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

AIR USE PERMIT

APPLI	CATI	ON	NO.	125	
7	9	9	-	9	7
1	1	/		1	A

3/88

APPLICANT: Business License Nai CMI-TECH CENTER MAILING ADDRESS: Number and 1600 W. 8 MILE BEOUIPMENT OR PROCESS LOCAT 1600 W. 8 MILE GENERAL NATURE OF BUSINESS POLYMER INJECTIO 5. EQUIPMENT OR PROCESS DESCR A PROTOTYPE NYLA	R AUTHORITY TO IN ND OPERATE PROCI OR CONTROL EQUIPN ' ADMINISTRATIVE I e of Corporation, Partnershi INC. itreet; City or Village; State OAD, FERNDALE ON: Number and Street; Cit OAD, FERNDALE IN MOLDING PTION: IN PLASTIC INJI	STALL, CONST ESS, FUEL-BURN AENT (PERMITS RULES PURSUA p, Individual Owner, ; Zip Code , MICHIGAN y, Village or Townst ECTION MOLI	RUCT, RECONS JING, OR REFU: TO INSTALL / NT TO ACT 3 Government Agency 48220-22(JP	STRUCT, RELOCATE, OR 4 SE-BURNING EQUIPMENT 4 AND OPERATE ARE REQUI 48, P.A. 1965, AS AMEN 02 02 COUNTY OAKL4 ITY. REFER TO APE	ALTER, AIR QUALITY DIVISIO AND/ IRED IDED). AUG 19 1992 PERMIT SECTION ZIP CODE 48220-2202 PLICATION NO. 542-91.
 APPLICANT: Business License Na CMI-TECH CENTER MAILING ADDRESS: Number and 1600 W. 8 MILE EQUIPMENT OR PROCESS LOCAT 1600 W. 8 MILE GENERAL NATURE OF BUSINESS POLYMER INJECTION 5. EQUIPMENT OR PROCESS DESCR A PROTOTYPE NYLA 	e of Corporation, Partnershi INC. treet; City or Village; State OAD, FERNDALE ON: Number and Street; Cit OAD, FERNDALE IN MOLDING PTION: IN PLASTIC INJ	p, Individual Owner, ; Zip Code , MICHIGAN y, Village or Townst	Government Agency 48220-22(^{Np} DING FACIL	02 COUNTY OAKLZ ITY. REFER TO APP	PERMIT SECTION ZIP CODE 48220-2202 PLICATION NO. 542-91.
 MAILING ADDRESS: Number and 1600 W. 8 MILE EQUIPMENT OR PROCESS LOCAT 1600 W. 8 MILE GENERAL NATURE OF BUSINESS POLYMER INJECTION 5. EQUIPMENT OR PROCESS DESCR A PROTOTYPE NYLA 	Treet; City or Village; State OAD, FERNDALE ON: Number and Street; Cit OAD, FERNDALE N MOLDING TION: N PLASTIC INJ	; Zip Code , MICHIGAN y, Village or Townst ECTION MOLI	48220-22(02 COUNTY OAKLA	AND 48220-2202 PLICATION NO. 542-91.
 a. EQUIPMENT OR PROCESS LOCAT 1600 W. 8 MILE 4. GENERAL NATURE OF BUSINESS POLYMER INJECTION 5. EQUIPMENT OR PROCESS DESCR A PROTOTYPE NYLONG 	DN: Number and Street; Cit COAD, FERNDALE IN MOLDING PTION: IN PLASTIC INJ	y, Village or Townst ECTION MOLI	DING FACIL	COUNTY OAKLZ	ZIP CODE 48220-2202 PLICATION NO. 542-91.
4. GENERAL NATURE OF BUSINESS POLYMER INJECTI 5. EQUIPMENT OR PROCESS DESCR A PROTOTYPE NYL	N MOLDING PTION: IN PLASTIC INJI	ECTION MOLI	DING FACIL	ITY. REFER TO APP	PLICATION NO. 542-91.
5. EQUIPMENT OR PROCESS DESCF	PTION: IN PLASTIC INJI	ECTION MOLI	DING FACIL	ITY. REFER TO APP	PLICATION NO. 542-91.
A PROTOTYPE NYL	n plastic inji	ECTION MOLI	DING FACIL:	ITY. REFER TO API	PLICATION NO. 542-91.
5. ESTIMATED COST: Air Pollution Control E 7. ACTION AND TIMING:	uipment \$	4	Total Project \$ ²	400,000 ESTIMATED STARTING DATE	ESTIMATED COMPLETION DATE
Installation, construction, rec	nstruction, or alteration				
X Relocation			-	JANUARY, 1993	JANUARY, 1993
Change of Ownership					
3. NAME OF PRIOR OWNER AS IN NAME TERRY FRANK	TEM 1 ABOVE, AND PRIOF	AIR USE PERMIT N	IUMBER, IF ANY:	PERM	MIT NO APPLICATION 542-9
NAME AND TITLE OF OWNER O DR. GARY RUFT Name	AUTHORIZED MEMBER OF	FIRM	Signature	- Quy Shuff)
Title: EXECUTIVE VI 0. CONTACT PERSON IF DIFFERENT Name JEFFREY NORIY	E PRESIDENT than item 9: N	Date:	8/6/92	Phone No. (3 Phone No. (3	(13) 399-9600 (13) 357-5180
1. DISPOSITION OF APPLICATION:		1/4/9	DNR USE ONLY	+ Sinnature Danne	w. M. Ducke
Receipt of all information required by Rule 203					
Receipt of all information required by Rule 203 Permit to install approved * on Permit to operate approved * on	-	140		Signature	1.
Receipt of all information required by Rule 203 Permit to install approved * on Permit to operate approved * on Application/permit voided on	-	3-13-	07	Signature Jun	Fudler



STATE OF MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY Lansing



JENNIFER M. GRANHOLM GOVERNOR

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 Permit Section Air Quality Division 517-373-7068

Enclosure cc/enc: Ms. Teresa Seidel, DEQ

a water in the state	STATE OF MICHIGA	N	
DEPARTMENT OF NATURAL RESOURCES	AIR USE PERM	п	APPLICATION NO.
2.0. BOX 30028	APPLICATION		
FOR AUTHORITY TO	INSTALL, CONSTRUCT, RECON	NSTRUCT, RELOCATE, OR ALTE	R,
AND OPERATE PRO OR CONTROL EQUI BY ADMINISTRATIVI	DCESS, FUEL-BURNING, OR REF PMENT (PERMITS TO INSTALL E RULES PURSUANT TO ACT	USE-BURNING EQUIPMENT AND AND OPERATE ARE REQUIRED 348, P.A. 1965, AS AMENDED	AUG 19 1992
1. APPLICANT: Business License Name of Corporation, Partne	rship, Individual Owner, Government Ager	icy	PERMIT SECTION
2. MAILING ADDRESS: Number and Street; City or Village; St 1600 W. 8 MILLE ROAD, FERNIDAL	ate; Zip Code E. MICHIGAN 48220-2	202	
3. EQUIPMENT OR PROCESS LOCATION: Number and Street; 1600 W. 8 MILLE ROAD, FERNDAL	City, Village or Township	COUNTY	ZIP CODE 48220-2202
4. GENERAL NATURE OF BUSINESS:			
5. EQUIPMENT OR PROCESS DESCRIPTION:			
gree			
6. ESTIMATED COST: Air Pollution Control Equipment \$; Total Project	\$ 400,000 ESTIMATED	ESTIMATED
		STARTING DATE	COMPLETION DATE
Installation, construction, reconstruction, or alteration		JANUARY, 1993	JANUARY, 1993
Relocation			
Change of Ownership	RIOR AIR LISE PERMIT NUMBER. IF ANY		
NAME TERRY FRANKLYN, CMI-NORE	IN, INC.	PERMIT N	0APPLICATION 542-91
9. NAME AND TITLE OF OWNER OR AUTHORIZED MEMBER	OF FIRMSignatu	· JunpRuff	
Title: EXECUTIVE VICE PRESIDENT 10. CONTACT PERSON IF DIFFERENT THAN ITEM 9:	Date: 8/6/92	Phone No. (313	, 399-9600
	FOR DNR USE ON	Phone No. (313	1 221-2790
Receipt of all information required by Rule 203	1/4/93	2	M Diche
Permit to install approved * on	1/1/13	_ Signature	<i>A b</i>
Permit to operate approved * on	7 12 0-1	Signature	Furth
Application/permit voided on	3-1501	- Signature	and later from the
Application/permit denied on			
Application/permit denied on	ons stipulated in the attached supplement UCTIONS FOR COMPLETING AND FIL	NG ARE ON REVERSE SIDE	



Copy sent to District Engineer

AR QUALITY DIVISION FEB 19 1993 PFRMIT SECTION

(313) 399-9600

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, Lal valor Jeff Norton **Environmental Engineer**

cc: Dr. Gary Ruff Diane Zekind STATE OF MICHIGAN



NATURAL RESOURCES COMMISSION

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

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,

Dull'es 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

- 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.
- 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.

CMI-Tech Center, Inc. Permit No. 799-92 Page 2 JANUARY 7, 1993

- 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.
- 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 1	EVALUATION SHEET
APILICANT NAME CMI -	ECH CENTER	INC APPLICATION NO. 799-42
E.I. NO .: A - 4646	, (DATE REQUESTE	5 IF NEW)
LOCATION OF SOURCE:		MAILING ADDRESS (IF DIFFERENT):
CITY FERNIDALE	TTP HARD 770	STREET ADDRESSAME
COUNTY NAME/NUMBER () AC	14ND 62	<u></u> 21P
REASON FOR APPLICATION (New Source, Alteratio	,etc) <u>RELOCATED</u> SOURCE
DESCRIPTION OF SOURCE &	RELATED CONTROL EQUI	P./TECHNOLOGY (Include Federal source class code
SOURCER		and Control Code No. ie., (1-23-456-78)(12)
- PROTOTYPE A 2 MOLDING A	JYLOW PLAST 14CHINES	TIC INSECTION MOLDING FACILITY
2 LOW TEMP	MELTING POIN	WT METHL CORE MACHINES
1 METHE COR	E MELT-OUT 7	FANT (WAX TANK)
CONTRADUC	SCC# 3	3-08-008-00 (3-08-008-02)
-NONE LO	00)	
	. /	· · · · · · · · · · · · · · · · · · ·
INSTALLATION DATE: PROCES	SS EQUIPMENT 30	93 CONTROL EQUIPMENT NONE
PERMIT(S) RELATED TO APPI	LICATION 542-	-91 voids <u>542-91</u>
STATE/FED. AIR REG'S SOUL	RCE IS SUBJECT TO?	NSPS, N NESHAPS Y PSD N
SIP(Rule No. (S) 7	02,201	, Act 64, Other NOWF
WINGS NOTION REQUIREDS		
MAPCE ACTION REQUIRED?	(N) EPA NOTIFICAT	ION REQUIRED? Y / N) DATE INFO SENT TO EPA
EMISSIONS FROM EQUIPME	INT COVERED BY THIS	PERMIT * TRACKING TO BE DONE: (DATE DONE)
Pol. EXPECTED	ALLOWABLE	LIMIT Permit Engineer
Codes PPH TI	Y PPH TPY	NATICH
PM10		
502		BACT/LAER Clearinghouse
NOx		Al Ludman
VOC Del O	1 0.1 4.4	NO DISIDIA VILOG NAA pollutante
		Susan Parker
		PSD / or Netted Out
* Calculations are either	attached to this s	heet, NSPS
or in a confidential file	, where applicable.	NESHAPs
		Synthetic Minor for
ATTAINMENT STATUS	MID SO2 CO O3	PSD and/or R220
ATTAINMENT		R220
I NON ATTAINMENT		Cathy Simon
		Rule 230
U - Unclassified * Cl	ose to Non Attainme	nt $HR./DAY \underline{24} DAYS/WK. \underline{7} WKS./YR. \underline{52}$
POLLUTANTS FOR PSD REVIEW	NONE	NETTED OUT NONE
POLLUTANTS FOR SYNTHETIC	MINOR: PSD NOR	RULE 220 N/A
Basis for Recommendation:		
MINUR SOURCE	OF UOC'S	(LESS THAN IOTPY) NO
TOTIC EMISSIO	WS ARE EXP	PECTED BACT IS NO CONTROL.
NO RESPONSE		- what is a material PERIOD
	FROM DISTRI	CT WIN COMMENTICETOD.

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 BERNEEDIA DATE 1/8/93	
ENFORCEMENT:	PERSON DATE	2
APPLICANT:	PERSON TEFFERY NORFON DATE 1/6/93	

COORDINATION	REQUIRED: (UN	ITS, DIVISIONS	S, AGENCIES)
	PERSON	DATE	REQUESTED
	CONTACTED	CONTACTED	RESPOND BY
DISTRICT	BERNIEL	1/8/93	A P.P.ROUEV
ENFORCEMENT			
MODELING			
STACK SAMPLING			
TOXICS			
WMD			
SWQ			
ERD			
L&W Mngt			
GEO SURVEY			
LAW ENFORCE			
		115	

STACK DATA 1) TOTAL HEIGHT(FT) 39 HEIGHT ABOVE BLDG.(ft) /2 EXIT DIMENSION(IN) 6 TEMP.(°F/°C) (50 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 SHEFT OF 3 (608) 831-4444 Box 8923 Madison, WI 53708-8923 PROJECT / PROPOSAL NAME CHECKED PREPARED PROJECT/PROPOSAL NO. CMI - Noren Union Carbide Evaluation Mass emission rate : 0.57 groms Reprovince generation period: 18 kours (1) Epproximile Carbowax Surface ora: 0.05 ft= () Estimited totlemission rote = 0.57 gruns/13 hours = 0.0317 grons /kour Extrapolation & CMI - Noren Melt - Out Tanks Proposed Melt-out tank surface areas 3×40' = 120/4" Estimoted melt-out tank emission note: 120 ft × 0:0317 2003 = 76.1. gums/h-76.194 1 × -115 = 0.168 16/1- N 0.17 13/1-(1) Tele-Con on Mirch 12, 1991, between Diare Gillenwooter & Union Carbide & Martin Storakerger of AMT.

COMPUTATION SHEET Z OF 3 SHEET. Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334 44 Heartland Trail P.O. Box 8923 PROJECT/PROPOSAL NO. CHECKED PROJECT / PROPOSAL NAME PREPARED 3/20/51 POW_ BY MI - Noton Estimated Specific Organic Compound Emission R.L. for Each of 3 mett-out Eanks: Estimobel Emission 2. 4 15/10-2 10/10 (Eve) Percent (1) 13/4 (Mor) Compound. Methyl Ethyl Ketone 3/20 2.09 21 0.35 Bootic beil Methy Formate 1.1 116 0.018 2.11 410 4.6 280 27.69 D: methyl Ether 1.0 63 92 6.20 110 Aceta/dehyde. 1.8 160 10.84 Methyl Alcohol 1.3 1.9 0.13 D. DZZ 2-But A Acetate Method Det. to 29 2.85 0.4B 42 70 6.87 1.2. 100 23 Butaric Baid 34 2.26 0.38 3.0 4.3 Alcohal 0.29 0.049 1- B8tal 1999555 BESCA ADDINA SSROw Former Doid XX MAA arton (1) Percent by weight of emissions generated in Union la bile Study. Estimated omissions was colculated by Multiply in the estimated total originic compound emission nation (0.17 b/m) by these operators (2) Based on operation of the melt-out land 24 hours per day and 250 days par year. (3) Bosed on operation of the nelt-out tink 21 hous per day and 365 days ple year.

COMPUTATION SHEET OF. Z Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334 744 Heartland Trail P.O. Box 8923 PREPARED CHECKED PROJECT/PROPOSAL NO. PROJECT / PROPOSAL NAME Date By113 2711/91 By 2117,03 CMI - Noren (MI- Noren interiors to use the followin materia as mold release and treatment compounds their prototype facility: Usage Rate - Mold release Zing Stearay 2- 802. Cans/mon 1- 802 can /mony + Mola preservative Mold Saver Paintable 1- 807 can/month - Mold coating 1- 802 an month Mold Cleaner -Mold cleaner The usage rate of these maverials is much lower than for typical plastic injection operations since the nylon to be used @ CMII-Noren has excellent release characteristics Estimated Emission Raves 802, = 0.0625 gal Zinc Stearate 0,125 3al/mo × 10,08 1/gal = 1,25 1/month 1 (2 80, can) 0,90 16 Volatiles/ Ib material = 1:13, 16 volastile 1125 month X 13.5 16 volatiles 1.13 × 12 mo year = 50% of this is methyleklar form

COMPUTATION SHEET

Γ.	-	7/5	m	I INC.
	71	NY/	111	
L	12	UL	<u>111</u>	0
20142				B

2 2 SHEET (608) 831-4444 P.O. Box 8923 FAX: (608) 831-3334 744 Heartland Trail Madison, WI 53708-8923 PROJECT/PROPOSAL NO. PREPARED CHECKED PROJECT / PROPOSAL NAME Date Byns Date) /// Byintf 2197.03 CMI-Noren 9 Mold Cleaner Daintable Mold Saver Diglan april 100 % volatile -As 10,08 \$ 89 ga 16 volatile 875 D. an x mo Volatiles 1/6 X 1% no 22 7 10 12 1-Les gear 16 volatiles 36.2 Tota year. most of this is methyl Chloroform (1,1, 1- TCA)



AIR QUALITY DIVISION JAN 4 1993 PFRMIT SECTION

(313) 399-9600

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



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 Environmental Engineer

JN/klk cc: Dr. Gary Ruff Diane Zekind DEPARTMENT OF NATURAL RESOURCES AIR QUALITY DIVISION P.O. BOX 30028 LANSING, MICHIGAN 48909 STATE OF MICHIGAN

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).

