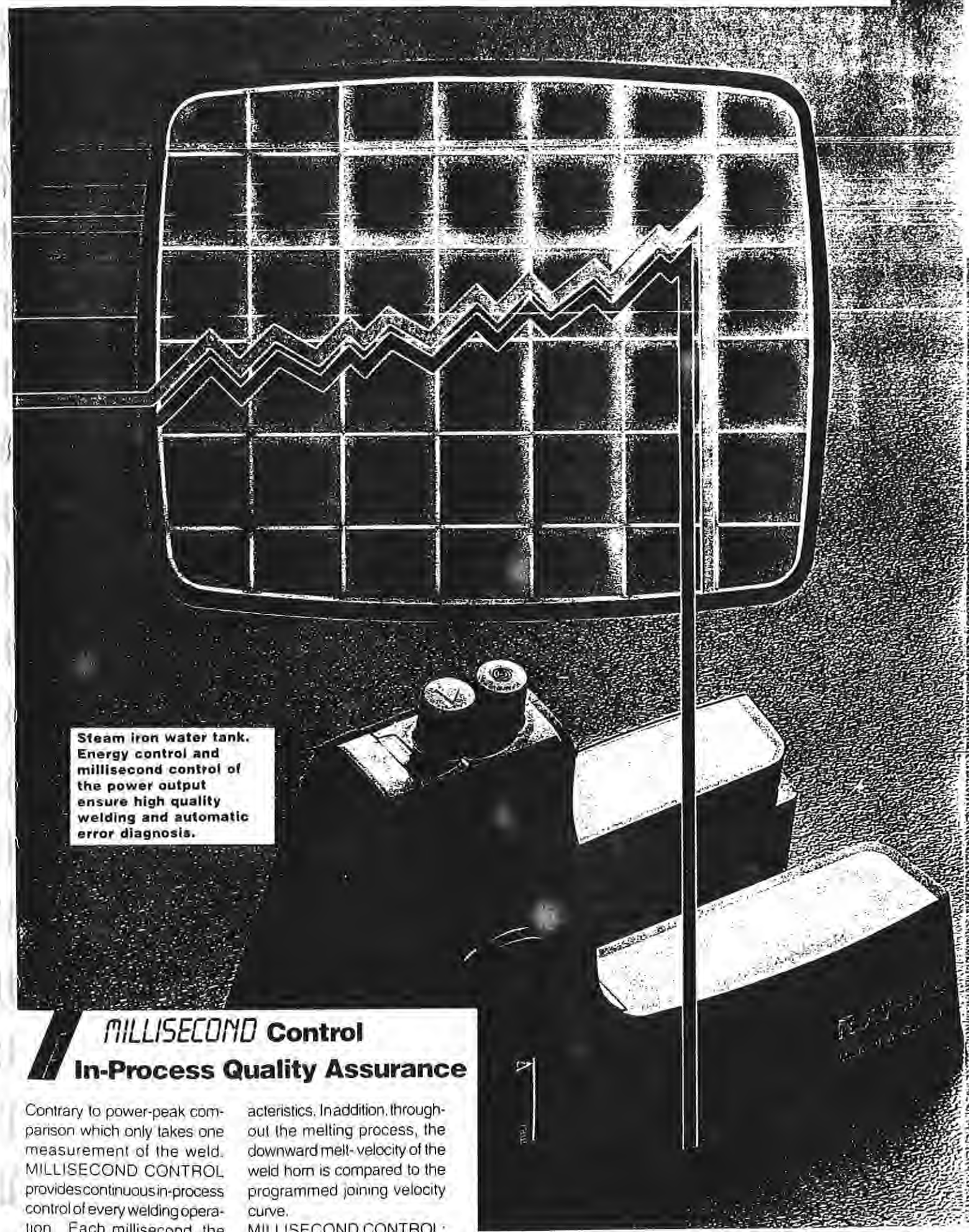
This new generation of welders is distinguished by a precision, field-tested machine design and state-of-the-art computer control. Applied innovative technology provides superb reliability and ease of operation. It makes Hermann Ultrasonics welders suitable for low volume production as well as for integration into fully automated production lines.

Integrated computerized in-process Quality Control provides 100% positive Quality Assurance to any ultrasonic welding operation.

Today and in the future . . . Positive control over your manufacturing process.

WH

Positive Quality Control



Steam iron water tank. Energy control and millisecond control of the power output ensure high quality welding and automatic error diagnosis.

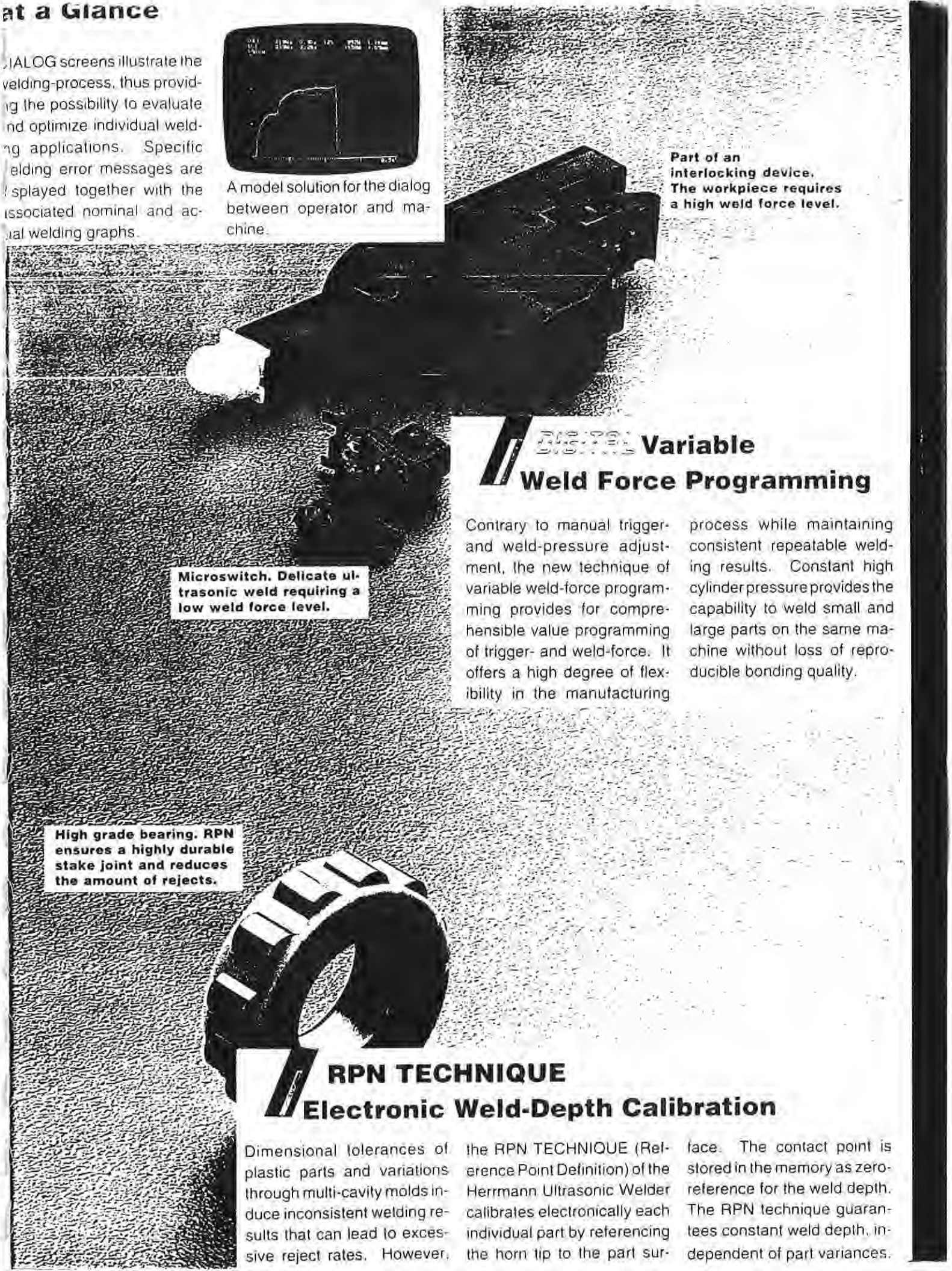
MILLISECOND Control
In-Process Quality Assurance