MAILING ADDRESS: Number and Street; City or Village; State; Zip Code			
1600 W. 8 MILE ROAD, FERNDALE, MICHIGAN	48220-2202		
EQUIPMENT OR PROCESS LOCATION: Number and Street; City, Village or Township 1600 W. 8 MILE ROAD, FERNDALE		COUNTY OAKLAND	ZIP CODE 48220-2202
. GENERAL NATURE OF BUSINESS: POLYMER INJECTION MOLDING			
. EQUIPMENT OR PROCESS DESCRIPTION:			
A PROTOTYPE NYLON PLASTIC INJECTION MOLDI	NG FACILITY. R	EFER TO APPLICA:	EION NO. 542-91.
. ESTIMATED COST: Air Pollution Control Equipment \$; . ACTION AND TIMING:	Total Project \$ 400,000 ESTIMATE STARTING D.	D ATE	ESTIMATED COMPLETION DATE
ESTIMATED COST: Air Pollution Control Equipment \$; ACTION AND TIMING: Installation, construction, reconstruction, or alteration	Total Project \$ 400,000 ESTIMATE STARTING D.	D ATE	ESTIMATED COMPLETION DATE
ESTIMATED COST: Air Pollution Control Equipment \$; ACTION AND TIMING: Installation, construction, reconstruction, or alteration X Relocation	Total Project \$ 400,000 ESTIMATEI STARTING D. JANUARY	Ате 7, 1993	ESTIMATED COMPLETION DATE JANUARY, 1993
ESTIMATED COST: Air Pollution Control Equipment \$; ACTION AND TIMING: Installation, construction, reconstruction, or alteration X Relocation	Total Project \$ 400,000 ESTIMATE STARTING D. JANUARY	Ате 7, 1993	ESTIMATED COMPLETION DATE
ESTIMATED COST: Air Pollution Control Equipment \$: ACTION AND TIMING: Installation, construction, reconstruction, or alteration Relocation Change of Ownership NAME OF PRIOR OWNER AS IN ITEM 1 ABOVE, AND PRIOR AIR USE PERMIT NUM	Total Project \$ 400,000 ESTIMATEI STARTING D. JANUARY	р Ате 7, 1993	ESTIMATED COMPLETION DATE JANUARY, 1993
ESTIMATED COST: Air Pollution Control Equipment \$ ACTION AND TIMING: Installation, construction, reconstruction, or alteration X Relocation Change of Ownership NAME OF PRIOR OWNER AS IN ITEM 1 ABOVE, AND PRIOR AIR USE PERMIT NUM NAME TERRY FRANKLYN, CMI-NOREN, INC.	Total Project \$ 400,000 ESTIMATE STARTING D JANUARY MBER, IF ANY:	Ате 7, 1993 РЕЯМІТ NOДI	COMPLETION DATE
ESTIMATED COST: Air Pollution Control Equipment \$: ACTION AND TIMING: Installation, construction, reconstruction, or alteration X Relocation Change of Ownership NAME OF PRIOR OWNER AS IN ITEM 1 ABOVE, AND PRIOR AIR USE PERMIT NUR NAME TERRY FRANKLYN, CMI-NOREN, INC. NAME AND TITLE OF OWNER OR AUTHORIZED MEMBER OF FIRM	Total Project \$ 400,000 ESTIMATEI STARTING D. JANUARY MBER, IF ANY:	Рате 2, 1993 РЕПИТ NOALE 2	ESTIMATED COMPLETION DATE JANUARY, 1993 PPLICATION 542-9
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MATERIAL SAFETY



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



Polynie



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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

Business Office

GENERAL ELECTRIC COMPANY Plastics Group LEXAN Products Division 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



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%	$\begin{cases} e \longrightarrow e^{CH_1} & e^{Q} \\ e^{-Q} & e^{-Q} \\ e^{CH_1} & e^{-Q} \\ n & 45 \pm 15 \end{cases}$	\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) Carbonic dichloride, polymer with 4.4'-(1-methylethylidene) bis(phenol)	(CH ₂ 0 ₃ • C ₁₅ H ₁₆ 0 ₂) _x (C ₁₅ H ₁₆ 0 ₂ • CCl ₂ 0) _x	25037-45-0 25971-63-5	
SPECIALTY RESINS (COPOLYMERS)			
COMMON NAME: Bisphenol-A/Tetrabromobisphenol-A Copolycarbonate			
CHEMICAL NAME: (as product of constilutent monomers)*			
Carbonic dichloride, polymer with 4,4'-(1-methylethylldene) bls(2,6- dibromophenol) and 4,4'-(1-methylethylldene bls(phenol)	(CCl ₂ 0 • C ₁₅ H ₁₆ O ₂ • C ₁₅ H ₁₂ Br ₄ O ₂) _x	32844-27-2	
COMMON NAME: Bisphenol-A/IsophithaloyIdichloride/TerephthaloyIdichloric	te Copolyester Carbonate		
CHEMICAL NAME: (as product of constitutent monomers)*			
1,3-Benzenedicarbonyldichloride, polymer with 1,4-benzene dicarbonyldl- chloride carbonic dichloride and 4,4'-(1-methylethylidene(bis(phenol)	(C ₁₅ H ₁₆ O ₂ • C ₈ H ₄ Cl ₂ O ₂ • C ₈ H ₄ Cl ₂ O ₂ • CCl ₂ O) _x	71519-80-7	
COMMON NAME: Bisphenol-A/Trimellitic Anhydride Copolyester Carbonate			
CHEMICAL NAME: (as product of constitutent monomers)*	A		
5-Isobenzofurandicarboxylic acid, 1,3'-dihydro- 1,3 dioxo-, polymer with carbonic dichloride and 4,4'-(1-methylethylidene) bis(phenol)	(C ₉ H ₄ 0 ₅ ● C ₁₅ H ₁₆ O ₂ ● CCl ₂ O) _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; 141; 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	Organic salts Pertluoralkyl polymer	<1%	900 series including 920, 940, 950, 920A, 940A, 950A, LEXAN C4600, and specific ML- and RL- resins.
	flame spread	TBBPA copolymers Other halogenated compounds	<8% (Halogen)	2014, 2015, 2514, 2814, 2816, 2034, 2035, 2534, BE 1230, 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, eIc.
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
TVDE	USAGE	COMP	POSITION	PRODUCT DESIGNATIONS
SPECIALTY RESINS	Flame retardance Melt stability	BPA/TBBPA/Copolycar BPA/TIMA/Copolyeste BPA/IPC/TPC/Copolye	bonale r Carbonale ster Carbonale	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 (ill), 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

Melt stability Thermal resistance

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).

BPA/TIMA/Copolyester Carbonate BPA/IPC/TPC/Copolyester Carbonate



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 salls)
1008	bis-Chloromethyl ether
1005	bela-Naphthylamine
1010	Benzidine
101	4-Aminodiphenyl
1012	Ethyleneimine
1013	beta-Propiolactone
1014	2-Acetylaminofluorene
1015	4-Dimethylaminoazobenzene
1010	N-Nitrosodimethlyamine
1017	Vinvl chloride
1016	Inorganic arsenic
1029	Coke oven emissions
104	Cotton dust
104	1 2-Dibromo-3-chloropropane
104	Acrylonitrile
104	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 Respirable Fraction	15 mg/m³ 5 mg/m³	10 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

THERMAL DECOMPOSITION Thermogravimetric Analysis (in air)

Initial (Onset) 50% Wt. Loss 420°C (788°F) 480°C (896°F)

IGNITION TEMPERATURE Flash Ignition Self Ignition ASTM D-1929 (Setchkin Method) 449°C (840°F) 632°C (1070°F)

Range 1.2 to 1.6

WEIGHT

SPECIFIC GRAVITY ($H_2O = 1$) BULK DENSITY (unfilled)

RESIN SOLUBILITY

WATER METHYLENE CHLORIDE insoluble ≈ 20% by wt.

VOLATILES

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

Pellets 641 kg/m³ (40 lbs/ft³)

COLOR AVAILABILITY

NATURAL	Transparent, water white
PIGMENTED	Unlimited; transparent to opaque

OTHER

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

*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) PPM mg/m³		1984-85 ACGIH (TL) PPM mg/m		
Carbon dioxide Diphenylcarbonate Methylene chloride Phenol	5,000 - 500 5	9,000 1,800 19	5,000 100 5	9,000 	

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

In all cases, a physician should be conlucted if initiation 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



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 treatmentrelated 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 alr 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 hyglene 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/ff²

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.



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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.

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

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PRODUCT IDENTIFICATION



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

 $\begin{array}{l} \textbf{CHEMICAL NAMES: 1, 4-Benzene carboxylic acid, dimethylester, polymer with 1, 4-butanediol, \\ 1, 6-hexanediol and α-hydro-ω-hydroxy (poly (oxy-1, 4-butanediol) \\ \end{array}$

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

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) 1, 4-Benzenedicarboxylic acid, polymer with 1, 4-butanediol 1, 4-Benzenedicarboxylic acid, dimethylester, polymer with 1, 4-butanediol

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

" LOMOD is a Registered Trademark of General Electric Company.

 $(C_{12}H_{12}O_4)_n$ $(C_8H_6O_4 \bullet C_4H_{10}O_2)_x$ $(C_{10}H_{10}O_4 \bullet C_4H_{10}O_2)_x$



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 BO 100-7011

*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-Naphlhylamine
1006	Methyl chloromethyl ether
1007	3.3'-Dichlorobenzidine (and salts)
1008	bis-Chloromethyl ether
1009	beta-Naphthylamine
1010	Benzidine
1011	4-Aminodiphenyl
1012	Elhyleneimine
1013	beta-Propiolactone
1014	2-Acetylaminofluorene
1015	4-Dimethylaminoazobenzene
1016	N-Nilrosodimethlyamine
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 Respirable Fraction	15 mg/m³ 5 mg/m³	10 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 POINTTm150 - 220°CVICAT SOFTENING Typical Range105 - 200°CINJECTION MOLDING Typical Range320 - 485°C

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

Insoluble

WEIGHT

WATER

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

RESIN SOLUBILITY

VOLATILES

	4.4 12.436
WATER	$0.3 \pm 0.1\%$
TETRAHYDROFURAN	< 100 ppm

COLOR AVAILABILITY

NATURAL PIGMENTED Opaque white Full range of opaque resins

OTHER

ODOR VAPOR PRESSURE VAPOR DENSITY BOILING POINT EVAPORATION RATE Slight 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 patential 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					
	PPM	OSHA (PEL) PPM mg/M ³		ACGIH (1984) (TLV) 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



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/ft³.

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.



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Polymen



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





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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





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 ₈ H ₈ O) _n	
CAS REGISTRY NUMBER: 25134-01-4		
ALLOYING/BLENDING RESINS		
COMMON NAMES: High Impact Polystyrene HIPS	(C ₈ H ₈) _x (C ₄ H ₆) _y	1-5
CHEMICAL NAMES: Poly (butadiene-styrene)		1
Benzene, ethenyl, polymer with 1, 3-butadiene		
CAS REGISTRY NUMBER: 9003-55-8		
COMMON NAME: Nylon 6		
CHEMICAL NAMES: Polycaprolactam	and the second se	
Poly [imino (1-oxo-1, 6-hexanediyl)]	(C ₆ H 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-hexanediy]	(C ₁₂ H ₂₂ N ₂ O ₂) _n	

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

CAS REGISTRY NUMBER: 32131-17-2
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. PX 1222; 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)

9 CFR 1910, 1001	Asbestos	1013 beta-Propiolactone
1002	Coal tar pitch volatiles	1014 2-Acetylaminofluoroene
1003	4-Nitrobiphenyl	1015 4-Dimethylaminoazobenzene
1004	alpha-Naphthylamine	1016 N-Nitrosodimethylamine
1006	Methyl chloromethyl ether	1017 Vinyl Chloride
1007	3.3'-Dichlorobenzidine (and salts)	1018 Inorganic arsenic
1008	bis-Chloromethyl ether	1029 Coke oven emissions
1009	beta-Naphthylamine	1043 Cotton dust
1010	Benzidine	1044 1,2-Dibromo-3-chloropropan
1011	4-Aminodiphenyl	1045 Acrylonitrile
1012	Ethyleneimine	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 Respirable Fraction	15 mg/m³ 5 mg/m³	10 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).

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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 - $132^{\circ}C(194 - 270^{\circ}F)$ VICAT SOFTENING ASTM D-1525 109 - $142^{\circ}C(228 - 288^{\circ}F)$ INJECTION MOLDINGTypical Range 232 - $325^{\circ}(450 - 617^{\circ})$ THERMAL DECOMPOSITION Thermoaravimetric Analysis (in air)

	monnogrammon	er allen fan tal and
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 ($H_2O = 1$) BULK DENSITY (unfilled) Range 1.05 to 1.36 Pellets 641 kg/m³ (40 lbs/ft³)

RESIN SOLUBILITY

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

• 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.

VOLATILES

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

COLOR AVAILABILITY

PIGMENTED

Full range of opaque colors

OTHER

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

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	OS 8-hr. PEL	HA STEL	ACGIH (TLV	1984-85) STEL
Styrene	100 ppm	200 ppm	50	100
Elhylbenzene	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 phosphale

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., Blgd. 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 af 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 will 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	
50 lb	
1000 lb	

Packaging Material
Multi-wall paper bags
Corrugated cardboard

Configuration
40 bags/pallet
aqvlord/pallet

Bulk shipments are available in truckload and railcar quantities. The bulk density range of NORYL resin pellets is 38 – 42 lbs/ft³

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.

resin

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).







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

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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 Mf, 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

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)

XENO

COMMON NAMES: Polybutylene terephthalate (PBT) Polytetramethylene terephthalate

(C12H12O4)n

(C16H14O3)n

CHEMICAL NAMES: Poly (oxy-1, 4-butanediylcarbonyl-1, 4-phenylenecarbonyl)

resin

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)

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) CAS REGISTRY NUMBER: 25038-59-9	(C ₁₀ H ₈ O ₄) _n
COMMON NAME: Poly (cyclohexylmethylene terephthalate) (PCT) CHEMICAL NAMES: 1, 4-Benzenedicarboxylic acid, dimethylester, polymer with 1, 4-cyclohexane dimethanol CAS REGISTRY NUMBER: 25135-20-0	(C ₁₀ H ₁₀ O ₄ • C ₈ H ₁₆ O ₂) _x
COMMON NAME: Polycaprolactone CHEMICAL NAME: 2-Oxepanone, homopolymer CAS REGISTRY NUMBER: 24980-41-4	(C ₆ H ₁₀ O ₂) _n
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 • C ₈ H	₄ CL ₂ O ₂ • C ₈ H ₄ CL ₂ O ₂ CCL ₂ O) _x
CAS REGISTRY NUMBER: 71519-80-7	

* XENOY Is a Registered Trademark 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 (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.

	010101000	1001	Arbostos	
	24 CFR 1410.	1001	Aspesios Cool lar pitch volatilar	
		1002	A Mashishand	
		1003	4-Nilrodiphenyi	
		1004	alpha-Naphthylamine	
		1006	Methyl chloromethyl ether	
		1007	3.3'-Dichlorobenzidine (and salls)	
		1008	bis-Chloromethyl ether	
		1009	beta-Naphthylamine	
		1010	Benzidine	
		1011	4-Aminodiphenyl	
		1012	Ethyleneimine	
		1013	bela-Propiolacione	
		1014	2-Acetylaminofluorene	
		1015	4-Dimethylaminoazobenzene	
		1016	N-Nitrosodimethlyamine	
		1017	Vinyl chloride	
		1018	Inoraanic arsenic	
		1029	Coke oven emissions	
		1043	Cotton dust	
		1044	1.2-Dibromo-3-chloropropane	
,		1047	Elbylene 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 NUISANC	EDUST: 8 hour Time-W	eighted-Average
	OSHA PEL	ACGIH (1984-85) TLV
Total Dust Respirable Fraction	15 mg/M³ 5 mg/M³	10 mg/M ³ 5 mg/M ³

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 Flash Ignition Self Ignition ASTM D-1929 (Setchkin Method) 350 - 365°C (660 - 690°F) 400 - 500°C (752 - 930°F)

WEIGHT

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

RESIN SOLUBILITY

WATER Insoluble Insoluble in most common organic solvents

VOLATILES

NATER	Typical Range	0.3 ± 0.1%
TETRAHYDRO	URAN	300 ppm (approx. – PBT containing products only)

COLOR AVAILABILITY

NATURAL

PIGMENTED

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

OTHER

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

* Typical values for general purpose grades based on material tested but may vary from sample to sample. Consult product literature for specially 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
and the second se	

- PBT Water, carbon dioxide, tetrahydrofuran
- PC Water, carbon dioxide, diphenyl carbonate.

methylene chloride, and phenol

PBT:

81	our Time-Wel	ghled Averag	90	
	PPM	IA (ILV) mg/m³	ACGIH (PPM	1982) (PEL) mg/m ³
Tetrahydrofuran	200	590	200	590

PC:

8 hou	ur Time-Weig	hted Averag	je -	
	OSH/ PPM	mg/m³	ACGIH (1 PPM	982) (PEL) mg/m ³
Carbon dioxide Diphenylcarbonale Methylene chloride	5,000 500	9,000	5.000 	9,000 360

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.
- 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 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 sooly 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



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 LD₅₀ 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 irritiation 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	
50 lb	M
1000 lb	Co

Packaging Material Multi-wall paper bags Corrugated cardboard Configuration 40 bags/pallet 1 gaylord/pallet

Bulk shipments are available in truckload and railcar quantities. The bulk density range of XENOY resin pellets is 38 – 42 lbs/ft³

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.



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Issue Date

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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

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PRODUCT IDENTIFICATION



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 Com	position	Chemical Structure	Molecular Weights
Polyetherimide (PEI)	CARBON OXYGEN NITROGEN HYDROGEN	75.0% 16.2 4.7 4.1	$ = 21 \pm 6 $	₩w = 30,000 ± 10,000 ₩n = 12,000 ± 4,000

CHEMICAL NAME (As Polymer): Poly (2, 2'-bis (3, 4-dicarboxyphenoxy) phenylpropane)-2-phenylene bismide)	EMPIRICAL FORMULA (C37H24O6N2)n	CAS REGISTRY NUMBERS 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 •C ₆ H ₈ N 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.



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	Elhyleneimine
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-V	Veighted-Average
	OSHA PEL	ACGIH (1984-85) TLV
Total Dust Respirable Fraction	15 mg/m³ 5 mg/m³	10 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

 Onset (1% Wt. Loss)
 530°C

 50% Wt. Loss
 670°C

 IGNITION TEMPERATURE
 ASTM D-1929 (Set

670°C (1238°F) ASTM D-1929 (Setchkin Method)

(986°F)

(970°F)

(1000°F)

Flash Ignition Self Ignition 521°C 538°C

WEIGHT

RESIN SOLUBILITY

WATER METHYLENE CHLORIDE Insoluble <20% by Wt.

VOLATILES

WATER

Typical Range 0.5 ± 0.3% at RT

COLOR AVAILABILITY

NATURAL PIGMENTED Transparent amber Broad range; transparent to opaque

OTHER

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

* 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 speciality grades. Typical values should not be construed as a 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.

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



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

Bulk shipments are available in truckload and railcar quantities. The bulk density range of ULTEM resin pellets is 40 – 50 lbs/ft³

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
DOTIGhel	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.







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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

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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 MI. Vernon, Indiana 47620 General Electric Company (812) 838-7236



PRODUCT IDENTIFICATION



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)

1, 4 Benzenedicarboxylic acid, polymer with 1, 4-butanediol

1, 4 Benzenedicarboxylic acid, dimethlyester, polymer with 1, 4-butanediol

 $(C_{12}H_{12}O_4)_n$ $(C_8H_6O_4 \bullet C_4H_{10}O_2)_x$ $(C_{10}H_{10}O_4 \bullet C_4H_{10}O_2)_x$

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)

(C10H8O4)n

CAS REGISTRY NUMBER: 25038-59-9

VALOX is a Registered Trademark 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 (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
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FR 1910,	1001	ASCOSIOS
	1002	Coal tar pitch volatiles
	1003	4-Nitrobiphenyl
	1004	alpha-Naphthylamine
	1006	Methyl chloromethyl ether
	1007	3.3'-Dichlorobenzidine (and salls)
	1008	bis-Chloromethyl ether
	1009	beta-Naphthylamine
	1010	Benzidine
	1011	4-Aminodiphenyl
	1012	Elhyleneimine
	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 NUISANCI	DUST: 8 hour Time-W	eighled-Average
	OSHA PEL	ACGIH (1984-85) TLV
Total Dust Respirable Fraction	15 mg/m³ 5 mg/m³	10 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 Tm

220-228°C (430-442°F)

INJECTION MOLDING Typical Range 230 - 260°C (445 - 500°F) THERMAL DECOMPOSITION Thermogravimetric Analysis (in air)

Initial (Onset) 50% Wt. Loss 365 - 400°C (689 - 752°F) 430 - 460°C (806 - 860°F)

IGNITION TEMPERATURE Flash Ignition Self Ignition ASTM D-1929 (Setchkin Method) 360 - 365°C (680 - 689°F) 360 - 375°C (680 - 707°F)

WEIGHT

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

RESIN SOLUBILITY

WATER Insoluble Insoluble in most common organic solvents

VOLATILES

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

COLOR AVAILABILITY

NATURAL PIGMENTED Opaque White Full range of opaque resins

OTHER

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

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.

81	our Time-Wel	ghted Averag	je		
	OSHA (PEL) PPM mg/m ³		1984-85 ACGIH (TLV) 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 Guldelines; 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



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 lest rabbits a slight transient redness occurred, consistent with the abrasive nature of the ground resin particles.

FUME INHALATION

Processing tumes 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"

PRG: 111.V.2

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 Welaht	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/ft³.

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
DOTLabel	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.

GENERAL COB ELECTRIC

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- X Water- X CO ₂ X Dry X Foam X Earth or spray fog stream CO ₂ X Chemical X Foam X Sand
	SpecialFire Fighting Procedures Do not Enter Allow fire Water may Building to burn Cause frothing Use approved respirator
	Unusual Fire and Explosion Hazards Dust explosion Sensitive Contamination Temp. Other hazard to shock (specify)
	Stability Conditions contributing to instability Stable Unstable X Thermal Photo Poly- decomp. degrad.
REACTIVITY DATA	Incompatibility-Avoid contact with Strong Strong Strong Other acids alkalis oxidizers (specify) Hazardous Deomposition Products-Thermal and Other CO, N.H., Minor: amonia, aliphatic amines, ketone, HCN
	Conditions to Avoid Avoid Heat Open Sparks Ignition Other above 650°F
SPILL OR LEAK	Steps to be taken if material is released or spilled Flush with Absorb with sand Neutralize Sweep or scoop water or inert material Dispose of Keep upwind Prevent spread Other immediately spaces (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

CITY	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.
	Irrit- 🗌 Skin 🔲 Severe 🗋 Moderate 🔯 None ation 🗋 Eye 🔲 Severe 🗋 Moderate 🗋 Mild 🔯 None (transient)
posure	Corrosivity 🗋 Skin 🗋 4 hrs. (DOT) 📑 24 hrs. (CPSC) 🔯 None 🗋 Eye 📄 May cause blindness 🕅 None
HEALTH HAZARD INFORMATION Emergency First Aid Effects of Exp	SensitizationInhalation effectsSkinRespiratoryAllergenNarcoticCyanosisAsphyxiantNONEeffectNONE
	Lung Effects (specify): NONE Other (specify): Repeated contact Other (specify):
	Ingestion Do not Induce Give plenty Get medical Other (specify): vomiting vomiting of water attention NONE
	Dermal Contaminated Flush with soap Get medical Clothing- Contaminated Other and water attention remove and launder shoes-destroy (specify)
	Eye Contact X Flush with plenty of water Get medical Other for at least 15 minutes attention (specify):
	Inhalation If not breathing Remove to give artificial Give Get medical Other fresh air respiration oxygen attention (specify):
tion	Ventilation Regirements-Always maintain exposure below permissible exposure limits. Consult an industrial hygienist X Local X Use with adequate or environmental health specialist exhaust ventilation
THOMAS	Check for air contaminant Other and oxygen deficiency (specify):
formation	□ Check for air contaminant □ Other and oxygen deficiency □ Other (specify): Eye □ Face Shield Hand (glove type) □ Buty1 □ Polyviny1 □ Other Rubber ☑ Safety □ Polyviny1 □ Neoprene □ Natura1 □ Polyethylene chloride □ PolyVINYER
Information	Check for air contaminant ☐ Other and oxygen deficiency (specify): Eye ☐ Face Shield Hand (glove type) ☐ Buty1 ☐ Polyviny1 ☐ Other
on Information	<pre> □ Check for air contaminant □ Other and oxygen deficiency (specify): Eye □ Face Shield Hand (glove type) □ Buty1 □ Polyviny1 □ Other Rubber Alcohol (specify) Glasses □ Goggles □ Polyviny1 □ Neoprene □ Natura1 □ Polyethylene chloride rubber GLOVES FOR HOT POLYMER Respirator type-Use only NIOSH/MESA approved equipment. NONE Other Protective Equipment NONE Precautionary Labeling </pre>

MPORTANTI The Information presented herein, while not guaranteed, was prepared by compotent lechnical personnel and is true and accurate to the best of our knowledge. NO WARRAN-TY, OR QUARANTY, EXPRESS OR IMPLIED, IS MADE REGARDING PERFORMANCE, STABILITY OR OTHERWISE. This information is not intended to be all-inclusive as to the manner and sonditions 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.



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FTHA MPANY

	MATERIAL SAFETY DATA SHEET
PRODUCT: POLYSTYR	ENE (IMPACT) PAGE 2 CF
	SECTION V - HEALTH HAZARƏ DATA
THRESHOLD LIMIT V NOT A CARCINOG NTP: NO IARC: NO OSHA: NO	ALUE EN.
ACUTE EFFECTS OF	OVEREXPOSURE
INHALATION	NEGLIGIBLE HAZARD AT ROOM TEMPERATURE. IKRITATING 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.
INGESTIÓN	N. AP.
CHRONIC EFFECTS	<u>OF OVEREXPOSURE</u>
N. AP.	
FINA OIL & CHEMICAL COMPANY MATERIAL SAFETY DATA SHEET PAGE 3 OF 3 PRODUCT: POLYSTYRENE (IMPACT) _____ SECTION VI - REACTIVITY DATA ------------CONDITIONS TO AVOID STABILITY N. AP. STABLE INCOMPATIBILITY (MATERIALS TO AVOID) N. AP. HAZARDOUS DECOMPOSITION PRODUCTS CARBON DIOXIDE, CARBON MONOXIDE, DENSE SMOKE CONDITIONS TO AVOID HAZARDOUS POLYMERIZATION N. AP. N. AP. ----SECTION VII - SPILL OR LEAK PROCEDURES _____ STEPS TO PELLETS ON THE FLOOR COULD PRESENT & SERIOUS SLIPPING PROBLEM. GOOD HOUSEKEEPING MUST BE BE TAKEN MAINTAINED AT ALL TIMES TO AVOID THIS HAZARD. SWEEP, SHOVEL, OR VACUUM MATERIAL INTO CLEAN IN CASE MATERIAL IS RELEASED CONTAINERS. OR SPILLED TRANSFER TO AN APPROVED DISPOSAL AREA IN WASTE ACCORDANCE WITH FEDERAL, STATE AND LOCAL DISPOSAL REGULATIONS. METHOD _____ -----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 THE HANDLING OF PELLETS MAY CAUSE NUISANCE DUST TO BE TAKEN IN HANDLING FORMED. TAKE NECESSARY PRECAUTIONS FOR PROTECTION OF TAKEN IN HANDLING PERSONNEL. AND STORING 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.



MATERIAL SAFETY DATA SHEET

24 Hour Emergency Phone (316) 524-5751

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

	-IDENTIFICATION	
CHEMICAL NAME Sodium Hydroxide, Anhydrous	CHEMICAL FORMULA NaCH	MOLECULAR WEIGHT
TRADE NAME Caustic Soda, Anhydrous, Beads and Solid		
SYNONYMS Caustic, Beads, Bead Caustic, Soda Lye		dot identification no. UN 1823

II- PRODUCT AND CO	MPONENT DATA		
COMPONENT(S) CHEMICAL NAME	CAS REGISTRY NO.	% (wt.) Approx.	OSHA PEL
Sodium Hydroxide	1310-73-2	100	2 mg/m³ Ceiling
CMI-NOREN INC.	ne 1986		

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

1	IV-REACTIVITY DATA
STABILITY Stable	CONDITIONS TO AVOID 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 I Chlorinated and aluminum, chlori	o avoid) fluorinated hydrocarbons (i.e. chlorofonn, difluoroethane), acetaldehyde, acrolein, ne trifluoride, hydroquinone, maleic anhydride, phosphorous pentoxide and tetrahydrofuran.
HAZARDOUS DECOMPOSITION	ON PRODUCTS Se
HAZARDOUS POLYMERIZATI Will not occur	ON

V – FIRE	AND EXPLOSION HAZARD DATA
FLASHPOINT (Mothod used)	FLAMMABLE LIMITS IN AIR
	N/A
N/A NFPA Hazard	Ratings: Health 3. Flanmability 0. Reactivity 1
NUSUAL FIRE AND EXPLOSION HAZARDS	
Firefighters should wear self contained	ed positive-pressure breathing apparatus, and avoid skin con-
Cact, Refer to Reactivity Data, Secti	Ion IV.
VI	- TOXICITY AND FIRST AID
XPOSURE LIMITS (When exposure to this product and other ch	emicals is concurrent, the exposure limit must be defined in the workplace)
and the second second	
AOGIH: 2 mg/m ³ Ceiling	
USHA: 2 mg/mr celling	
Effects described in this section are believed not to occur if expo	sures are maintained at or below appropriate TLVs.
EDICAL CONDITIONS AGGRAVATED BY EXPOSURE	sposore minis may not be applicable to all persons and those with medical conditions listed below.
May aggravate existing skin and/or eye	e conditions on contact.
CUTE TOXICITY Primary route(s) of exposure:	Inhalation 🕅 Skin XI Skin XI Ingestion
Inhalation: Inhalation of dust or mis	it can cause mild irritation at $2 mg/m^3$. More severe huros and
tissue damage at the upper respiratory	tract, can occur at higher concentrations. Pneumonitis can
result from severe exposures.	
Stin: Major potential bazard - Boad o	at liquid contract with the chine are server as a with the
ulcerations. Contact with dust or mis	t 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 ef	fects in less than 3 minutes.
Eves: Major potential hazard - Beads	in the eve can cause severe destruction and blindness. These
effects can occur rapidly effecting al	1 parts of the eye. Mist or dust can cause irritation with high
concentrations causing destructive bur	ns.
Ingestion: Ingestion of addim budges	ide and annual humbre and adde to 1t - and the
throat and stomach.' Severe scarring o	of the threat can occur after svallowing Death can regult from
ingestion.	a un autoit can occur arter swartownig. Death can result fruit
	· ·
RST AID Tabalation: Man parson to freak air	Té brechier store addaiser antélit l'a dati a
medical attention immediately.	If breathing stops, administer artificial respiration. Get
<u>Skin</u> : Remove contaminated clothing an with large quantities of water (prefer.	d inmediately wash skin thoroughly for a minimum of 15 minutes ably a safety shower). Cet medical attention inmediately.
ives: Wash eyes immediately with large	e amounts of water (preferably eyewash fountain), lifting the upper
immediately.	washing for a minimum of 13 minutes, Get medical attention
Ingestion: If person is conscious, giv	ve large quantities of water to dilute caustic. Do not induce
	and the second

CHRONIC TOXICITY

No known chronic effects.

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

Jocymei [

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

<u>Reproductive Toxicity</u>: 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/m³ 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/m³ 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 <u>contaminated with caustic should be removed immediately and thoroughly laundered before reuse</u>. 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.

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 ASIM 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	•	
PLACARD REQUIRED	· ·	
LABEL REQUIRED Corrosive. Label as required by regulations.	OSHA Hazard Communication Standard, and any applicable state an	d local

Modical Emergencies	For any other information contact:
Call collect 24 hours a day for emergency toxicological information 415/821-5338	Vulcan Chemicals Technical Service Department P.O. Box 530390 Birmingham, AL 35253-0390 800/873-4898
Call 316/524-5751 (24 hours)	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 Form 3239-230 violation of applicable laws, regulation, rules or insurance requirements.