Contrary to power-peak comparison which only takes one measurement of the weld, MILLISECOND CONTROL provides continuous in-process control of every welding operation. Each millisecond, the acteristics. In addition, throughout the melting process, the downward melt-velocity of the weld horn is compared to the programmed joining velocity curve.

at a Glance

)IALOG screens illustrate the velding-process, thus provid-ıg the possibility to evaluate nd optimize individual weld-ıg applications. Specific elding error messages are ! splayed together with the ıssociated nominal and ac-ıal welding graphs.

A model solution for the dialog between operator and machine.



Part of an interlocking device. The workpiece requires a high weld force level.

Microswitch. Delicate ultrasonic weld requiring a low weld force level.

High grade bearing. RPN ensures a highly durable stake joint and reduces the amount of rejects.

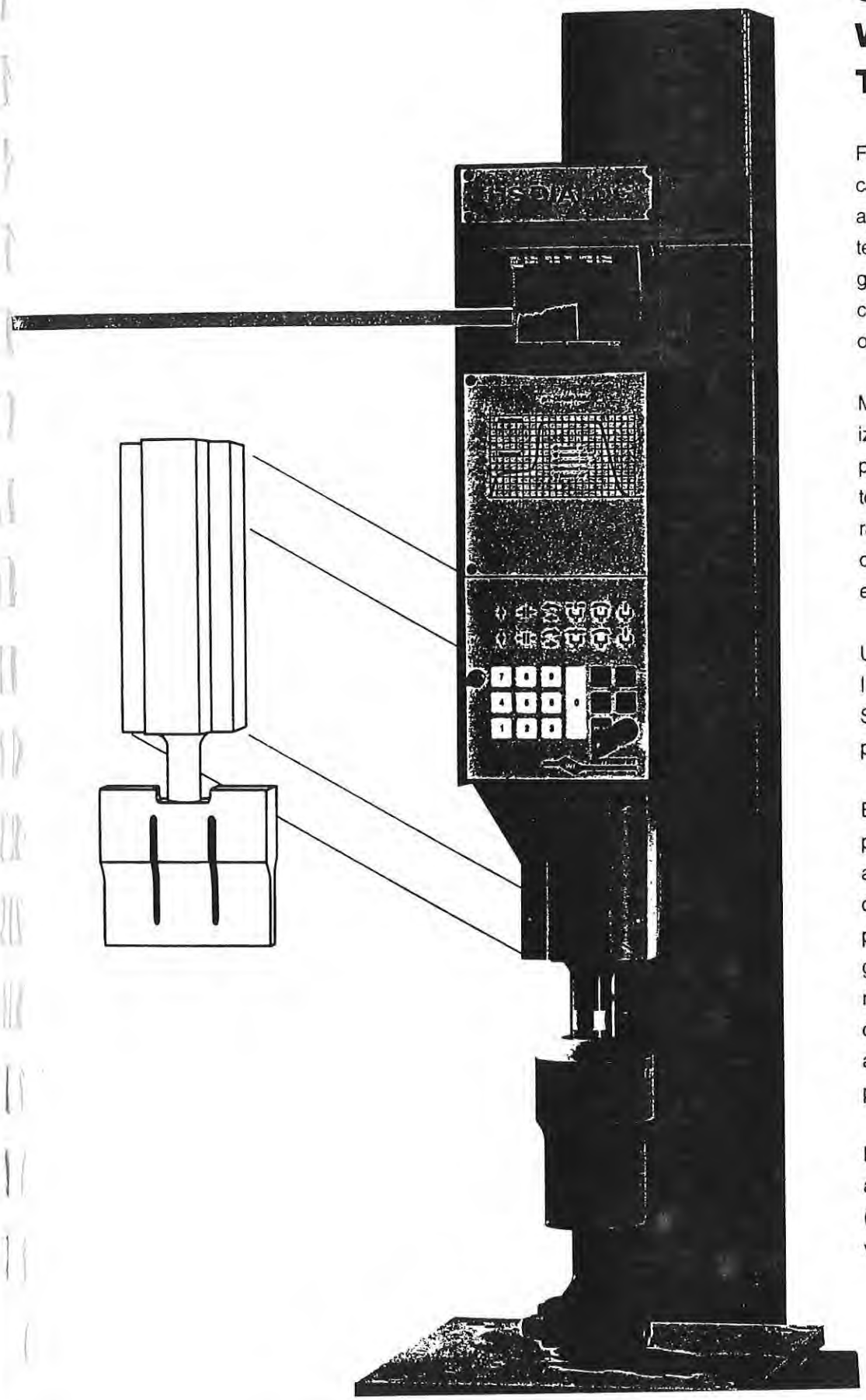
DIGITAL Variable Weld Force Programming

Contrary to manual trigger- and weld-pressure adjustment, the new technique of variable weld-force programming provides for comprehensible value programming of trigger- and weld-force. It offers a high degree of flexibility in the manufacturing process while maintaining consistent repeatable welding results. Constant high cylinder pressure provides the capability to weld small and large parts on the same machine without loss of reproducible bonding quality.

RPN TECHNIQUE Electronic Weld-Depth Calibration

Dimensional tolerances of plastic parts and variations through multi-cavity molds induce inconsistent welding results that can lead to excessive reject rates. However, the RPN TECHNIQUE (Reference Point Definition) of the Herrmann Ultrasonic Welder calibrates electronically each individual part by referencing the horn tip to the part surface. The contact point is stored in the memory as zero-reference for the weld depth. The RPN technique guarantees constant weld depth, independent of part variances.

Ultrasonic Welders



Herrmann Ultrasonic CNC Welders for Thermoplastics

Field-tested, torsion resistant cast-iron frame construction and applied state-of-the-art computer technology provide a high degree of operating reliability for cost-efficient ultrasonic welding of thermoplastics.

Modular design and standardized production of mechanic, pneumatic, and electronic systems (mounted in a 19" card rack) result in a leading technology level with excellent cost-benefit ratio.

Universal machine concept with Indexed Quick Changeover System provides fast and repeatable resonant unit change.

Easy Operator friendly controls provide weld-process graphs and alpha-numeric message displays on CRT screen. Simplistic menu-driven keypad program entry and complete memory resident welding programs, (including all welding parameters), assure fast and reproducible application changeover.