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

Polymer



UNION CARBIDE CHEMICALS AND PLASTICS COMPANY INC. Industrial Chemicals Division

MATERIAL SAFETY DATA SHEET

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

10/10/90

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):

SOLUBILITY IN WATER by wt: 100%

EVAPORATION RATE (Butyl Acetate = 1): Nil

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

Copyright 1985, 1989 Union Carbide Chemicals & Plastics Technology Corp. UNION CARBIDE is a Trademark of Union Carbide Corporation USA CARBOWAX is a Trademark of Union Carbide Chemicals & Plastics Technology Corp. EMERGENCY PHONE NUMBER: 1-800-UCC-IIELP (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

MELT OUT TANK OIL USED:

	ui.	INGREDI	ENTS	
MATERIAL	%	TLV (Units)	HAZARD
Polyethylene Glycol	100	None	established	See Section V
IV. F	IRE AND	EXPLO	SION HAZ	ARD DATA
FLASH POINT test method(s)):	> 350 475 F	F, Pensky-N , Cleveland	Nartens closed open cup ASTN	cup ASTM D 93 M D 92
LAMMABLE LIMITS IN AIR, 6 by volume:		LOWER: UPPER;	1.1 (Est) 6.9	
EXTINGUISHING MEDIA:	Apply all techniqu	cohol-type c les for large	or all-purpose- fires. Use CO2	type foams by manufacturers' recommended 2 or dry chemical media for small fires.
SPECIAL FIRE FIGHTING PROCEDURES:	Do not c this may breathin	direct a solid y cause froth g apparatus	stream of wat hing and increas and protective	ter or foam into hot, burning pools; se fire intensity. Use self-contained e clothing.
UNUSUAL FIRE AND EXPLOSION HAZARDS:	None			
	v	. HEALTI	H HAZARD	DATA
TLV AND SOURCE:	None es	tablished by	ACGIH or OSH	Α.
EFFECTS OF SINGLE OVER	REXPOSI	JRE:		
SWALLOWING:	No evid	ence of adv	erse effects fr	om available information.
SKIN ABSORPTION:	No evid	ence of adv	erse effects fr	om available information.
INHALATION:	No evid	ence of adve	erse effects fro	om available information.
SKIN CONTACT:	No evid	ence of adve	erse effects fr	om available information.
EYE CONTACT:	No evid	lence of adv	erse effects fr	om available information.
EFFECTS OF REPEATED O	VEREXF No evid	POSURE: Jence of adv	erse effects fr	om available information.
OTHER EFFECTS OF OVEF	REXPOSI Overe> respira materia	URE: posure to vi- tory tract irr al.	apors generate Itation and in th	ed at high temperatures may result in eye and he inhalation of harmful amounts of
EMERGENCY AND FIRST A	ID PROC	EDURES:		
SWALLOWING:	No ha	rmful effects	expected.	

Carl State

SKIN:

Wash with soap and water.

PAGE 3

Contraction of the local division of the loc

PRC	DUCT	NAME:	CARBOWAX	PC
РКС	DUCI	NAME:	CARDUWAA	

¢,

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 (material	s 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 POLYMERIZA	TION: Will Not Occur
CONDITIONS TO AVOID:	None
N	II. SPILL OR LEAK PROCEDURES
STEPS TO BE TAKEN IF M	ATERIAL IS RELEASED OR SPILLED: Small spills should be flushed with large quantities of water. Larger spills should be collected for disposal.
WASTE DISPOSAL METHO	D: Incinerate in a furnace where permitted under appropriate Federal, State, and local regulations. See Section IX.
	SPECIAL PROTECTION INFORMATION
RESPIRATORY PROTECTION	ON (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
EVE PROTECTION:	Safety plasses

PRODUCT NAME:

CARBOWAX POLYETHYENE GLYCOL 600

IX. SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TA	KEN 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, 29CFR 1910.1047. 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."

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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.

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

Components present in the	product at a letter that	UPPER BOUND	
CHEMICAL	CAS NUMBER	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 ***

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.

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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%) UPPER BOLIND

		OT LIT DOOND	
CHEMICAL	CAS NUMBER	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

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
 (304)
 424-5411

PRODUCT IDENTIFICATION CYCOLAC T

TRADE NAMECycolac TCOMMON NAMEABS polymerCHEMICAL NAMEAcrylonitrile-butadiene-styrene terpolymerCAS NUMBER9003-56-9FORMULANot applicable



CMI-NOREN INC.

HAZARDOUS INGREDIENTS

CHEMICAL NAM	3 Styrene
	CAS NUMBER 100-42-5
	OSHA PEL 50 ppm TWA8
	ACGIH STEL 100 ppm

ACGIH TLV 50 ppm TWA8 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

Solid pellets
Faint
218-262°F (103-128°C)
Unknown
Unknown
Unknown
1.02-1.17
Insoluble

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

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PHYSICAL HAZARD INFORMATION

FLASH POINT	660 degrees F (349 degrees C)
LOVER 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

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PRIMARY ROUTES OF EXPOSURE

INHALATION Yes SKIN ABSORPTION No INGESTION Unlikely 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.

PL-0117-89B Page 4

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.

No No

ENGINEERING CONTROLS AND PERSONAL PROTECTIVE EQUIPMENT

VENTILATION: Recommended; sufficient to control fumes.

PERSONAL PROTECTIVE EQUIPP DEGREE OF EXPOSURE	ENT EYE	SKIN	RESPIRATORY	OTHERS
CLOSED SYSTEM (REMOTE)	A	D	NONE	NONE
OCCASTONAL (INFREQUENT)	Α	D	NONE	NONE
REPRATED & PROLONGED	Α	D	G	NONE
SPILLS (GROSS CONTACT)	Α	D	G	NONE

KEY FOR PERSONAL PROTECTIVE EQUIPMENT

A	SAFETY GLASSES	н	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
R	IMPERVIOUS CLOTHING	L	APRON
P	IMPERVIOUS AND GAS TIGHT	н	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
EXPLOSIVE	No	PEROXIDE
FLAMMABLE	No	COMPRESSED GAS
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.

STATE OF MICHIGAN



NATURAL RESOURCES COMMISSION LARRY DEVUYST PAUL EISELE MARLENE J. FLUHARTY CORDON E. GUYER TO HOLLI JTEWART MYERS HAYMOND POUPORE

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, MEdwards

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

GME:dlr Enclosure cc: Joe Holmes CMI - Noren Fruitport, Michigan

August 7, 1991

GENERAL CONDITIONS

- 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.
- 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.
- 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.
- 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.
- 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.

ČMI - Noren Permit No. 542-91 Page 3 August 7, 1991

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



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 1

Jeffrey Norton Environmental Engineer

JN/klk cc: Dr. Gary Ruff Diane Zekind STATE OF MICHIGAN

NATURAL RESOURCES COMMISSION LARRY DEVUYST PAUL EISELE GORDON E. GUYER JAMES P. HILL DAVID HOLLI O. STEWART MYERS JOEY M. SPANO



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,

do

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 <u>4</u> 1991 PERMIT SECTION



14638 Apple Drive Fruitport, MI 49415 A SUBSIDIARY OF CMI INTERNATIONAL INC.

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

[616] 842-3500

December 3, 1991 Page 2

Carbowax thermal decomposition products included recall, 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.

ames De she

James Warren Plant Engineer

JW/p Enc.

Xc: Joe Holmes 12/9/91 it note 1/23/82 - no response, so assumed ok.

12. 4.1991 10.41 P. 2 FROM BEHN INDUSTRIES MATERIAL SAFELY DATA SHEET 豪武家武武家家家家家家家家家家家家家家家家家家家家家 BUCKEYE LUBRICANTS 20801 Salisbury Rd. Bedford, Ohio 44146 Phone (216) 501 3600 Fax (216) 581-2734 a do de la celezione angli de la mana de la mana de la sur la sur la sur de la manente mé de la manente de la m FLAMMABILITY _1_ REACTIVITY _0_ PROTECTION _E_ HEALTH 1 SECTION 1 IDENTITY AND EMERGENCY INFORMATION Emergency Phone #: (216) 581-3600 Trade Name: MELT-LUBE P-NE

Chemical name and synonyms: NO Chemical Family: VEGETABLE DIL WITH ADDITIVES

Other Product Info: PRORIETARY FORMULATION

SECTION 2 - HAZARDOUS INGREDIENTS

Ingredient GAS_Number % Nature_of_Hazard NONE INDICATED

SECTION 3 - PHYBICAL DATA Boiling point (F): <u>>425F</u> Melting point (F): <u>NA</u> PH: <u>NA</u>

Vapor density (Air=1): _)1.0 Vapor pressure (mm Hg): (Q_Q)

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): <u>_>500F</u> (C.C.C.) Flammable limits in sir (LEL/UEL): <u>ND / ND</u>____

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 manuscriptionerenergy and a second second

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 yadses. Hazardous polymerization: <u>WILL NOT</u> occur. Conditions to avoid: NONE FROM BEHM INDUSTRIES

12. 4.1991 10:41

P. 3

DUCKLYL LUBRICANTS MODS for MELT LUBE P-NE (Page 2) energy and the considering and and any a three and any and any and a distances of the second s SECTION 6 - HEALTH HAZARD DATA Route of exposure: Eyes: Splash, mist, vapor. Effects of overexposure: Rodness, 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. Gral: Swallowing. Threshold limit value: Not determined. Effects of overexposure: Nausea, vomiting, diarrhea. Emergency procedures: Drink large amounts of water. Contact physician or Pdison 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 spiled clothing before reusing. Special equipment required: None with normal applications and conditions. SUIPPING AND TRANSPORTATION INFORMATION SECTION 7 D.D.T. Proper shipping name: NOT DETERMINED D. O. T. Hazard Llass: 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 Encloye Lubricents shall in no event be responsible for any damage whatsoever, directly or indirectly, resulting from the publication or use of or reliance upon data costained haresh. No warranty, either expressed or implied, of earchantibility or fitness of any holure with respect to the product or to the data is made herein.

STATE OF MICHIGAN 1 DEPARTMENT OF NATURAL RESOURCES No legender No Vorge Wo Vorge TRANSMITTAL TO: FOR ACTION AS INDICATED I NOTE AND FORWARD SIGNATURE REPLY-MY SIGNATURE APPROVAL REPLY-COPY TO ME NOTE AND FILE ACTION D PLEASE SUMMARIZE NOTE AND RETURN COMMENTS D PLEASE INVESTIGATE D PLEASE PHONE ME INFORMATION FORWARDED PER REQUEST D PLEASE SEE ME RETURN W/YOUR RECOMMENDATIONS **REMARKS:** Aduids ok to me. I'm not planning to respond. Cony problems? FROM DATE Rev 2/79



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, ich a. Bon

Rick A. Borns Process Development Manager Polymer Composite Components

vc: Jul Koebbe

c.c. D. Trumble R. Fors file:oil2

INC

AIR QUALITY DIVISION JUL 1.2 1991 PERMIT SECTION

RMT, Inc. 744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 Phone: 608-831-4444 FAX: 608-831-3334

14

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 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

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Work/Hyglenic Prectices:

Health

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

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5. IDENTITY: 1.11

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MSP-16 MOLD SAVER

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Manufacture's Name PLASTIC PROCESS EQUI	PMENT, INC.	Telephone Number	or Information	Although and	
Address 7950 EMPIRE PKWY.		Date Prepared			
MACEDONIA, OH 44056		8/30/89			
Section II - Hazardous Ingredients/Identity Inform	Common Names	SI) OSHA PEL	ACGIH TLV	STEL	46(0
Hazardous Components (Specific Chemical Identity,			350	450	
* 1,1,1 TRICHLOROETHANE (71-55-6)		100	50	200	
* PERCHLOROETHYLENE (127-18-4)		1000	1000	ASPHYXI	ANT
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Section II - Hazardous ingredients/identity informa	otion		ACGINTLY	STEL	46	k
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Soction IV . Fire and Explosion Hazard Data		and	1.000	Luci
	 Flammable Limits	1	LEL	Joce
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Extinguishing Media USE WATER FOG. DRY CHEMICAL OR CARBON DIOXIDE 1 Special Fire Fighting Procedures i. 1.0

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AEROSOL CANS MAY RUPTURE WHEN HEATED Unusual Fire and Explosion Hazards HEATED CANS. MAY BURST

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ardous Deco	fire will de	compo	se to water, Ci	arbon dioxider			
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ymerization	Will not Occur	×	None				
ction VI - He	alth Hazard Data			Skin?		Ingestion? Yes	
outo(s) of Enti	y:	Inha	lation? Yes	Yes	a statute of skin	Effects are reversi	ole. "
ealth Hazards	Acute and Chronit	c) ; ness or n	arcosis in high vapor	concentrations. Will c	se lung, liver or kidne	y damage. The solve	nts
	Long term expos	sure (yea	urs) to high concentration	ons of vapor they con		an the angle of the second	·
	listed have been	reporte	d to affect the central	nervous system.	Second Secondaria	an the second and	37.4
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Complies with OSHA Communication Standard 29 CFR 1910.1200 Dept. of Labor) Form approved OMB No 1218-0072 OSHA 174 - Sept. 1985

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CLIA	174	- Sept.	1900

Health	3
Flammability	0
Reactivity	1

NFPA Rating

1

IDENTITY:

PAINTABLE P-201

		DOT Shipping - C	Consumer Commodity	ORM-D	-
irketer's Name Must Appear Below			ahaaa Number		
	TNC.	Emergency Tolo	phone Humber (2	16)468-151	1
nulacturer's Name PLASTIC PROCESS EQUIPMENT	1 Inc.	Telephone Num	ber for information (2	16)468-151	1
dress 7950 EMPIRE PARKWAY		Date Prepared	1/31/90	Checked	V
MACEDONIA, OH 44056		J			
ection (I - Hazardous Ingredients/Identity Information		OSUA PEL	ACGIH TLV	STEL	96(op1:0
aza:dous Components (Specific Chemical Identity, Comm	non Names	S)) OSHAFEC			
		350	350	450	50-60
*1,1,1 TRICHLOROETHANE (71-55-6)		1000	750	1000	1-10
*ACETONE (67-64-1)		1000	1000	1250	35-4
CHLORODIFLUCRUMENTANE (75-45-6)		1000	-	-	1-10
NON HAZARDOUS				*	
All chemical compounds marked with an Asterisk () are to fund Amendments and Reauthorization Act (SARA) of 19 product is sold. This statement must remain a part of thi	oxic chemic 86 and 40 C is Material S	als subject to the re FR Part 372. You i Salety Data Sheet.	aporting requirements o must notify each persor	f Section 313 o to whom this m	I Title lif of the S hixture or trade
pro-	1				
Section III - Physical/Chemical Charterton	41.4 F	10 Specific Grav	$H_2O=1)$		1.2
Bolling Point Range	ND	Melting Point	PH I	iquid	- NA
Vapor Pressure PSIG @ 701	ND	Evaporation F	Rate (Butyl Acetate	= 1)	>1
Vapor Density (AIR = 1) Heavier than Air	4.0	Appearance	and Odor	NUENT ODO	R
Solubility in Water NIL			CLEAR/ S	JEVENI ODO.	
Section IV - Fire and Explosion Hazard Data		L Flammable L	imits	LEL	UEL 12 B
Flash Point (Method Used) BASED ON ACETONE -4°F T.C.C.		Trainington		2.0	12.0
Extinguishing Media Use water log, dry chemical or car	bon dioxide				
Special Fire Fighting Procedures	eated			1	
Aerosol cansinay ropert					
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aldw ?	Unstable	1.011				
and A.	Stable	×	High Temporatures	4 - 5 - 6 - 6		
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ardous Dece	omposition or Byp	HLORI	C AND HYDROFLUORIC	ACIDS AND POSSI	BET GILLE	
PHOSGEN	E AND HIDROC	I	Conditions to Avoid			
a dous	May Occur					
ymerization	Will not Occur	Ty	None			
		1^	Hone			
	anith Hazard Data					Ingestion?
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	theute and Chro	nic)		ntrations. Will cause o	efailing of skin. El	lects are reversible.
alth Hazard	May cause dizz	iness of	r narcosis in high vapor conoc		a, liver or kidney do	mage. The solvents
	Loop term exp	sure (ye	ears) to high concentrations o	I vapor may cause for		
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COMPUTATION SHEET

SHEET. (608) 831-4444 FAX: (608) 831-3334 Madison, WI 53708-8923 744 Heartland Trail P.O. Box 8923 CHECKED PROJECT/PROPOSAL NO. PROJECT / PROPOSAL NAME PREPARED By Julai By113 Date: 1/9 21197,03 CMI - Noren CMI- Noren interos to use the tollowing materials as mold release and treatment compounds at their prototype facility: Use Usage Rate Zinc Stearate - Mold release 2 - 807. cans/month 1- 802 can month Mold Saver + Mold preservative 1- 807 can/month Paintable - Mold coating 1- 802 can month Mold Cleaner - Mold cleaner The usage rave of these materials is much lower than for typical plastic injection operations since the nylon to be used @ CMIT-Noren has excellent release characteristics Estimated Emission Pares 802 = 0.0475 qu) Zinc Stearate 0,125 Sal/mo × 10,08 /gal = 1,25 /month 1 0,90 16 Volatiles (1) volatile 125 month X 1.13 × 12 mo/year = 13.5 16 volatiles 50% of this is methyl ellaroform
COMPUTATION SHEET

,744 Heartland Trail	P.O. Box 8923	Madison, WI 53708-8923	(608) 831-4444	FAX: (608) 8	SHEET 31-3334	2	OF	-
PROJECT/PROPO CMI	- Nore	24		By	Date: 11/9/	By:	Date 1/1/91	PROJECT/PROPOSAL 2197.D	. no. 3

Mold Saver, Paintable, Mold Cleaner (183 ear earl) -Assume 100 % volatile D. 1875 3a// x 10,08 b/al = 1,89 /b volatile /mo 1.89 b volatile / x 12 mo/ = 027 16 volatiles / 1.89 b volatile / x 12 mo/ = 027 16 volatiles / gear 1,89 16 volatile v. 12 molect = 36.2 16 volatiles Total most of this is methyl Chloroform (1,1,1-TCA)

STATE OF MICHIGAN

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



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, M Edwards

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

GME:dlr Enclosure cc: Joe Holmes

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CMI - Noren Fruitport, Michigan

August 7, 1991

GENERAL CONDITIONS

- 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.
- 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.
- 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.
- 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.

CMI - Noren Permit No. 542-91 Page 3 August 7, 1991

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

STATE OF MICHIGAN

NATURAL RESOURCES COMMISSION MARLENE J FLUHARTY GORDON E GUYER O. STEWART MYERS RAYMOND POUPORE



JOHN ENGLER, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING P.O. BOX 30023 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:

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. 542-91. 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.

MINOREN INC.

Mr. Terry Franklyn Page 2 June 4, 1991

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, prins A. Combinto

Dennis A. Armbruster, Supervisor Permit Section Air Quality Division 517-373-7086

IR 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 : Firs VICE PRESIDENT FOUNDRIES TITLE:

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 STATE OF MICHIGAN

NATURAL RESOURCES COMMISSION MARLENE J. FLUHARTY GORDON E. GUYER O STEWART MYERS RAYMOND POUPORE



JOHN ENGLER, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING P.O. BOX 30023 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:

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. 542-91. 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.

APPENDIX B

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PROCESS EQUIPMENT LAYOUT DIAGRAMS

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APPENDIX A

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STATE OF MICHIGAN AIR PERMIT APPLICATION FORMS

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PROTOTYPE FACILITY

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INC

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,

9 dat and

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

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CMI-Noreen PI 542-91

Warver request

The company submitted a warver 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 dose its investment and future business if it Canat provide Test parts to potential customers.

The proposed equipment should company with all regulations.

I recommend approval of the waiver request. Im Edwards 5-29-91



AIR QUALITY I ISIO.

MAY 8 1991 PERMIT SECTION

(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, Ing

Terro Franklyn Vice President Foundries

TF/p cc: Dennis Armbruster File







AIR QUALITY DIVISION

APR 29 1991

PERMIT SECTION

(616) 842-3500

14638 Apple Drive Fruitport, MI 49415 A SUBSIDIARY OF CMI INTERNATIONAL INC

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 <u>Plastic-Injection Molding Facilities, Fruitport, Michigan</u>

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-Noren, 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 productionlevel 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-Noren requests a waiver of approval of a Permit to Install to allow construction of the <u>prototype</u> facility pursuant to Michigan Air Quality Commission Rule 202. Approval of



Mr. Dennis Armbruster April 26, 1991 Page 2

this waiver would allow CMI-Noren 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 CMI is aware of no alternative facility that could approval. 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-Noren seeks this approval is to demonstrate CMI-Noren's capability If CMI is unable to begin to produce the requested parts. 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-Noren 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-Noren to prepare air emission data for consideration in the application for the CMI-Noren 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-Noren, 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-Noren submits this information solely for the confidential use by the Michigan Department of Natural Resources and the Air Pollution Control Commission unless CMI-Noren 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-Noren, 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



Mr. Dennis Armbruster April 26, 1991 Page 3

otherwise with respect to this matter, please do not hesitate to contact me.

Sincerely,

CMI-Noren, Inc.

Terry Franklyn Vice President Foundries

enclosures

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- Appendix D Equipment Brochures
- Appendix E Melt-out Tank Emission Calculations Appendix F Screen Modeling Results

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1. INTRODUCTION

CMI-Norēn 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-Norēn 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-Noren 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-Norēn 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-Norën 14638 Apple Drive Fruitport, MI 49415

Attn: Terry Franklin Phone: 616-842-3500 Fax: 616-842-5872

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RMT, Inc. 744 Heartland Trail P.O. Box 8923 Madison, WI 53708

Attn: Martin Stromberger Phone: 608-831-4444 Fax: 608-831-3334

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1-2

2. PERMIT APPLICATION SUMMARY

Production Facility

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- 1. CM-Noren 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.
- 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-Norěn process. However, the information reviewed indicates that these process raw materials do not have a significant capability to generate air emissions, toxic or otherwise.

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:

	Estimated Emission
Compound	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.

6.

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.

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-Norěn 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 ST	ACK EXHAUST PARAMETERS
Building Height	18 feet
Stack Height	30 feet
Stack Diameter	0.5 feet
Exhaust Flow Rate	62.52 20 actual cubic feet per minute
Exhaust Velocity	.320 feet per minute
Exhaust Temperature	150°F (estimate)
Minimum Distance to Property Line	45 feet

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	TABLE 4-2	
ESTIMATED AMBI	ENT CONCENTRATIONS BASED UPON TO PROTOTYPE MELT-OUT TANK	N SCREEN ANALYSIS
Compound	Maximum Modeled 1-Hour Concentration (μg/m³)	Acceptable Ambient Concentration (µg/m ³)
Methyl ethyl ketone	1.4	5,900
Acetic acid	0.07	250
Methyl formate	18.6	2,460
Dimethyl ether *	4.0	- 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	- 24 amuel
T-Butyl alcohol	0.20	3,030
Formic acid	13.3	94
Formaldehyde	1.6 (.022) ^a	12 (.08) ^b

* Value in parentheses is predicted annual impact which is obtained by dividing the hourly impact by 75.

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^b Value in parentheses represents acceptable annual concentration.

° No acceptable ambient concentration was available for these compounds.

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APPENDIX C

MATERIAL SAFETY DATA SHEETS

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Material Safety Data Succt

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 Polyhexamethylene adipamide - Nylon 66 - plus CHEMICAL NAME 33% short glass fibers. 32131-17-2 for base polymer CAS REGISTRY NUMBER All reportable ingredients are listed in the TSCA TSCA INVENTORY STATUS Chemical Substance Inventory. Not regulated DOT HAZARD CLASS NA SHIPPING NAME DATE June 6, 1990 D. L. Liczwek PREPARER

HAZARDOUS COMPONENTS

MATERIAL CAS NO. **CONCENTRATION % OSHA PEL OSHA STEL** ACGIH TLV ACGIH STEL DUPONT AEL

Additives not hazardous by 29CFR1910.1200

NA NA NA NA NA NA 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 ODOR MELTING POINT SOLUBILITY IN WATER **VOLATILE CONTENT** SPECIFIC GRAVITY

Granules None 250 - 260°C Insoluble 1 (water) 1.38

CRI-NOREN INC.

FIRE AND EXPLOSION HAZARD DATA

FLASH IGNITION TEMPERATURE 400°C METHOD ASTM D1929

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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

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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.

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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/m³ (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
- Set of the set of the section when "<" is in right margin</p>

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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

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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

¥.	Extinguishing Data Water- Water- Water- X CO2 X Dry spray fog Stream X Chemical X Foam X Earth or Sand
LRE AND DSION DAT	SpecialFire Fighting Procedures Do not Enter Allow fire Water may Building to burn Cause frothing Subscription
FJ	Unusual Fire and Explosion Hazards Dust explosion Sensitive Contamination Temp. Other hazard to shock (specify) NONE
	Stability Conditions contributing to instability Stable Unstable Image: Stable <td< td=""></td<>
Y DATA	Incompatibility-Avoid contact with Strong Strong Other acids alkalis oxidizers (specify) NONE
CTIVIT	Hazardous Deomposition Products-Thermal and Other C, CO, CO ₂
REA	Conditions to Avoid Theat Open Sparks Ignition Other flames flames Sparks (specify)
R LEAK	Steps to be taken if material is released or spilled Steps to be taken if material is released or spilled Sweep or scoop up and remove up and remove Dispose of immediately spaces Sweep or scoop up and remove or spill Sweep or scoop up and remove or spilled Sweep or scoop up and remove or spilled Sweep or scoop up and remove (specify) spaces
SPILL OF	Waste Diposal Method-Consult federal, state, or local authoities for proper procedures. Controled burial or incinderate in accordance with local, state, and federal regulations

tox1- city	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.
	Irrit- 🗌 Skin 🔲 Severe 🗋 Moderate 🐼 None ation 🗌 Eye 🔲 Severe 🗋 Moderate 🗋 Mild 🔯 None (transient)
osure	Corrosivity 🗋 Skin 🗌 4 hrs. (DOT) 🗌 24 hrs. (CPSC) 🔯 None 🗌 Eye 🗌 May cause blindness 🐼 None
riun s of Exp	Sensitization Skin Respiratory Allergen NONE NONE None None None Sensitization effects Narcotic Cyanosis Asphyxiant effect NONE
fect	Lung Effects (specify): NONE
D INI	Other (specify):
HAZAR	Ingestion Do not Induce induce Give plenty Get medical Other (specify): vomiting vomiting of water attention NONE
rst Aid	Dermal Contaminated I Flush with soap Get medical Clothing- Contaminated Other and water attention remove and launder shoes-destroy (specify
ency F1	Eye Contact X Flush with plenty of water Get medical Other for at least 15 minutes attention (specify):
Emerg	Inhalation If not breathing Remove to give artificial Give Get medical Other fresh air respiration oxygen attention (specify):
tion	<pre>Ventilation Reqirements-Always maintain exposure below permissible exposure limits. Consult an industrial hygienist</pre>
Lal Protection	Eye Glasses Goggles Chloride Hand (glove type) Butyl Polyvinyl Other Rubber Alcohol (specify) Batery Classes Goggles Chloride Chloride CLOVES FOR HOT POLYMER
Speci	Respirator type-Use only NIOSH/MESA approved equipment. NONE
	Other Protective Equipment
ų	Precautionary Labeling
ut 1	NONE Other Handling and Storage Conditions
2 1	AUGTE CONTAMINATION STORE IN COOL, DRY PLACE,

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IMPORTANTI The Information presented herein, while not guaranteed, was prepared by compotent technical personnel and is true and accurate to the best of our knowledge. NO WARRAN-TY, 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 consistent of pers, handling and storage. Other factors may involve other or additional safety or performance considerations. While our technical personnel with be happy to respond to quee Best regarding safe handling and use precedence, safe bandling and use remains the reaponeibility of the customer. He suggestions for use are intended as, and nothing herein shall be construed et, a recommendation to indeling any missing petents or to violate any Federal, Slate or local laws.

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U.S. Department of Labor Occupational Safety and Health Administration (Non-Mandatory Form) Form Approved OMB No. 1218-0072 Note: Blank spaces are not permitted. If any item is not a information is available, the space must be marked Emergency Telephone Number (301) 939-3500 Telephone Number for Information (301) 939-3500 Date Prepared May 21, 1990 Signature of Preparer (optional) OSHA PEL ACGIH TLV Other Limits Recommended None Established inorganic carbonate compounds Deing withheld as a trade sec: WMAM	Applicable, or no to indicate that % (optional) in a
Note: Blank spaces are not permitted. If any item is not a information is available, the space must be marked Emergency Telephone Number (301) 939-3500 Telephone Number for Information (301) 939-3500 Date Prepared May 21, 1990 - Signature of Preparer (optional) OSHA PEL ACGIH TLV Other Limits Recommended None Established Inorganic carbonate compounds	% (optional) in a
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Signature of Preparer (optional) OSHA PEL ACGIH TLV During None Established Loorganic carbonate compounds Deing withheld as a trade sec: WRAMA	% (optional) in a ret.
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OSHA PEL ACGIH TLV Recommended None Established Inorganic carbonate compounds Deing withheld as a trade sec:	% (optional) in a ret.
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WRome	
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Specific Gravity (H ₂ O = 1)	1.02-1.0
Melting Point	140°C
Evaporation Rate Butyl Acetate = 1)	N/A
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Flammable Limits LEL N/A N/A	UEL N/A
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	Flammable Limits N/A N/A should be worn.

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Section V -	Reactivity D-				
Stability	Unstable	a	Conditions in Aug		
	Gristable		Conditions to Avoid		
	Stable	X	Desiredan	That is a set of the	The second s
ncompatibility	(Materials to Avoid	0	1 Degrades at temper	atures greater t	than 150°C
<u>Reacts</u> w	mposition or Byproc	o lib	erate CO2 gas.		
Hazardous	May Occur	-	Louis Inc.		
olymenzation	indy occur		Conditions to Avoid		
	Will Not Occur	X			
ection VI	Health Hear	1			· · ·
oute(s) of Entry		d Data			
energy of charge	Not	Norr	Skin?		Ingestion?
ealth Hazards (Acute and Chronic)		NONO		Possible
No. 1		2.52			· • • • •
No healt	n effect dat	a is	available		
		2.			
arcinogenicity:	NO	P?	IARC	Monographs?	OSHA Regulated?
	110		NO.		No
None that mergency and F Wash hand contact.	; are known First Aid Procedures s immediate rinse thorou	ly af ughly	ter use with copious with water	amounts of soap	and water. In case of eye
None that mergency and F Wash hand contact. ection VII — eps to Be Take Spilled p Clean spi	are known First Aid Procedures S immediate rinse thorou Precautions for n in Case Material roduct shoul 11 area with ethod ccording to	ly af ughly or Saf or Saf Id be n wate	ter use with copious with water. Handling and Use Handling of Use cleaned up by mechan er.	amounts of soap ical means and c	and water. In case of eye collected in sealed drums.
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EFFECTIVE DATE: October, 1985

DO NOT DUPLICATE THIS FORM. REQUEST ORIGINAL.

Unless Carbides Corbaration urges the customer receiving this Material Safety Osta Shoeri to study it carefully to become awars of bazards. If any, of the product involved, in the interval of carbides Carbides

and the second second				VCOL 600						
ODUCT NAME: CAN	RBOWAX	WAX® POLYETHYLENE GLICOL GOG		v.	Oxyalkylene					
HEMICAL NAME: Po.	Polyethylene Glyd		Glycols	CHEMICAL FAMIL		Υ:	Polymer			
ORMULA: HO	-(CH20	CH20)	n-H	MOLECULAR WEIGHT			570 - 630			
VNONYMS: PO	lyoxy	ethyl	ene 600							
AS # 25322-68-3	CAS	NAM	E Poly(oxy-	-1,2-ethanedi	yl),a-hy	dro-w	-hydroxy			
A3 #		1.2 5								
OILING POINT,	>	200°0 (Deco	(392°F) omposes)	FREEZING	POINT		(68 to 77°F) 20 to 25°C			
PECIFIC GRAVITY	1	.130	at 20/20°C	VAPOR PR at 20°C.	ESSURE		<0.01 mm Hg			
$H_2O = 1$ (APOR DENSITY (air = 1)		>	1	SOLUBILI WATER, % at 20°C	by wt.		100			
APPEARANCE		Liquid (slight haze); mild		EVAPORA (Butyl Ac	TION RA	1)	NIL			
ODOR		-	ANT AND	and the second	the first	: ²	i sertadiani e e			
	*	- 18	1 %	TLV			HAZARD			
MATERIA			100	None established			See Section V			
Polyethylene glycol										
		-			-					
					*		9 a			
FLASH POINT	>35	O°F, °F, C	Pensky-Marte Cleveland ope	ens closed cup en cup ASTM D	92	93				
FLAMMABLE LIMITS	LO	WER	WER 1.1 (Est) UPPER							
EXTINGUISHING		Apply alcohol-type or all-purpose-type foams by manufactures recommended techniques for large fires. Use CO ₂ or dry chemical media for small fires.								
SPECIAL FIRE FIGH	TING	Do n pool	ot direct a s; this may	solid stream cause frothin	of water ig and in	or increa	foam into hot burn se fire intensity.			
UNUSUAL FIRE AND)		pools; this may cause there y							

CARBOWAX® Polyethylene Glycol 600

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None established by ACGIH or OSHA.

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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.

No evidence of adverse effects from available information.

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

SWALLOWING	No harmful effects expected.	
SKIN	Wash with soap and water.	
INHALATION	No emergency care anticipated.	
FYES	Flush with water.	
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(continued)

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NOTES TO PHYSICIAN

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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.

STAR	BILITY		
UNSTABLE	STABLE	CONDITIONS	None
	x	TO ATOLS	
INCOMPATIBIL (materials to a	ITY void)	Normally unread temperatures, s materials react	tive; however, avoid strong bases at high trong acids, strong oxidizing agents and tive with hydroxyl compounds.
HAZARDOUS C	COMBUSTION OR	Burning can pro and/or carbon o	oduce carbon monoxide dioxide.
HAZARDOUS F	OLYMERIZATION		
May Occur	Will Not Occur	CONDITIONS	None
	x	10 Arolo	
		and and	and the second sec
STEPS TO BE	TAKEN IS RELEASED	Small spills s of water. Larg disposal.	hould be flushed with large quantities er spills should be collected for
WASTE DISPO	SAL	Incinerate in appropriate Fe Also, see Sect	a furnace where permitted under deral, State, and local regulations. tion IX.