HS DIALOG (left photo) is also available with sound enclosure (ULTRASAFE DIALOG) and various automation features.

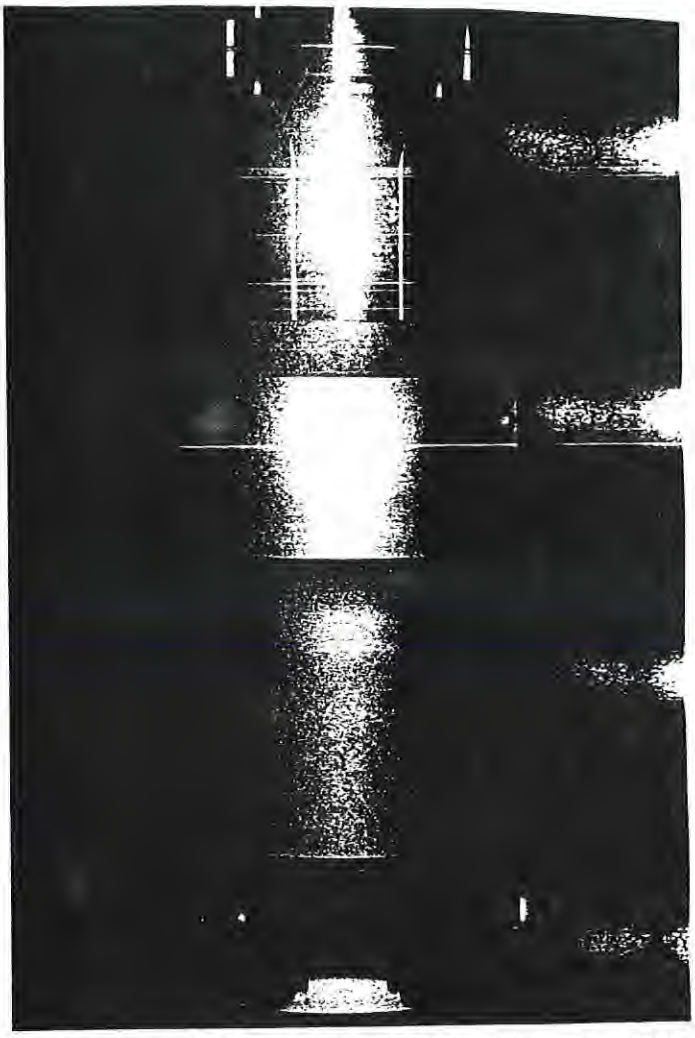
Reference Point Definition (RPN Technique)

Repeatability, high production output, and high quality welds can be achieved despite dimensional variations of the thermoplastic parts using Herrmann Ultrasonics RPN Technique.

Although the dimensional tolerances of thermoplastic parts have been reduced considerably in recent years by the manufacturers, dimensional variations, particularly with parts from multi-cavity molds, remain the major reject factor in thermoplastic welding operations.

Herrmann Ultrasonics RPN-Technique provides an innovative solution to weld thermoplastic parts with dimensional variations, assuring minimum rejects. The RPN technique calibrates electronically for dimensional variations of the product which prevents weld errors. The reference point is measured when the horn tip makes contact with the part and is stored as "zero-point" reference for the weld depth. This assures a precisely metered equal amount of melt for each welding joint.

For a comprehensive quality assurance, in the weld modes "TIME" and "ENERGY", the effective weld-depth is measured and evaluated for each completed weld.



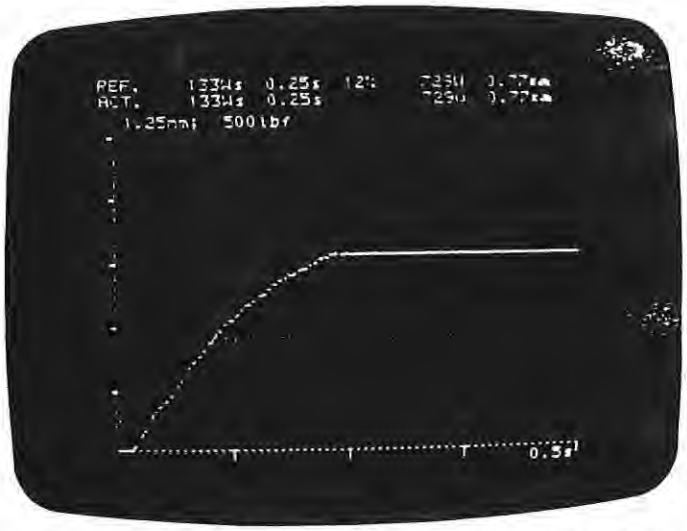
RPN reference point, established upon weld horn contact with the part and stored as "zero-point" reference for the effective weld depth.

Weld Depth + Programmed Joining Velocity = Quality

Next to the power distribution, the controlled and stable velocity during the melting process is the second vital characteristic of the welding operation. Together with the RPN Technique, controlled metering of the effective melting process (joining velocity) of each individual weld provides the foundation for positive Quality Control.

Visualizing the joining velocity curve through the DIALOG screen displays a true picture of the melting process and allows finite optimizing of the welding process. Deviations from the programmed joining velocity curve will be recorded and displayed together with a message identifying the weld-process error.

To provide high welding strength in all weld modes, the weld horn remains under force on the part after the weld depth is reached. The weld joint then cools down under pressure.

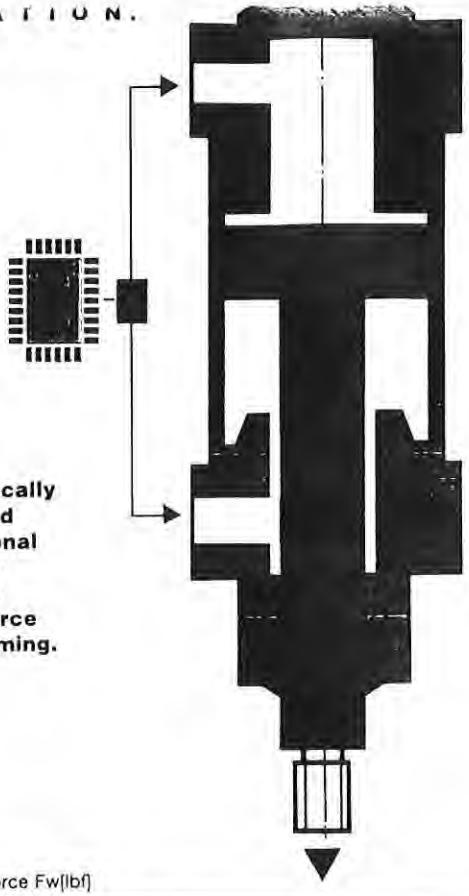


CRT display of the joining velocity curve provides a true picture of the melting process.