ARBOWAXO	Pol	yethylen	e Glycol	600
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ESPIRATORY (specify typ	PROTECT	ION None expected	l to be needed,	
ENTILATION	General (m satisfacto	nechanical) room vent pry.	tilation is expected to	be
GLOVES	F	VC - coated	EYE	Safety glasses
OTHER PROTE	CTIVE E	ye bath, safety show	er	

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 TWAg and the action level of 0.5 ppm TWAg.

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 Copyrighte 1985 Union Carbide Corporation

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CLASSIFICATION WHMISt controlled SIMDUT.controlled

erial Salety Data Sheet be used to comply with A's Hazard Communication Standard, FR 1910,1200, Standard must be	U 0 11 7 0	S. Department of Labor ccupational Salety and Health Admi lon-Mandatory Form) form Approved MB No. 1218-0072	inistration	()
Uted for specific (equirements,	Ŵ	ola: Blank spaces are not permitted, if an information is available, the space m	ny item is not applications to include the marked to include the marked to include the inc	ible, or no means that.
SCTROLLOY - 281		Sector Sector		
tion I	1	margency Talephone Number	885-0300	
ctrovert- Metal Dispensing Di ress (Number, Street, City, State, and ZIP Code)	vision	Telephone Number for Information (401)	885-0300	
55 Main Street		October 1987		
. Greenwich, RI 02818		Signature of Preparer (optional)		
ection II — Hazardous Ingredients/Iden	tity information		Other Limits Becommended	% (opcional)
azardous Components (Specific Chemical Identity;	Common Name(s))	OSHA PEL AUGINIEV	hed	
Bismuth (Bi) (CAS#7440-	-69-9)	None publis		
51311111 (CAS#7440-	-31-5)	2119/11		
	acteristics			
Section III — Physical/Chemical Chara	acteristics	Specific Gravity (H2O = 1)		8.7
Section III — Physical/Chemical Chara Boiling Point Vacor Pressure Imm Hg.)	acteristics 2000 ⁰ F	Specific Gravity (H ₂ O = 1) Metting Point	· ·	8.7 281°F/139°
Section III — Physical/Chemical Chara Bolling Point Vapor Pressure (mm Hg.) Vapor Density (AIR = 1)	acteristics 2000 ⁰ F N/A N/A	Specific Gravity (H ₂ O = 1) Metting Point Evaporation Rate (Butyl Acetate = 1)	· 2	8.7 281°F/139° N/A
Section III — Physical/Chemical Chara Bolling Point Vapor Pressure (mm Hg.) Vapor Density (AIR = 1) Solubility in Water None	acteristics 2000 ⁰ F N/A N/A	Specific Gravity (H2O = 1) Metting Point Evaporation Rate (Butyl Acetate = 1)	· ·	8.7 281°F/139° N/A
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Section III — Physical/Chemical Chara Boiling Point Vapor Pressure (mm Hg.) Vapor Density (AIR = 1) Solubility in Water None Appearance and Odor Silver, grav Section IV — Fire and Explosion Ha	acteristics 2000 ⁰ F N/A N/A metal, odorle zard Data	Specific Gravity (H ₂ O = 1) Metting Point Eveporation Rate (Butyl Acetate = 1) USS -	LEL N/A	8.7 281°F/139° N/A
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Section III — Physical/Chemical Chara Boiling Point Vapor Pressure (mm Hg.) Vapor Density (AIR = 1) Solubility in Water None Appearance and Odor Silver, grav Section IV — Fire and Explosion Ha Flash Point (Method Used) N/A Extinguishing Media Alloy is non-f.	acteristics 2000 ⁰ F N/A N/A metal, cdorle zard Data lammable.	Specific Gravity (H2O = 1) Melting Point Evaporation Rate (Butyl Acetate = 1) 255 - Flammable Limits N/A	LEL N/A	8.7 281°F/139° N/A
Section III — Physical/Chemical Chara Boling Point Vapor Pressure (mm Hg.) Vapor Density (AIR = 1) Solubility in Water None Appearance and Odor Silver, grav Section IV — Fire and Explosion Ha Flash Point (Method Used) N/A Extinguishing Media Alloy is non-f: Special Fire Fighting Procedures Do not	acteristics 2000 ⁰ F N/A N/A metal, odorle zard Data lammable. use water nea	Specific Gravity (H ₂ O = 1) Metting Point Evaporation Rate (Butyl Acetate = 1) 255. Flammable Limits N/A r molten metal - danger of	LELN/A of explosion.	8.7 281°F/139° N/A

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audous	May Occur	1	Conditions to Avoid						
ymenzation	Well Met Oren				_				
	Will Not Occur	X	1						-
ection VI -	- Health Haza	rd Dala		Citie 2			Incestion 7		<u>.</u>
ute(s) of Enin	r: li	Yes		No			Yes		
ath Hazards	(Acule and Chrone	c) See	Attached She	et					
arcinogenicity:		NTP?		IARC Monograp	ons?		OSHA Re	gulated	7
	None								
and and Sur	oloms of Exposure		Attached She	at					
Igna and Sym		- Se	e Attached she	æ					
mergency an	avaled by Exposu d First Aid Proced	ures If	molten metal	available for a contacts skin	or eye	nixture. e, irriga	ate imm	ediat	ely w
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Emergency an Section VII Steps to Be T Waste Dispos Precautions to Other Precau Section V Respiratory f Ventilation	avaled by Exposu d First Aid Proced cold water, I — Precaution aken in Case Matu- ial Method Dis waste regul o Be Taken in Hau Be mons Ava Ken III — Control Protection (Specify Local Exhau Mechanical sloves Heat Re	ures If seek is for S enal is Re spose of lation oding and sure oid ma ep awa Measur Type/ N st None (General/ Recor	information a molten metal medical assis Safe Handling and cleased or Spiked No of in accordar s. Waste may a Stonng solid alloy is king dust. y from childre es kone if alloy below 500°F mmended nt	available for a contacts skin tance. d Use ormal solid clea nce with local, be saleable. s dry before ad en and their en is used within	or eye or eye an up state ding t nvironm 100°F Special Other ection	nixture. e, irriga procedur e or fede to molter ment. of melt: None None Coggle	ate imme es. ral haz alloy.	ediat	us

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APPENDIX D

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EQUIPMENT BROCHURES





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 6161 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.

Newar a Composition for Quality on Saljeiry

STAGGERED TUBES PROVIDE 10.PASS SELF BAFFLED HEAT-ING SURFACE FOR HIGH EFFI-CIENCY.

FLEXIBLY DESIGNED TO PER-MIT FREE EXPANSION AND CONTRACTION, ELIMINATING WARPING AND LEAKING.

TUBES ARE 1-5/16" O.D. STEEL, HEAVY THICKNESS .133" WELD ED TO HEADERS WITH HIGH TENSILE WELD METAL.

HEAVY STEEL BASE FOR MOUNTING ON CONCRETE FLOOR. HEADERS INTERNALLY BAF.

BENT TUBE DESIGN PERMITS EACH TUBE TO EXPAND AND CONTRACT WITH CHANGES OF TEMPERATURE.

ATMOSPHERIC LOW PRESSURE SELF ASPIRATING GAS BURN-ERS PROVIDE HIGH COMBUS-TION EFFICIENCY AND UNI-FORM HEAT DISTRIBUTION ON ENTIRE HEATING SURFACE.

INTERNAL CONSTRUCTION OF A GAS FIRED MODEL

The Parker design incorporates every essential requirement a heater must have for the heating of thermal liquids.

 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.

- 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.
- 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.
- 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.
- 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.

ILOS ANNELLES CALIFORNIA 200202299

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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.

E1:00:01:01:1: 2070:

SPEC. SHEET D-207-1 APRIL 1985

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PARKER INDUSTRIAL HIGH TEMPERATURE THERMAL LIQUID HEATER HT-1296 TO HT-6250 - GAS FIRED



NOTE: LOCATION OF INLET DEPENDS ON NUMBER OF PASSES AS DETERMINED BY FACTORY.





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
в	B.T.U. OUTPUT B.T.U. PER HR.	1037 M	1229 M	1536 M	1843 M	2112 M	2496 M	2765 M	3226 H	4000 M	5000 M
IWA	WIDTH-CABINET ONLY IN.	36	42	42	42	52	58	58	58	58	58
1148	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
344	HEIGHT-CABINET ONLY IN.	52	52	52	52	52	56	56	56	56	55
348	HEIGHT OVERALL INCLUDING DRAFT HOOD(S) IN.	92	94	95	92	92	98	98	98	100	103
44	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
48	VENT STACK DIAMETER WITH BAROMETRIC DAMPER IN.	(1) 12	(1) 14	(1) 16	(1) 15	61 (1)	(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	1	7	7	7	1	1	7	10	10
78	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	1	1	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	5	3	4	4	4	4	4	4	4
16H	INLET HE IGHT FROM FLOOR IN.	19	19	19	19	19	19	19	19	21	21
170	DRAIN SIZE IN.	1	1	1	1	1	1	1	1	1	1
18	SAFETY RELIEF VALVE SIZE - 125 PS1 INLET IN.	1	1	t =	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

SPEC, SHEET D-207-1 APRIL 1985

PARKER INDUSTRIAL HIGH TEMPERATURE THERMAL LIQUID HEATER HT-126 TO HT-1008 - GAS FIRED

				NOTE:	LOCATIO OF PASS	N OF INLE ES AS DET	T DEPENDS ERMINED B	ON NUMBE Y FACTORY	R
	LIMIT & OPERATING CONTROLS 3HB 3HA 3HA 7H		18. SAF VAL				4 <u>A</u> . DR INSPEC May Be Inlet Manufa <u>16</u> . IN <u>16</u> . IN <u>16</u> . IN <u>16</u> .	CTION OPEN Colal Appl Used as When Spec Inturer.	ling. ications Alternate ified By
	7. GAS 2LA INLET 2LB	×		à	SIDE	VIEW			
	Z. GAS 2LA INLET 2LB FRONT VIEW	UT 100	Tur 190	LUT 207	SIDE	VIEW	HT-672	HT-864	HT-1008
NO.	Z. GAS 2LA INLET 2LB FRONT VIEW	HT-126	HT-180	HT-247	<u>SIDE</u> HT-432	VIEW HT-528	HT-672	HT-864	HT-1008
10.	7. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. INPUT B.T.U. PER.HR.	HT-126	HT-180 180 M	HT-247 247 M	<u>side</u> HT-432 432 M 345 M	VIEW HT-528 528 M	HT-672 672 M 538 M	HT-864 864 M 691 M	HT-1008
10.	Z. GAS	HT-126 126 M 101 M	HT-180 180 M 144 M	HT-247 247 M 198 M	<u>side</u> HT-432 432 M 346 M	VIEW HT-528 528 M 422 M	HT-672 672 M 538 M	HT-864 864 M 691 M	HT-1008 1008 M 806 M 30
NO . WA	Z. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER HR. WIDTH-CABINET ONLY IN.	HT-126 126 M 101 M 16	HT-180 180 M 144 M 16	HT-247 247 M 198 M 18	<u>side</u> HT-432 432 M 346 M 26	VIEW HT-528 528 M 422 M 26 53	HT-672 672 M 538 M 26 53	HT-864 864 M 691 M 30 53	HT-1008 1008 M 806 M 30 53
10. WA	7. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER HR. WIDTH-CABINET ONLY IN. WIDTH-OVERALL INCLUDING CONTROLS IN. WIDTH-OVERALL INCLUDING CONTROLS IN.	HT-126 126 M 101 M 16 42 30	HT-180 180 M 144 M 16 45 31	HT-247 247 M 198 M 18 45 33	<u>side</u> HT-432 432 M 346 M 26 53 41	VIEW HT-528 528 M 422 M 26 53 41	HT-672 672 M 538 M 26 53 41	HT-864 864 M 691 M 30 53 45	HT-1008 1008 M 806 M 30 53 45
NO. WA	7. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER.HR. WIDTH-CABINET ONLY IN. WIDTH-OVERALL INCLUDING CONTROLS IN. MINIMUM MEADER WIDTH - LESS FITTINGS IN. LENCTH-CABINET ONLY IN.	HT-126 126 M 101 M 16 42 30 28	HT-180 180 M 144 M 16 43 31 32	HT-247 247 M 198 M 18 45 33 40	<u>SIDE</u> HT-432 432 M 346 M 26 53 41 39	VIEW HT-528 528 M 422 M 26 53 41 44	HT-672 672 M 538 M 26 53 41 58	HT-864 864 M 691 M 30 53 45 53	HT-1008 1008 M 806 M 30 53 45 58
NO.	Z. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER.HR. WIDTH-CABINET ONLY IN. WIDTH-OVERALL INCLUDING CONTROLS IN. MINIMUM HEADER WIDTH - LESS FITTINGS IN. LENGTH OVERALL IN.	HT-126 126 M 101 M 16 42 30 28 34	HT-180 180 M 144 M 16 43 31 32 38	HT-247 247 M 198 M 18 45 33 40 44	<u>SIDE</u> HT-432 432 M 346 M 26 53 41 39 44	VIEW HT-528 528 M 422 M 26 53 41 44 48	HT-672 672 M 538 M 26 53 41 58 50	HT-864 864 M 691 M 30 53 45 53 55	HT-1008 1008 M 806 M 30 53 45 58 61
NO.	Z. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. OUTPUT B.T.U. OUTPUT B.T.U. OUTPUT B.T.U. OUTPUT B.T.U. PER HR. WIDTH-CABINET ONLY WIDTH-CABINET ONLY IN. WIDTH-CABINET ONLY IN. MINIMUM HEADER WIDTH - LESS FITTINGS IN. LENGTH-CABINET ONLY IN. LENGTH-CABINET ONLY IN. HEIGHT-CABINET ONLY IN.	HT-126 126 M 101 M 16 42 30 28 34 38	HT-180 180 M 144 M 16 43 31 32 38 38 38	HT-247 247 M 198 M 18 45 33 40 44 38	<u>side</u> HT-432 432 M 346 M 26 53 41 39 44 45	VIEW HT-528 528 M 422 M 26 53 41 44 48 45	HT-672 672 M 538 M 26 53 41 58 60 45	HT-864 864 M 691 M 30 53 45 53 55 45 45	HT-1008 1008 M 806 M 30 53 45 58 61 45
NO , 3 1WA 1WB 1WC 2LA 2LB 3HA 3HB	7. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER.HR. WIDTH-CABINET ONLY IN. WIDTH-CABINET ONLY IN. MINIMUM HEADER WIDTH - LESS FITTINGS IN. LENGTH-CABINET ONLY IN. LENGTH-CABINET ONLY IN. HEIGHT-CABINET ONLY IN. HEIGHT OVERALL IN. HEIGHT OVERALL IN. HEIGHT OVERALL IN.	HT-126 126 M 101 M 16 42 30 28 34 38 66	HT-180 180 M 144 M 16 43 31 32 38 38 38 66	HT-247 247 M 198 M 18 45 33 40 44 38 68	<u>SIDE</u> HT-432 432 M 346 M 26 53 41 39 44 45 77	VIEW HT-528 528 M 422 M 26 53 41 44 48 45 77	HT-672 672 M 538 M 26 53 41 58 60 45 79	HT-864 864 M 691 M 30 53 45 53 55 45 81	HT-1008 1008 M 806 M 30 53 45 58 61 45 81
NO . A 3 1WA 1WB 1WC 2LA 2LB 3HA 3HB +A	7. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER.HR. WIDTH-CABINET ONLY IN. WIDTH-OVERALL INCLUDING CONTROLS IN. MINIMUM HEADER WIDTH - LESS FITTINGS IN. LENGTH-CABINET ONLY IN. HEIGHT-CABINET ONLY IN. HEIGHT OVERALL INL HEIGHT OVERALL INCLUDING DRAFT HOOD IN. VENT STACK DIAMETER WITH DRAFT HOOD IN.	HT-126 126 M 101 M 16 42 30 28 34 38 66 66 6	HT-180 180 M 144 M 16 43 31 32 38 38 56 5	HT-247 247 M 198 M 18 45 33 40 44 38 68 8	<u>SIDE</u> HT-432 432 M 346 M 26 53 41 39 44 45 77 10	VIEW HT-528 528 M 422 M 26 53 41 44 48 45 77 10 0	HT-672 672 M 538 M 26 53 41 58 60 45 79 12	HT-864 864 M 691 M 30 53 45 53 55 45 81 14	HT-1008 1008 M 806 M 30 53 45 58 61 45 81 14
NO , A B 1WA 1WB 1WC 2LA 2LB 3HA 3HA 3HA 44A 49	7. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER.HR. WIDTH-CABINET ONLY IN. WIDTH-OVERALL INCLUDING CONTROLS IN. MINIMUM HEADER WIDTH - LESS FITTINGS IN. LENGTH-CABINET ONLY IN. LENGTH OVERALL INL HEIGHT-CABINET ONLY IN. VENT STACK DIAMETER WITH DRAFT HOOD IN. VENT STACK DIAMETER WITH BAROMETRIC DAMPER IN.	HT-126 126 M 101 M 16 42 30 28 34 38 66 6 6 5	HT-180 180 M 144 M 16 43 31 32 38 38 38 56 5 5	HT-247 247 M 198 M 18 45 33 40 44 38 68 8 68 8 6	<u>SIDE</u> HT-432 432 M 26 53 41 39 44 45 77 10 8	VIEW HT-528 528 M 422 M 26 53 41 44 48 45 77 10 8	HT-672 672 M 538 M 26 53 41 58 60 45 79 12 10	HT-864 864 M 691 M 30 53 45 53 55 45 81 14 10	HT-1008 1008 M 806 M 30 53 45 58 61 45 81 14 12
NO , A B 1WA 1WB 2LA 2LB 3HA 3HB 4A 19 	Z. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER.HR. WIDTH-CABINET ONLY IN. LENGTH-CABINET ONLY IN. LENGTH-CABINET ONLY IN. LENGTH-CABINET ONLY IN. LENGTH OVERALL IN. HEIGHT-CABINET ONLY IN. VENT STACK DIAMETER WITH DRAFT HOOD IN. VENT STACK DIAMETER WITH BAROMETRIC DAMPER IN. STD. NAT. GAS INLET SIZE / MAN. PRESS. AT BURNER: 4"WC IN.	HT-126 126 M 101 M 16 42 30 28 34 38 66 6 5 3/4	HT-180 180 M 144 M 16 43 31 32 38 38 56 5 5 3/4	HT-247 247 M 198 M 18 45 33 40 44 38 68 8 68 8 6 58 8 6 3/4	<u>SIDE</u> HT-432 432 M 346 M 26 53 41 39 44 45 77 10 8 1	VIEW HT-528 528 M 422 M 26 53 41 44 48 45 77 10 8 1	HT-672 672 M 538 M 26 53 41 58 60 45 79 12 10 1	HT-864 864 M 691 M 30 53 45 53 55 45 81 14 10 1-1/2	HT-1008 1008 M 806 M 30 53 45 58 61 45 81 14 12 1-1/2
NO . A 3 1WA 1WB 1WC 2LA 2LB 3HA 3HB 4A 19 2A	Z. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER HR. WIDTH-CABINET ONLY IN. LENGTH-CABINET ONLY IN. LENGTH OVERALL INCLUDING CONTROLS IN. IN. LENGTH OVERALL IN. LENGTH OVERALL IN. HEIGHT OVERALL IN. VENT STACK DIAMETER WITH DRAFT HOOD IN. VENT STACK DIAMETER WITH BAROMETRIC DAMPER IN. STD. NAT. GAS INLET SIZE / MAN. PRESS. AT BURNER: 4"WC IN. STD. NAT. GAS INLET SUPPLY PRESS: MAX: 14"WC; MIN: 7"WC IN.	HT-126 126 M 101 M 16 42 30 28 34 38 66 6 5 5 3/4	HT-180 180 M 144 M 16 43 31 32 38 38 56 5 3/4 1	HT-247 247 M 198 M 18 45 33 40 44 38 68 8 68 8 6 5	<u>SIDE</u> HT-432 432 M 346 M 26 53 41 39 44 45 77 10 8 1	VIEW HT-528 528 M 422 M 26 53 41 44 48 45 77 10 8 1	HT-672 672 M 538 M 26 53 41 58 60 45 79 12 10 1	HT-864 864 M 691 M 30 53 45 53 55 45 81 14 10 1-1/2 1-1/2	HT-1008 M 1008 M 806 M 30 53 45 58 61 45 81 14 12 1-1/2 1-1/2
NO, MA MA MA MA SHA SHA SHA SHA SHA SHA SHA SHA SHA SH	Z. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER HR. WIDTH-CABINET ONLY IN. WIDTH-CABINET ONLY IN. WIDTH-CABINET ONLY IN. WIDTH-CABINET ONLY IN. LENGTH-CABINET ONLY IN. LENGTH-CABINET ONLY IN. LENGTH-CABINET ONLY IN. LENGTH-CABINET ONLY IN. LENGTH OVERALL INL HEIGHT OVERALL INL VENT STACK DIAMETER WITH DRAFT HOOD IN. VENT STACK DIAMETER WITH BAROMETRIC DAMPER IN. STD. NAT. GAS INLET SIZE / MAN. PRESS. AT BURNER: 4"WC IN. STD. NAT. GAS INLET SIZE / MAN. PRESS. AT BURNER: 4"WC IN. STD. NAT. GAS INLET SUPPLY PRESS: MAX: 14"WC; MIN: 7"WC HI HI PRESS. NAT. 6 LP GAS INLET SIZE / SUPPLY PRESS 1-10 PS1 IN. IN.	HT-126 126 M 101 M 16 42 30 28 34 38 66 6 5 3/4 1	HT-180 180 M 144 M 16 45 31 32 38 38 56 5 5 3/4 1	HT-247 247 M 198 M 18 45 33 40 44 38 68 8 68 8 5 5 3/4 1	<u>SIDE</u> HT-432 432 M 346 M 26 53 41 39 44 45 77 10 8 1 1	VIEW HT-528 528 M 422 M 26 53 41 44 48 45 77 10 8 1 1	HT-672 672 M 538 M 26 53 41 58 60 45 79 12 10 10 1	HT-864 864 M 691 M 30 53 45 53 55 45 81 14 10 1-1/2 1-1/2	HT-1008 1008 M 806 M 30 53 45 58 61 45 81 14 12 1-1/2 1-1/2
WA WB WC LA LB HA A B B	Z. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER.HR. WIDTH-CABINET ONLY IN. WIDTH-OVERALL INCLUDING CONTROLS IN. MINIMUM HEADER WIDTH - LESS FITTINGS IN. LENGTH-CABINET ONLY IN. LENGTH OVERALL INL VENT STACK DIAMETER WITH DRAFT HOOD IN. VENT STACK DIAMETER WITH BAROMETRIC DAMPER IN. STD. NAT. GAS INLET SIZE / MAN. PRESS. AT BURNER: 4"WC IN. STD. NAT. GAS INLET SIZE / MAN. PRESS. AT BURNER: 4"WC IN. STD. NAT. GAS INLET SUPPLY PRESS: MAX: 14"WC; MIN: 7"WC HI HI PRESS. NAT. & LP GAS INLET SIZE / SUPPLY PRESS 1-10 PSI IN. LPG MANIFOLD PRESS. AT BURNER: 18"WC	HT-126 126 M 101 M 16 42 30 28 34 38 66 6 5 3/4 1 1	HT-180 180 M 144 M 16 43 31 32 38 38 66 5 5 3/4 1 5	HT-247 247 M 198 M 18 45 33 40 44 38 68 8 6 6 3/4 1 1 5	<u>SIDE</u> HT-432 432 M 346 M 26 53 41 39 44 45 77 10 8 1 1 1 5	VIEW HT-528 528 M 422 M 26 53 41 44 48 45 77 10 8 1 1 1 5	HT-672 672 M 538 M 26 53 41 58 60 45 79 12 10 1 1 1 5	HT-864 864 M 691 M 30 53 45 53 55 45 81 14 10 1-1/2 1-1/2 5	HT-1008 1008 M 806 M 30 53 45 58 61 45 81 14 12 1-1/2 1-1/2 5
NO, WA WB WWC CLA BHA BHA B B A B B B B B B B B B B B B	Z. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER.HR. WIDTH-CABINET ONLY IN. WIDTH-OVERALL INCLUDING CONTROLS IN. MINIMUM HEADER WIDTH - LESS FITTINGS IN. LENGTH-CABINET ONLY IN. LENGTH OVERALL INCLUDING CONTROLS MINIMUM HEADER WIDTH - LESS FITTINGS IN. LENGTH OVERALL INL VENT STACK DIAMETER WITH - LESS FITTINGS IN. VENT STACK DIAMETER WITH DRAFT HOOD IN. VENT STACK DIAMETER WITH DRAFT HOOD IN. VENT STACK DIAMETER WITH BAROMETRIC DAMPER IN. STD. NAT. GAS INLET SIZE / MAN. PRESS. AT BURNER: 4"WC IN. STD. NAT. GAS INLET SUPPLY PRESS: MAX: 14"WC; MIN: 7"WC HI HI PRESS. NAT. & L P GAS INLET SIZE / SUPPLY PRESS 1-10 PS1 IN. LPG MANIFOLD PRESS. AT BURNER: 18"WC GAS INLET HEIGHT FROM FLOOR IN. VERATIFE CORFEC SO.FT.	HT-126 126 M 101 M 16 42 30 28 34 38 66 66 6 5 3/4 1 1 6 6 21	HT-180 180 M 144 M 16 43 31 32 38 38 66 6 5 3/4 1 6 27	HT-247 247 M 198 M 18 45 33 40 44 38 68 8 6 5 3/4 1 1 6 40.5	<u>SIDE</u> HT-432 432 M 346 M 26 53 41 39 44 45 77 10 8 1 1 1 5 5 67	VIEW HT-528 528 M 422 M 26 53 41 42 48 45 77 10 8 1 1 1 1 5 77	HT-672 672 M 538 M 26 53 41 58 60 45 79 12 10 1 1 1 1 5 106	HT-864 864 M 691 M 30 53 45 53 55 45 81 14 10 1-1/2 1-1/2 5 120	HT-1008 1008 M 806 M 30 53 45 58 61 45 81 14 12 1-1/2 1-1/2 5 133
NO,	Z. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER.HR. WIDTH-CABINET ONLY IN. WIDTH-OVERALL INCLUDING CONTROLS IN. MINIMUM HEADER WIDTH - LESS FITTINGS IN. LENGTH-CABINET ONLY IN. LENGTH-CABINET ONLY IN. LENGTH-CABINET ONLY IN. LENGTH OVERALL INL NOTH-CABINET ONLY IN. LENGTH OVERALL INN. LENGTH OVERALL INN. VENT STACK DIAMETER WITH DRAFT HOOD IN. VENT STACK DIAMETER WITH BAROMETRIC DAMPER IN. STD. NAT. GAS INLET SIZE / MAN. PRESS. AT BURNER: 4"WC IN. STD. NAT. GAS INLET SUPPLY PRESS: MAX: 14"WC; MIN: 7"WC HI MI PRESS. NAT. & LP GAS INLET SIZE / SUPPLY PRESS 1-10 PS1 IN. LPG MANIFOLD PRESS. AT BURNER: 18"WC GAS INLET HEIGHT FROM FLOOR IN. HEATING SURFACE SQ.FT.	HT-126 126 M 101 M 16 42 30 28 34 38 66 6 5 3/4 1 6 21 -1/4	HT-180 180 M 144 M 16 43 31 32 38 38 56 5 3/4 1 6 27 1-1/4	HT-247 247 M 198 M 18 45 33 40 44 38 68 8 6 5 3/4 1 1 6 40.5 1-1/2	<u>SIDE</u> HT-432 432 M 346 M 26 53 41 39 44 45 77 10 8 1 1 1 5 67 1-1/2	VIEW HT-528 528 M 422 M 26 53 41 44 48 45 77 10 8 1 1 1 5 77 2	HT-672 672 M 538 M 26 53 41 58 60 45 79 12 10 1 1 1 1 5 106 2	HT-864 864 M 691 M 30 53 45 53 55 45 81 14 10 1-1/2 1-1/2 5 120 2	HT-1008 1008 M 806 M 30 53 45 58 61 45 81 14 12 1-1/2 1-1/2 5 133 2
NO , A B IWA IWB IWC 2LA 2LA 2LA 2LB 3HA 3HA 3HA 3HA 7H 14 15	Z. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER HR. B.T.U. OUTPUT B.T.U. PER HR. WIDTH-CABINET ONLY IN. LENGTH-CABINET ONLY IN. LENGTH-CABINET ONLY IN. LENGTH OVERALL INCLUDING CONTROLS MINIMUM HEADER WIDTH - LESS FITTINGS IN. LENGTH-CABINET ONLY IN. LENGTH OVERALL INL NEIGHT OVERALL INN. VENT STACK DIAMETER WITH DRAFT HOOD IN. VENT STACK DIAMETER WITH BAROMETRIC DAMPER IN. STD. NAT. GAS INLET SIZE / MAN. PRESS. AT BURNER: 4"WC IN. STD. NAT. GAS INLET SUPPLY PRESS: MAX: 14"WC; MIN: 7"WC IN. HI PRESS. NAT. & LP GAS INLET SIZE / SUPPLY PRESS 1-10 PS1 IN. LPG MANIFOLD PRESS. AT BURNER: 18"WC GAS INLET HEIGHT FROM FLOOR IN. HEATING SURFACE SQ.FT.	HT-126 126 M 101 M 16 42 30 28 34 38 66 6 5 3/4 1 1 6 21 1-1/4 32	HT-180 180 M 144 M 16 43 31 32 38 38 56 5 3/4 1 6 27 1-1/4 32	HT-247 247 M 198 M 18 45 33 40 44 38 68 8 6 5 3/4 1 1 6 40.5 1-1/2 32	<u>SIDE</u> HT-432 432 M 346 M 26 53 41 39 44 45 77 10 8 1 1 5 67 1-1/2 37	VIEW HT-528 528 M 422 M 26 53 41 44 48 45 77 10 8 1 1 1 5 77 2 37	HT-672 672 M 538 M 26 53 41 58 60 45 79 12 10 1 1 1 5 106 2 37	HT-864 864 M 691 M 30 53 45 53 55 45 81 14 10 1-1/2 5 120 2 37	HT-1008 1008 M 806 M 30 53 45 58 61 45 81 14 12 1-1/2 5 133 2 37
NO., NO.,	Z. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER.HR. WIDTH-CABINET ONLY IN. WIDTH-CABINET ONLY IN. WIDTH-CABINET ONLY IN. WIDTH-CABINET ONLY IN. LENGTH-CABINET ONLY IN. LENGTH-CABINET ONLY IN. LENGTH OVERALL INCLUDING CONTROLS MINIMUM HEADER WIDTH - LESS FITTINGS IN. LENGTH-CABINET ONLY IN. LENGTH OVERALL INL LENGTH OVERALL INL NEIGHT OVERALL INN. VENT STACK DIAMETER WITH DRAFT HOOD IN. VENT STACK DIAMETER WITH BAROMETRIC DAMPER IN. STD. NAT. GAS INLET SIZE / MAN. PRESS. AT BURNER: 4"WC IN. STD. NAT. GAS INLET SUPPLY PRESS: MAX: 14"WC; MIN: 7"WC IN. STD. NAT. GAS INLET SUPPLY PRESS: MAX: 14"WC; MIN: 7"WC IN. HI PRESS. NAT. & LIP GAS INLET SIZE / SUPPLY PRESS 1-10 PS1 IN. LPG MANIFOLD PRESS. AT BURNER: 18"WC GAS INLET HEIGHT FROM FLOOR <td>HT-126 126 M 101 M 16 42 30 28 34 38 66 6 5 3/4 1 1 6 21 -1/4 32 1-1/4</td> <td>HT-180 180 M 144 M 16 43 31 32 38 38 66 6 5 3/4 1 1 6 27 1-1/4 32 1-1/4</td> <td>HT-247 247 M 198 M 18 45 33 40 44 38 68 8 68 8 6 5 3/4 1 1 6 40.5 1-1/2 32 1-1/2</td> <td><u>SIDE</u> HT-432 432 M 346 M 26 53 41 39 44 45 77 10 8 1 1 1 5 67 67 1-1/2 37 1-1/2</td> <td>VIEW HT-528 528 M 422 M 26 53 41 44 48 45 77 10 8 1 1 1 5 77 10 8 1 1 5 77 77 2 37 2</td> <td>HT-672 672 M 538 M 26 53 41 58 60 45 79 12 10 12 10 1 1 5 106 2 37 2</td> <td>HT-864 864 M 691 M 30 53 45 53 55 45 81 14 10 1-1/2 5 120 2 37 2</td> <td>HT-1008 1008 M 806 M 30 53 45 58 61 45 81 14 12 1-1/2 5 133 2 37 2</td>	HT-126 126 M 101 M 16 42 30 28 34 38 66 6 5 3/4 1 1 6 21 -1/4 32 1-1/4	HT-180 180 M 144 M 16 43 31 32 38 38 66 6 5 3/4 1 1 6 27 1-1/4 32 1-1/4	HT-247 247 M 198 M 18 45 33 40 44 38 68 8 68 8 6 5 3/4 1 1 6 40.5 1-1/2 32 1-1/2	<u>SIDE</u> HT-432 432 M 346 M 26 53 41 39 44 45 77 10 8 1 1 1 5 67 67 1-1/2 37 1-1/2	VIEW HT-528 528 M 422 M 26 53 41 44 48 45 77 10 8 1 1 1 5 77 10 8 1 1 5 77 77 2 37 2	HT-672 672 M 538 M 26 53 41 58 60 45 79 12 10 12 10 1 1 5 106 2 37 2	HT-864 864 M 691 M 30 53 45 53 55 45 81 14 10 1-1/2 5 120 2 37 2	HT-1008 1008 M 806 M 30 53 45 58 61 45 81 14 12 1-1/2 5 133 2 37 2
NO , A 3 1WA 1WB 1WC 2LA 2LB 3HA 3HB 4A 9 7H 15 15H 16 16H	Z. GAS 2LA INLET 2LB FRONT VIEW I T E M B.T.U. INPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER.HR. B.T.U. OUTPUT B.T.U. PER.HR. WIDTH-CABINET ONLY IN. LENGTH-CABINET ONLY IN. VENT STACK DIAMETER WITH DRAFT HOOD IN. VENT STACK DIAMETER WITH BAROMETRIC DAMPER IN. VENT STACK DIAMETER WITH BAROMETRIC DAMPER IN. STD. NAT. GAS INLET SIZE / MAN. PRESS. AT BURNER: 4"WC IN. STD. NAT. GAS INLET SUPPLY PRESS: MAX: 14"WC; MIN: 7"WC IN HI PRESS. NAT. & LP GAS INLET SIZE / SUPPLY PRESS 1-10 PS1 IN.	HT-126 126 M 101 M 16 42 30 28 34 38 66 6 5 3/4 1 1 6 21 -1/4 32 1-1/4 15	HT-180 180 M 144 M 16 43 31 32 38 38 66 6 5 3/4 1 6 27 1-1/4 32 1-1/4 15	HT-247 247 M 198 M 18 45 33 40 44 38 68 8 6 5 3/4 1 1 6 40.5 1-1/2 32 1-1/2 15	<u>SIDE</u> HT-432 432 M 346 M 26 53 41 39 44 45 77 10 8 1 1 1 5 67 1-1/2 37 1-1/2 17	VIEW HT-528 528 M 422 M 26 53 41 42 48 45 77 10 8 1 1 1 5 77 10 8 1 1 5 77 2 37 2 17	HT-672 672 M 538 M 26 53 41 58 60 45 79 12 10 12 10 1 1 5 5 106 2 37 2 17	HT-864 864 M 691 M 30 53 45 53 55 45 81 14 10 1-1/2 1-1/2 5 120 2 37 2 17	HT-1008 1008 M 806 M 30 53 45 58 61 45 81 14 12 1-1/2 5 133 2 37 2 17
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	Sales Company, Inc.	Robert A. Gri
	November 20,	1990
Mr. Buzz Larsen C. M. I. NOREN 14638 Apple Driv Fruitport, MI 4 (616) 842-3500	19415	
	INTEC SALES COMPANY, INC. Equipment Ouotation	
2 Indoor stor	age silos, 40,000# capacity	
1 Installatio	on of silos	
2 Conair soud including: clean-out sight gla drain por alide gat blank ada lid with As describe Price Eachs	door isses it is shut-off apter plate provisions for a Conair loader. in enclosed Bulletin FDB-9.	
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	D. D Making (0409 2005	FAX (616) 392-5638