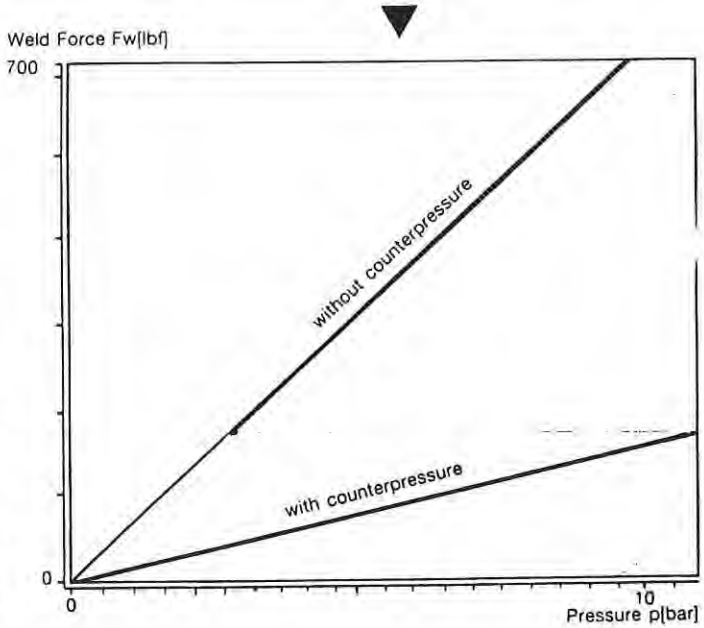
Variable Weld Force Programming

ntrary to manual weld-pressure adjustment, the new nique of variable weld-force programming provides for nprehensible value programming of weld- and trigger-e. Herrmann Ultrasonics applied technology allows a h degree of flexibility in the manufacturing process, while intaining consistent high quality bonding for a full spec-n of materials, sizes and shapes of parts.

ple menu-driven keyboard entry, together with linear d force adjustment, allow for the welding of various parts. example, large tail lights and delicate micro-switches be welded on the same machine. While conventional lders use manually adjustable pressure regulators, rrmann Ultrasonics computerized weld-force program-g utilizes an electronically controlled proportional valve. s provides automatic weld-force adjustment with con-nt cylinder pressure (always => 25psi) for precise and roducible weld and trigger force. Fast and simple ngeover make the welder especially suitable for the nufacturing of small batches. Labor extensive system difications (exchange of cylinder) and/or indefinable and -reproducible welding results are eliminated.



Electronically controlled proportional pressure valve for digital force programming.

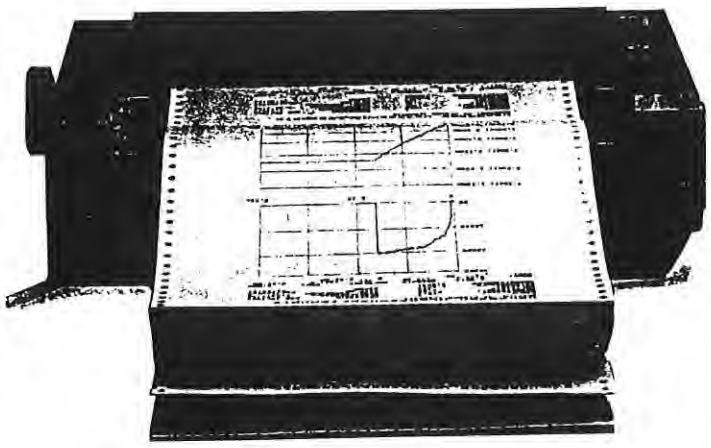


Linear weld-force adjustment up to 600 lbf, with automatic range changeover for repeatable welding of small and large parts on the same machine.

Added Information rough Process-Data Logging

ough RS232/v24 port, valuable machine and process a can be documented. The optional printer provides a le spectrum of printouts which include welding programs d related graphs, weld power curves, joining velocity ves, and various production protocols.

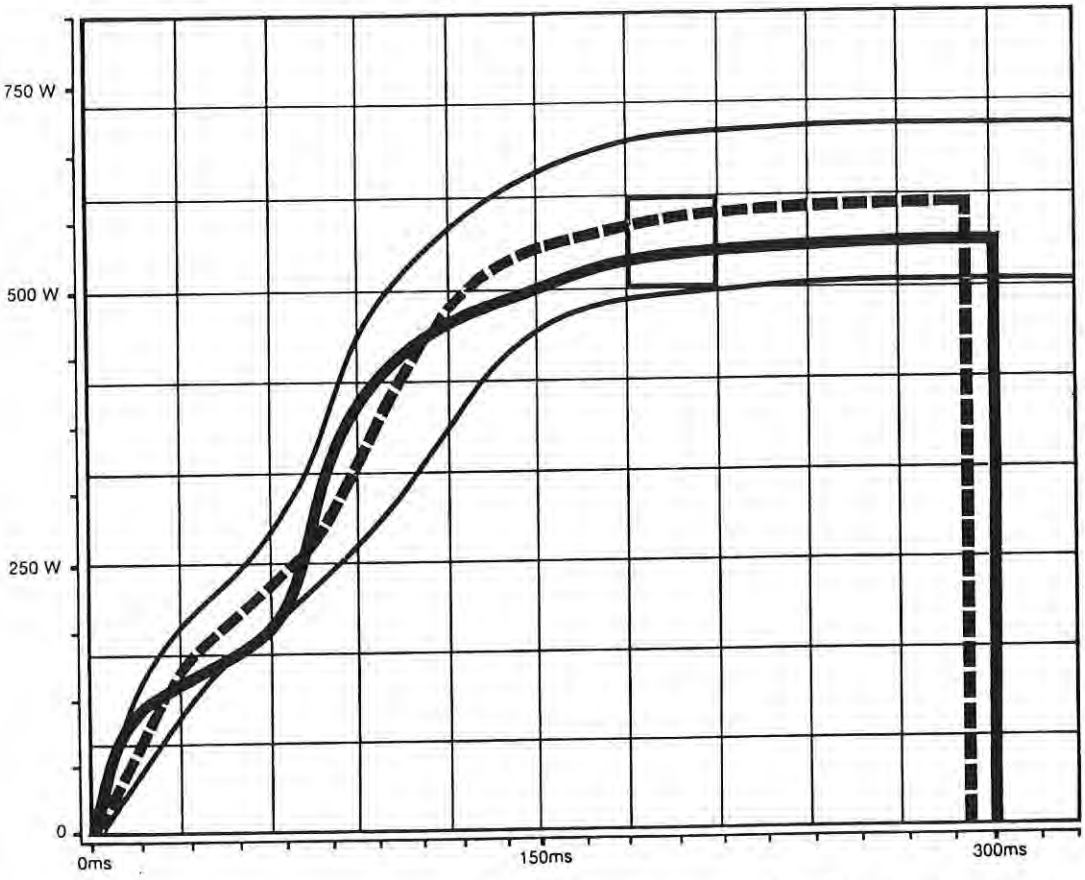
data logging feature supplies both technicians and nagement with comprehensive information on machine d production performance as well as data-processing tistics.



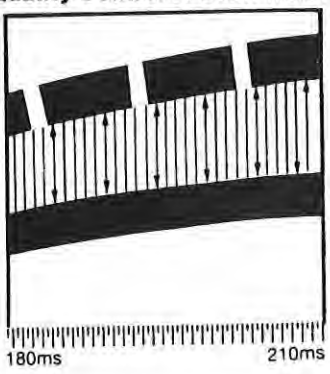
Competitive Advantages

Quality Assurance through Continuous In-Process Control

Herrmann Ultrasonics new generation of computer-controlled welding machines meet the demand of today's competitive industry for higher production rates and quality assurance while drastically reducing staffing levels.
Herrmann Ultrasonics DIALOG microcomputer control provides state-of-the-art in process measuring technique unmatched on today's market. Integrated real-time weld data processing allows for positive Quality Control of the individual weld.
Throughout each welding process, every millisecond, the computer compares the actual power distribution with the programmed power curve characteristics. The MILLISECOND CONTROL is represented by DIALOG screen graphs of the nominal and the actual power characteristics curves. MILLISECOND CONTROL, which takes one thousand measurements per second, provides true Quality Control, while peak-power comparison, with only one measurement of the weld, provides insufficient data to reflect the welding quality. During production, weld quality changes are automatically recognized and displayed with specific error messages. Therefore, corrective action can be taken before expensive down time occurs and/or inferior quality is produced.



Every millisecond, the computer compares the actual power distribution with the programmed reference curve. Millisecond Control provides comprehensive Quality Control of each weld.



Reference power graph for an optimal ultrasonic weld

Actual power graph of a production weld cycle

Permitted deviation from the programmed reference power graph (preselectable)

REVOLUTIONARY. THE NEW GENERATION.

Extended Flexibility. Ultrasonic Welders with DIALOG

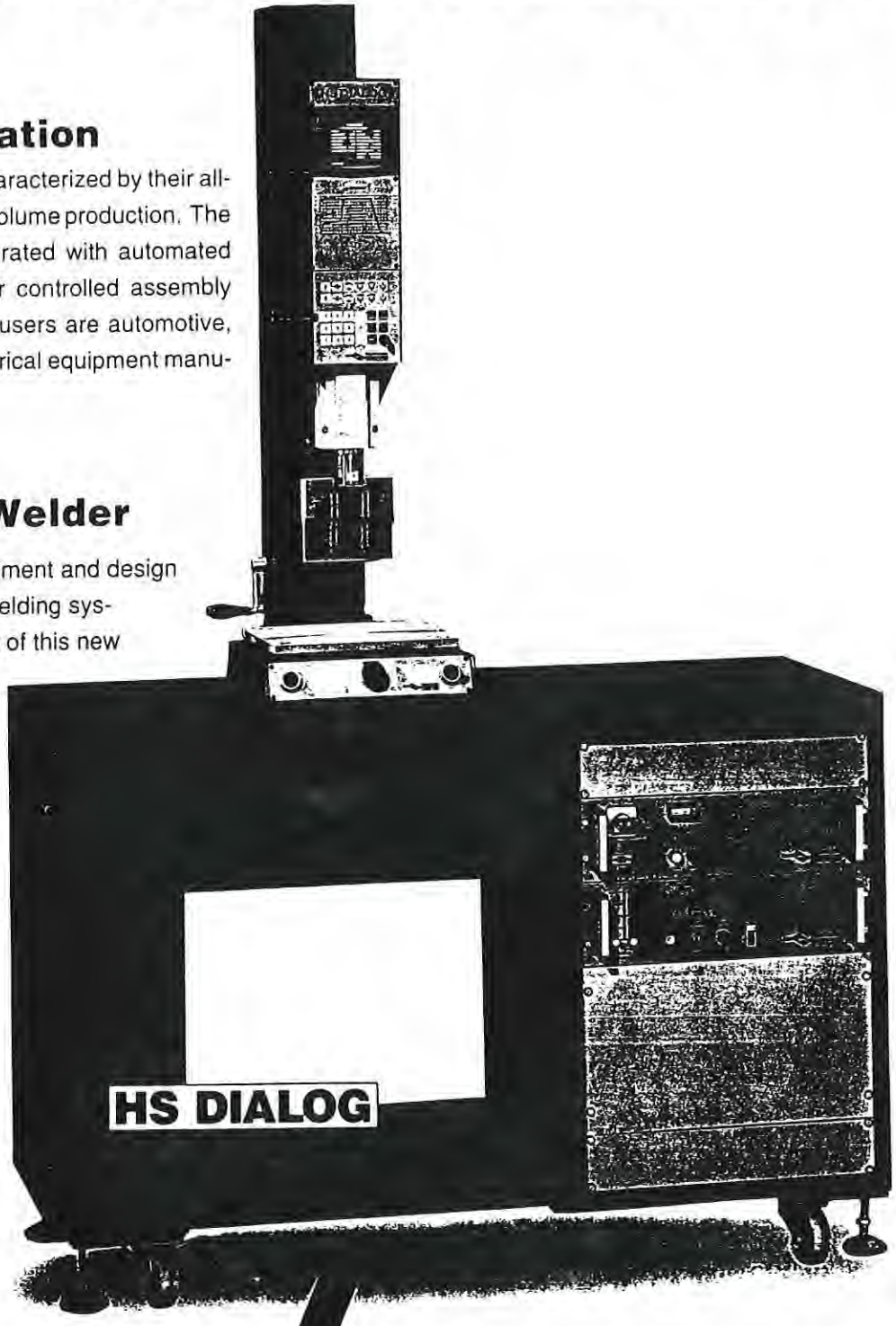
Areas of Application

Herrmann Ultrasonic Welders are characterized by their all-around applicability in small or large volume production. The welding system can be easily integrated with automated machines as well as fully computer controlled assembly lines. The most frequent industrial users are automotive, medical, household goods, and electrical equipment manufacturers.

Assets of the Welder

Extensive experience in the development and design of complex, specialized ultrasonic welding systems are integrated into the concept of this new generation of standardized ultrasonic welders. Some outstanding features of the machine are:

- Simple and operator friendly machine operation through CRT display and keyboard command entry. Menu-driven setup and graphic weld-performance display to optimize the weld application.
- Computerized integrated Quality Control for a minimum of rejects. 100% Quality Assurance of each welded part.
- Extensive machine status information displayed on the monitor for ease of operation.
- 19" rack modular design ensures ease of maintenance and adaptability to update for future innovations.
- Indexed Quick-Changeover System for precise application tool change in minutes without scrap parts.



High Performance Ultrasonic Generators

Ultrasonic Generators DYNAMIC with up to 3000W effective ultrasonic output power assures maximum productivity through an extensive application range. Applied innovative technology includes outstanding technical characteristics such as: constant amplitude, electronic softstart, high power reciprocation and automatic frequency adjustment. State-of-the-art modular design with reliable micro electronics in 19" rack and LED error diagnostics provide high performance and decisive service advantages.

Optimized Ultrasonic Resonance Units

At Herrmann Ultrasonics horn development laboratory, using an FEM computer, the weld horn is designed and optimized to conform to the parts to be welded. The vibratory attitude of the horn is made visual using the FEM (Finite Element) Method. The assembled resonant unit is optimized with specially developed test equipment. Converters and boosters are made exclusively of titanium. Weld horns are available in aluminum, titanium, and specially hardened alloys.

Screen

Machine Concept

6 CRT for weld graphs and fault error message display

Functional Membrane keyboard (prepared for optional equipment) with key selector switch for function lockout

Dynamic triggering through proportional pressure valve

Cast-iron machine column in torsion resistant frame construction. No deflection, therefore repeatable welding results

Cast-aluminum converter carriage Hardened and ground backlash-free linear slide

Indexed Quick Changeover Tool System, universal for 35 kHz and 20 kHz systems

Converter booster horn assembly made of titanium

Simple, precise height adjustment through manual crank handle.

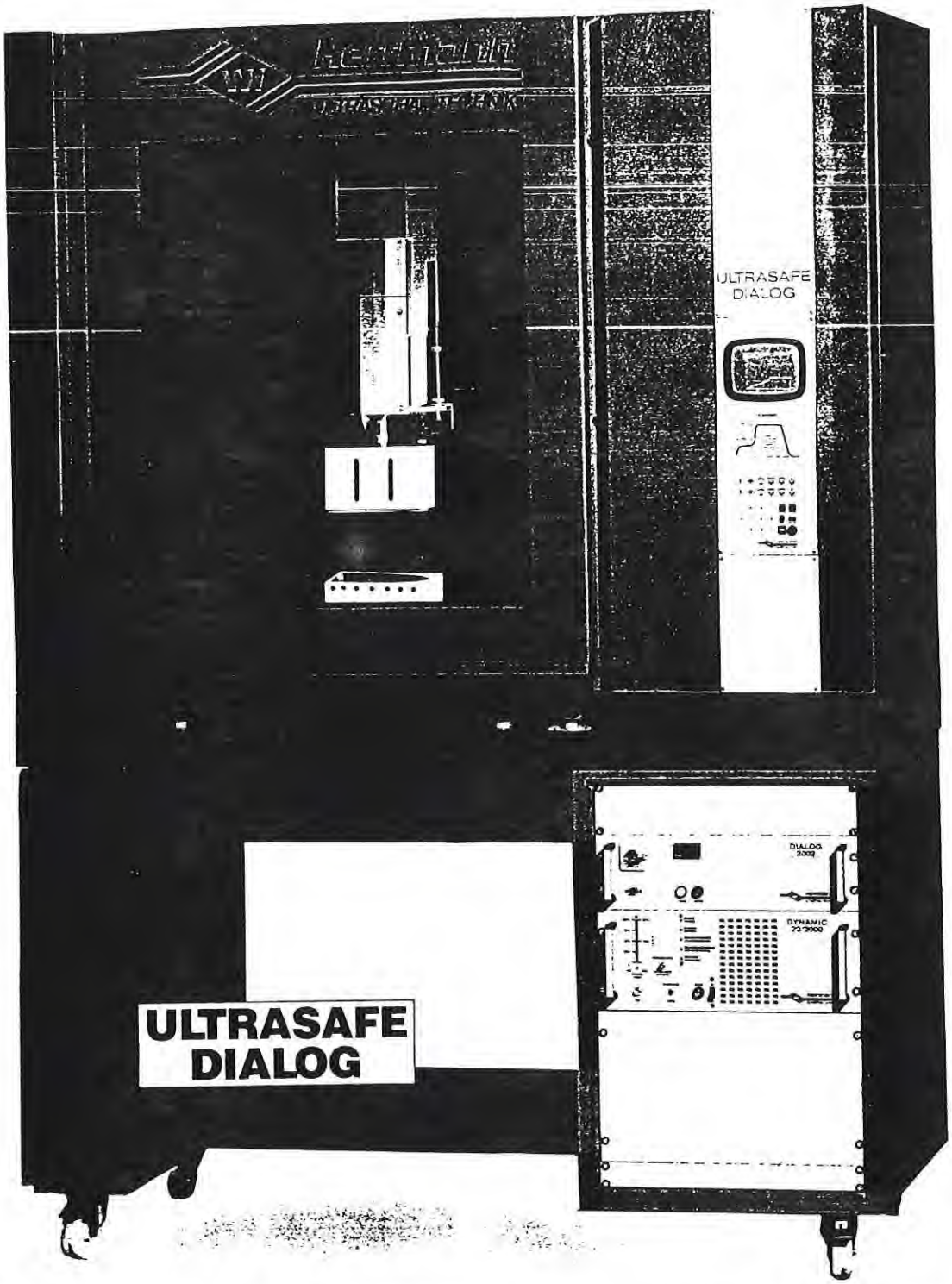
Ball-pivot supported fixturing plate for automatic centering of weld horn to plastic part.

Microcomputer control, type DIALOG 2002, in 19" slide rack.

Ultrasonic generator type DYNAMIC in 19" slide rack.

Illuminated enclosure for reduced sound level (less than 80 dB(A)).

Optional equipment:
Machine work-station table with 19" drawers and separate electrical enclosure (including height-adjustable foot rest, table height adjustment, and casters with locking devices).



Technical Specifications

		HS DIALOG				ULTRASAFE DIALOG	
		35/300	35 1000	20/2000	20/3000	20/2000	20/3000
Frequency	[kHz]	35			20		
Ultrasonic power	[W]	300	1000	2000	3000	2000	3000
Supply voltage	[V/Hz]			Europe:220/50	USA: 240/60		
Control voltage	[V]			24			
Height adjustment	[mm]			480			
Horn stroke	[mm]			100			
Working area	[mm]			300x300			
Machine dimensions	[mm]		560x350x1130			1600x760x2225	
Machine range	[mm]			245			
Color spec.				BLUE DARK BLUE			
Weight	[kg]		130 (295 lbs.)			480 (990 lbs.)	

Special Options

Increased Cycle Rate with Rotary Index Tables

Ideal for use in a high-production environment. Operational safety, extended reliability, and high precision are incorporated into the table design. A three-phase brake motor with spur-gear drive and pre-loaded cam rollers provide controlled and backlash-free transition from stationary to motion and reversed. Solid anvils are incorporated to support the heavy duty cast aluminum table (24" or 32" dia.) in the welding position. Surface hardened fixtures are precisely located on the table for a minimum of positioning errors. The table speed is infinitely variable.

Increased Productivity with Indexable Linear Shuttle

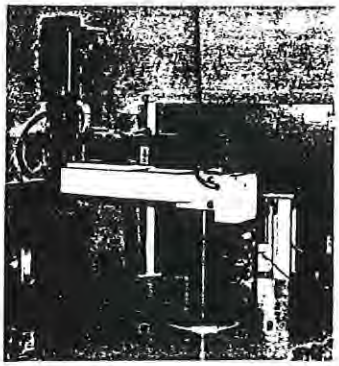
Particularly useful in handling large thermoplastic parts at a high production rate. The electro/pneumatically operated shuttle provides extended versatility through selective transverse or longitudinal motion.

Superior Staking and Swagging Capability with Hydraulic Joining Velocity Control

Stable hydraulic weld-horn immersion speed ensures reproducible welds with a minimum reject rate. Hydraulic joining velocity control provides decisive advantages over pneumatic control where pressure build-up and stick-slip may occur. Mechanical destruction through weight of the resonant unit on impact sensitive parts is eliminated. An indicator scale enables precise and reproducible joining-velocity settings.

High Volume Production with Automated Pick-and-Place System

Variable motion profiles and selectable automatic good/reject parts separation make the pick-and-place system adaptable to a wide spectrum of automatic handling applications. Together with Herrmann Ultrasonics DIALOG welders, it can easily be integrated into automated production lines.



Subject to technical changes

Herrmann Ultrasonics Inc.
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Schaumburg, IL 60193
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FAX: (708) 980-1470

Herrmann ULTRASONICS

APPENDIX E

MELT-OUT TANK EMISSION CALCULATIONS

COMPUTATION SHEET

RMT INC.

SHEET 1 OF 3

744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX. (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
CMI - Norēn				3/26/91	2197.01

Union Carbide Evaluation

Mass emission rate : 0.57 grams

Approximate generation period : 18 hours (1)

Approximate Carbowax surface area : 0.05 ft² (1)

Estimated total emission rate = 0.57 grams / 18 hours

= 0.0317 grams / hour

Extrapolation to CMI - Norēn Melt-Out Tanks

Proposed Melt-out tank surface area : 3' x 40' = 120 ft²

Estimated melt-out tank emission rate :

$$\frac{120\ ft^2}{0.05\ ft^2} \times 0.0317\ \frac{grams}{hr} = 76.1\ grams/hr$$

$$76.1\ grams/hr \times \frac{1\ lb}{453.6\ g} = 0.168\ lb/hr \sim 0.17\ lb/hr$$

(1) Tele-Con on March 12, 1991, between Diane Gillenwater & Union Carbide & Martin Stromberger & RMT.

RMT INC

744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
CMI - Norton	[illegible]	[illegible]	COW	3/26/91	2197.01

Estimated Specific Organic Compound Emission Rate for Each of 3 melt-out tanks:

Compound	Percent(1)	Estimated Emission Rate lb/hr x10⁻²	lb/yr (Ave)(2)	lb/yr (max)(3)	
Methyl Ethyl Ketone	2.09	0.35	21	31	–
Acetic Acid	0.11	0.018	1.1	1.6	–
Methyl Formate	27.69	4.6	280	410	–
Dimethyl Ether	6.20	1.0	63	92	–
Acetaldehyde	10.82	1.8	110	160	–
Methyl Alcohol	0.13	0.022	1.3	1.9	–
2-Butyl Acetate	2.85	0.48	29	42	–
Methyl Acetate	6.87	1.2	70	100	–
Butyric Acid	2.26	0.38	23	34	–
1-Butyl Alcohol	0.29	0.049	3.0	4.3	–
Formic Acid	19.55	3.3	200	290	–
Formaldehyde	2.35	0.40	24	35	–

(1) Percent by weight of emissions generated in Union Carbide Study. Estimated emissions were calculated by multiplying the estimated total organic compound emission rate (0.17 lb/hr) by these percentages.

(2) Based on operation of the melt-out tank 24 hours per day and 250 days per year.

(3) Based on operation of the melt-out tank 24 hours per day and 365 days per year.

COMPUTATION SHEET

RMT INC.

SHEET 3 OF 3

744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
CMI - Norew		3/26/81		3/26/81	2197.01

Due to the lack of information, it wasn't possible to adjust the Union Carbide emission data for the following parameters:

Parameter	Union Carbide Evaluation	CMI Process
Carbowax Temperature	159°F	~340°F
Atmospheric Pressure	459 mm Hg	760 mm Hg
Agitation	minimal	Introduction of parts into tanks

OXIDATIVE DEGRADATION OF POLYETHYLENE GLYCOL

Polyethers, such as the CARBOWAX® Polyethylene Glycols (PEGs), are thermally stable for limited periods of time in inert atmospheres to about 300°C. However, in the presence of oxygen (such as an air atmosphere) polyethers undergo an oxidative degradation process. A typical degradation mechanism is presented in Figure 1.

As with most organic compounds, the oxidative degradation of polyethylene glycols is complex. This complexity is most probably the result of the existence of several possible modes by which the free radicals derived from polyethylene oxide degrade to low molecular weight fragments. The nature of fragments formed depends on the structure of the intermediate radicals, the experimental conditions (such as temperature and pressure) and the presence of acids, bases or metals in the oxidized material.

There is no specific temperature required for this degradation to proceed. The rate of degradation can be expected to be quite slow at room temperature and increase exponentially as temperature is increased. The rate is also influenced by the amount of oxygen exposure and often catalyzed by metal contamination.

The beginning of degradation is evidenced by increased peroxide, acidity and/or carbonyl levels. After significant degradation, physical properties such as viscosity or melting range can change, often accompanied by a yellowing of the polyether.

Using a nitrogen atmosphere in an elevated temperature operation will dramatically reduce oxidative degradation. Even if this is not practical in the actual operation, often a nitrogen atmosphere can be utilized on lab scale to troubleshoot a suspected oxidation problem.

Commercially available antioxidants added to the PEGs in small quantities can significantly delay the onset of polyether degradation. The additive choice and concentration is dependent on the operation (such as the use temperature, food grade requirements, appearance requirements, etc.). For example, BHT or propyl gallate at 0.1 to 2% are effective low temperature food grade additives.

Antioxidant vendors such as Eastman Chemical Products, UOP Inc., and PMC Specialties Group Inc., can provide recommendations for specific applications.

CARBOWAX is a registered trademark of Union Carbide Chemicals & Plastics Technology Corporation, U.S.A.
UNION CARBIDE is a registered trademark of Union Carbide Corporation, U.S.A.

UNION CARBIDE CHEMICALS
AND PLASTICS COMPANY INC.
South Charleston Technical Center
3200/3300 Kanawha Turnpike
South Charleston, WV 25303

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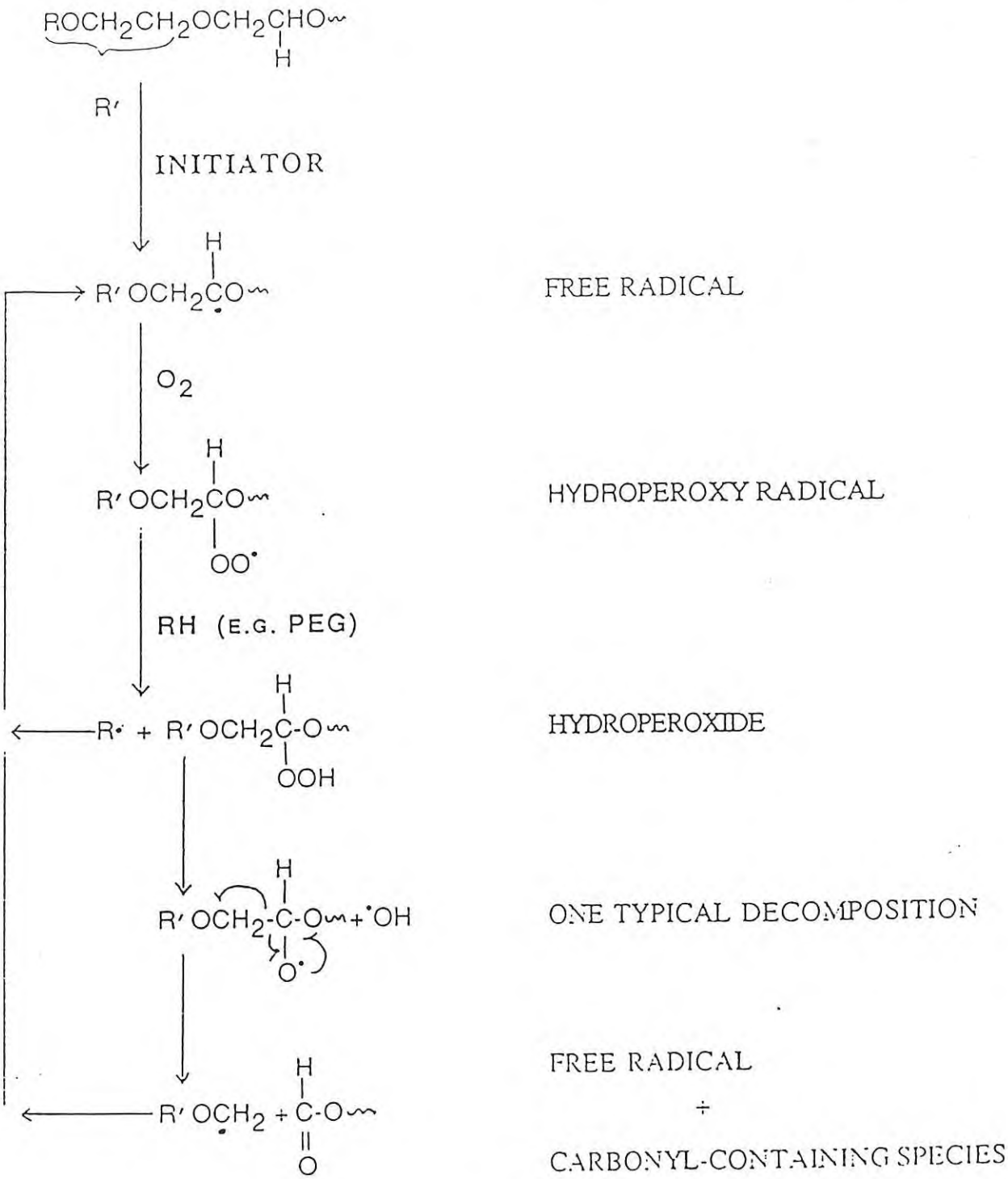
FIGURE 1

OXIDATIVE DEGRADATION PROCESS OF POLYETHYLENE GLYCOL



OXIDATIVE DEGRADATION OF "CARBOWAX"

OXIDATION PRODUCTS AS DETERMINED BY MASS SPECTRUM

Product	Per Cent by Weight	Mole Per Cent
Methyl ethyl ketone	2.09	1.01
Acetic acid	0.11	0.06
Methyl formate	27.69	16.11
Dimethyl ether	6.20	4.72
Acetaldehyde	10.82	8.56
Methyl alcohol	0.13	0.14
Water	23.29	45.20
2-Butyl acetate	2.85	0.84
Methyl acetate	6.87	3.21
Butyric acid	2.26	0.90
t-Butyl alcohol	0.29	0.14
Formic acid	19.55	14.85
Carbon dioxide	1.20	0.94
Formaldehyde	2.35	3.32

Weight of CARBOWAX oxidized	=	50.0 grams (0.0256 moles)
Moles of oxygen consumed	=	0.01769
Weight of light material isolated	=	0.570 gram
Oxidation temperature	=	70.0± 0.1°C
Oxidation pressure	=	459± 1 mm.
Total carbonyl content in residue	=	0.411 per cent
Free carbonyl content in residue	=	0.230 per cent
High molecular weight acids	=	0.0776 mg. equivalent per gram of residue

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UNION CARBIDE CHEMICALS
AND PLASTICS COMPANY INC.
South Charleston Technical Center
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South Charleston, WV 25303

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APPENDIX F

SCREEN MODELING RESULTS

COMPUTATION SHEET

RMT INC.

SHEET ____ OF 1

744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
CMI	DJF	4/5/91	MJS	4/5/91	2197.03

SCREEN ANALYSIS

Emission Rate 1 g/s (7.94 lb/hr)
Stack height 9.15 m
exit vel 1.62 m/s
temperature 338.7°K

Bldg height 5.49
Bldg length 58.07
Bldg width 36.62

Max Impact is 3208 ug/m3 @ 50 m
ratio emission rates to get impacts for substances. For one hour impacts formula is

$$\frac{ER\ Substance\ A}{7.94} * 3208\ ug/m3 = Impact\ substance\ A$$

For annual results divide one hour impact by 75. The 75 factor is consistent with Michigan Air Toxics screening tables

Compound	Emission Rate (lb/hr)	Impact 1-hr	Impact annual
MEK	.0035	1.41	–
Acetic Acid	.00018	0.073	–
Methyl Formate	.046	18.5	–
Dimethyl ether	.010	4.0	–
Acetaldehyde	.018	7.3	0.097
Methyl Alcohol	.00022	0.089	–
2-Butyl acetate	.0048	1.9	–
methyl acetate	.012	4.8	–
butyric acid	.0038	1.5	–
t-butyl alcohol	.00049	0.198	–
formic acid	.033	13.3	–
formaldehyde	.004	1.6	0.021

04-05-91
07:26:33

*** SCREEN-1.1 MODEL RUN ***
*** VERSION DATED 88300 ***

CMI-NOREN

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	1.000
STACK HEIGHT (M)	=	9.15
STK INSIDE DIAM (M)	=	.15
STK EXIT VELOCITY (M/S)	=	1.62
STK GAS EXIT TEMP (K)	=	338.70
AMBIENT AIR TEMP (K)	=	293.00
RECEPTOR HEIGHT (M)	=	.00
IOPT (1=URB,2=RUR)	=	2
BUILDING HEIGHT (M)	=	5.49
MIN HORIZ BLDG DIM (M)	=	36.62
MAX HORIZ BLDG DIM (M)	=	58.06

BUOY. FLUX = .01 M**4/S**3; MOM. FLUX = .01 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN DISCRETE DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
30.	2813.	4	1.0	1.0	320.0	9.9	2.7	4.8	HS
50.	3208.	4	1.0	1.0	320.0	9.9	4.3	6.1	HS
75.	2768.	4	1.0	1.0	320.0	9.9	6.3	7.4	HS
100.	2284.	4	1.0	1.0	320.0	9.9	8.2	8.3	HS
200.	1213.	4	1.0	1.0	320.0	9.9	15.6	11.9	HS
300.	934.1	6	1.0	1.0	5000.0	14.8	11.3	10.0	HS
400.	781.9	6	1.0	1.0	5000.0	14.8	14.7	10.8	HS
500.	683.0	6	1.0	1.0	5000.0	14.8	18.0	11.9	HS

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*** CAVITY CALCULATION - 1 ***			*** CAVITY CALCULATION - 2 ***		
CONC (UG/M**3)	=	.0000	CONC (UG/M**3)	=	.0000
CRIT WS @10M (M/S)	=	99.99	CRIT WS @10M (M/S)	=	99.99
CRIT WS @ HS (M/S)	=	99.99	CRIT WS @ HS (M/S)	=	99.99
DILUTION WS (M/S)	=	99.99	DILUTION WS (M/S)	=	99.99
CAVITY HT (M)	=	5.49	CAVITY HT (M)	=	5.49
CAVITY LENGTH (M)	=	27.88	CAVITY LENGTH (M)	=	24.02
ALONGWIND DIM (M)	=	36.62	ALONGWIND DIM (M)	=	58.06

CAVITY CONC NOT CALCULATED FOR CRIT WS > 20.0 M/S. CONC SET = 0.0

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	3208.	50.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****