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November 20, 1990 C. M. I. NOREN Page 2 Conair CD600-A Compu-Dry Dehumidifying Dryer, including: --microprocessor control --user friendly programmable microprocessor --utilizes & 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: -Conair 7-1/2 hp Pump/Motor Assembly, including: 2 --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. TEFC motor - 240 or 480/3/60 (specify one); NEMA-1 pump control - 115/1/60. Voltage: As described in enclosed Bulletin FLB-3.

Price Each:

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 Conair Dust Collector for use with a 7-1/2 hp Pump/Motor, including; floor stand threa-way valve assembly manual dump dust pan. As described in the enclosed Bulletin FLE-3. Price Each:	 Conair Dust Collector for use with a 7-1/2 hp Pump/Motor, including: floor stand threa-way valve assembly manual dump dust pan. As described in the enclosed Bulletin FLE-3. Price Each: Price Each: 10 Conair 15" diameter Selectronic 4 Singla-Tube Vacuum Loader for use with a 7-1/2 hp Pump/Motor Assembly, and Selectronic 4 Control, including: screen filter threa-way vacuum breaker valve automatic lavel control metallic weighted discharge flange-mounted Bicroprocessor control with adjustable load timer sufficient tubing to accomplish a 12' vertical lift vertical or horisontal feed tube (specify one). As described in enclosed Bulletin FLE-3. Price Each: \$1,315.00 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 PEPRESENTATIVE FOR INFORMATION ON THE CONAIR LEASING PROGRAM. This quotation remains valid for a period of 30 days. 		1. NOREN		Nove Page	mber 20, 199 J	0
 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 metallid 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. Frice Each: \$1,315.00 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. 	 10 Conair 15" diameter Selectronic 4 Singla-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 PLB-3. Price Each: \$1,315.00 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. 	2	Conair Dus Pump/Motor floor st three-we manual d As descrip Price Each	t Collector f , including; and by valve assen ump dust pan. bed in the encome	for use with ably closed Bulle	a 7-1/2 hp tin FLB-3.	
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The New Generation of Herrmann Ultrasonic Welders for Thermoplastic Resins



ULTRASONICS

Innovative Technology of Herrmann

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The new Herrmann Ultrasonic welders produce consistent high-quality bonding in high speed thermoplastic welding operations with 100% positive QualityAssurance.

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 inprocess Quality Control provides 100% positive Quality Assurance to any ultrasonic welding operation.

Today and in the future . . . Positive control over your manufacturing process.



Positive Quality Control

Contraction of the That 124 ACCH NOT 5.02 Steam iron water tank. Energy control and millisecond control of the power output ensure high quality welding and automatic error diagnosis. 1 State Are MILLISECOND Control n-Process Quality Assurance 12

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 millises and the acteristics. Inaddition, throughout the melting process, the downward melt-velocity of the weld horn is compared to the programmed joining velocity curve.

MILLISECOND CONTROL .

at a Glance

JALOG screens illustrate the velding-process, thus providig the possibility to evaluate ind optimize individual welding applications. Specific elding error messages are splayed together with the issociated nominal and acial 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.

Weld Force Programming

Contrary to manual triggerand 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.

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.

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 (Relerence 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 zeroreference 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 programentry 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. REVOLUTIONARY. THE NEW GENERATION.

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.



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 Trough Process-Data Logging

s provides automatic weld-force adjustment with connt cylinder pressure (always => 25psi) for precise and roducible weld and trigger force. Fast and simple ingeover make the welder especially suitable for the nufacturing of small batches. Labor extensive system difications (exchange of cylinder) and/or indefinable and

n-reproducible welding results are eliminated.

rough 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.

a data logging feature supplies both technicians and nagement with comprehensive information on machine 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 MILLISEC-OND 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.



Extended Flexibility. Ultrasonic Welders with DIALOG

HS DIALOG

UNSTRUME)

Areas of Application

Herrmann Ultrasonic Welders are characterized by their allaround 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 ultra-

sonic welders. Some outstand-

ing 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.



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



E 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 backlashfree 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

rechnical spec	meano	113		HS DIALOG					ULTRASAFE DIALOG		
		35/300		35 1000	20/2000	1	20/3000	1	20/2000	20/3000	-
Frequency Ultrasonic power Supply voltage Control voltage Height adjustment	[KHz] [W] [V/Hz] [V] [mm]	300	35	1000	2000 Europe:	220/50 24 480	3000 USA: 240/60	20	2000	3000	
Horn stroke Working area Machine dimensions	[mm] [mm] [mm]			560+3	3 50x1130	100 00x300			1600×76	50×2225	
Machine range Color spec. Weight	[mm] [ka]			1	BLUE 30 (295 lbs.)	DARK	BLUE		48	80 (990 lbs.)	_

REVOLUTIONARY. THE NEW GENERATION.

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 con-



trolled 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.

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

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. 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 UItrasonics DIALOG welders, it can easily be integrated into automated production lines.



Subject to technical changes

Herrmann Ultrasonics Inc. 630 Estes Avenue Schaumburg, IL 60193 TEL: (708) 980-7344 FAX: (708) 980-1470



APPENDIX E

MELT-OUT TANK EMISSION CALCULATIONS

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COMPUTATION SHEFT (608) 831-4444 FAX: (608) 831-3334 Madison, WI 53708-8923 744 Heartland Trail P.O. Box 8923 PROJECT/PROPOSAL NO. PREPARED CHECKED PROJECT / PROPOSAL NAME Date: CMI - Noren Union Carbide Evaluation Mass emission rate: 0.57 groms Reprovince generation period: 18 kours (1) Epproximile Carbowax Surface ore: 0.05/4= () Estimited totlemission rate = 0.57 grums/18 hours = 0.0317 grows / hour Extrapolation & CMI - Noren Melt - Out Tanks Proposed Meltout tank surface areas 3x40'= 120/4" Estimated melt out tank emission note: 120 ft × 0:0317 grans = 76.1 grans/h-761 9 1 x 453.69 = 0.168 16/1- N 0.17 15/1-(1) Tele-Con on Murch 12, 1991, between Diane Gillenwooder & Union Carbide & Martin Stromberger of AMT.

COMPUTATION SHEET Z OF 3 (608) 831-4444 FAX: (608) 831-3334 Madison, WI 53708-8923 P.O. Box 8923 744 Heartland Trail PROJECT/PROPOSAL NO. CHECKED PREPARED PROJECT / PROPOSAL NAME 3/20/91 By Bole: 10w 2197.01 MI - Noron Estimated Specific Organic Compound Emission R.L. for melt-out tankso Each of 3 Estimolist Emission 2.4 13/10-2 13/10-(Eve) 13/ Percent 13/4 (mor) Compound. 31 Methyl Ethyl Katone 21 0.35 2.09 1.6 Beefic beil 1.1 0.018 2.11 410 280 Methyl Formate Dimethyl Ether 4.6 27.69 63 1.0 92 6.20 110 160 1.8 Aceta/dehyde. 10.84 1.9 1.3 0.13 0.022 Methyl Alcohol 2-Buty Acetate Methy Abstate Butgrie Deid 29 42 2.85 0.4B 70 100 6.87 1.2 0.38 23 34 2.26 3.0 0.049 4.3 0.29 1-Betal Alcohal 3.3 290 200 19.55 Formic Deid 0.40 35 2.35 24 Formaldehade (1) Percent by weight of emissions generated in Union la bile Study. Estimated missions was coloulited by Multiply in the estimated total armin compound emission hats (0.17 b/h) & tress Operatoryes (2) Based on operation of the melt-out land 24 hours per day and 250 days par year. (3) Bosed on operation of the nelt-out tent 24 hours per days and 365 days par year. ------

COMPUTATION SHEET OF_ 3 - SHEET. Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334 744 Heartland Trail P.O. Box 8923 PROJECT/PROPOSAL NO CHECKED PREPARED PROJECT / PROPOSAL, NAME Dote: 3/26/Er By: By Date: 16. MT - Norew Due to the lock of information, it want possible to adjust the Union Co-bib emission date for the following parameters: Union Co-bide Exclust-Pucco Parameter ~ 340°F 159°F Carbowox Temperatur 760 mr Hg 459 mm Hg Atmospheric Pressur minimal Introduction for the parts into ton his. Dgitati-÷. . . - - -. The second second second 1.1 . . . ACTIVE 1440 والمما المراجع الممادية منه ببدا تواويون الو and the second second the term and the second المقاد والمحصور والم والمرجعة المردونية بستانين ترديك -----e e e e le le ----a sea a s والمروان المتدرية ستم مممع ورايا موجمه ------11 m m dar -

Polyethylene Glycols

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.

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OXIDATIVE DEGRADATION OF "CARBOWAX"

OXIDATION PRODUCTS AS DETERMINED BY MASS SPECTRUM

Per Cent by	Weight		Mole Per Cent	
2.09			1.01	
0.11			0.06	
27.69			16.11	
6.20			4.72	
10.82			8.56	
0.13			0.14	
23.29			. 45.20	
2.85			0.84	
6.87			3.21	
2.26		G	0.90	
0.29			0.14	
19.55	40		14.85	
1.20			0.94	
2.35			3.32	
	Per Cent by 2.09 0.11 27.69 6.20 10.82 0.13 23.29 2.85 6.87 2.26 0.29 19.55 1.20 2.35	Per Cent by Weight 2.09 0.11 27.69 6.20 10.82 0.13 23.29 2.85 6.87 2.26 0.29 19.55 1.20 2.35	Per Cent by Weight 2.09 0.11 27.69 6.20 10.82 0.13 23.29 2.85 6.87 2.26 0.29 19.55 1.20 2.35	Per Cent by WeightMole Per Cent2.091.010.110.0627.6916.116.204.7210.828.560.130.1423.2945.202.850.846.873.212.260.900.290.1419.5514.851.200.942.353.32

Weight of CARBOWAX oxidized		
Moles of 'oxygen. consumed'		
Weight of light material isolated	4	
Oxidation temperature		
Oxidation pressure	1	
Total carbonyl content in residue	•	
Free carbonyl content in residue		
High molecular weight acids		

CARBOWAX

Polyethylene Glycols

= `	50.0 grams	(0.0256	moles)	

= 0.01769

= 0.570 gram

= 70.0±0.1°C

- = 459±1 mm.
- = 0.411 per cent
- = 0.230 per cent
 - 0.0776 mg. equivalent per gram of residue

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APPENDIX F

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SCREEN MODELING RESULTS

COMPUTATION SHEET

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and Trail P.O. Box 8923 Madison, WI 53708-85	923 (608) 831-4444 FAX: (6		OF
PROPOSAL NAME	PREPARED	CHECKED	PROJECT/PROPOSAL
CMI	DJF 4	5/41 MUS 475/	51 2197 03
SREEN ANA	LYSIS		
Emission Rate	18/3 (7.941	b/ha)	
Stack herd-1	9.15 m		
exit vel	1.62 m/s		
temperature	338.7°K_		
	1.0		
Globy height	5.49	-	
Bletz length	58.07	*	k.
Blog under	36.66	1413 (4444444) - 14445 (1	2
	· · · ·	· · · ·	
Mars T	0208 40 /103	Q 55 M	
Impact is	to to at impart	to for substance	as, For one hou
ratio emission ra	la in	<u></u>	•7
Ingraco It and			
ERS	ulstance A 3208	ug/m3 = Im	nact sutstance A
7.94	4	0	
For annual re	sulto durde on	e how unpa	it by 75. Th
75 factor is co	insistent with	Michigan Au	Topics screening 7
	و به مستحد ما ا		
Compound	Emission Rate	Impact	
V	(16/hr)	1-hi	annual
MEK	-0035		······
Acetu Aud	00018	0.073	and all the second
Methyl Formate	.046	18.5 ⊥ .	a a la de marce
Domethyl etter	.010	9.0	0.007
Acetaldehyde	.018	7.3	0.011
Methyl Alcohol	.00012	19	
2-Bidy acctale	-0048	'./	
methyl aletale		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·
- Butypic acid		0.109	
f-butyl alcond	00099	12 3	
tormic and	033	13.5	0021
tormaldeliget .	.00.9	110.	······
ا ب محمد و بر معد دور ا		· · · · · · · · · ·	i i se servez en la la
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*** 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

SUOY. FLUX = .01 M**4/S**3; MOM. FLUX = .01 M**4/S**2.

*** FULL METEOROLOGY ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

	CONC		1110M	LISTK	MIX HT	PLUME	SIGMA	SIGMA		
DISI	CONC		UTON	OUTK	nin ni			7 /41	DUACH	
(M)	(UG/M**3)	STAB	(M/S)	(M/S)	(M)	HT (M)	T (M)	2 (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 CALCULATI	ON - 1 *	*** ***	CAVITY	CALCULAT	ION -	2 ***
CONC (UG/M**3)	= .00	000 000	NC (UG/I	4**3)	=	.0000
CRIT WS @10M (M/S)	= 99.	.99 CR	IT WS a	10M (M/S)	=	99.99
CRIT WS @ HS (M/S)	= 99.	.99 CR	IT WS a	HS (M/S)	=	99.99
DILUTION WS (M/S)	= 99.	.99 DI	LUTION N	WS (M/S)	=	99.99
CAVITY HT (M)	= 5.	.49 CA	VITY HT	(M)	=	5.49
CAVITY LENGTH (M)	= 27	.88 CA	VITY LE	NGTH (M)	=	24.02
ALONGWIND DIM (M)	= 36	.62 AL	ONGWIND	DIM (M)	=	58.06

CAVITY CONC NOT CALCULATED FOR CRIT WS > 20.0 M/S. CONC SET = 0.0

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*** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION	MAX CONC	DIST TO	TERRAIN
PROCEDURE	(UG/M**3)	MAX (M)	HT (M)
SIMPLE TERRAIN	3208.	50.	0.

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **