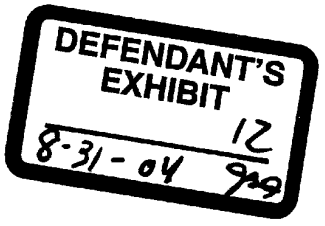


Aroclor blends, std. mfg. proc. Sept 27

MONSANTO COMPANY
ORGANIC CHEMICALS DIVISION
ANNISTON, ALABAMA



STANDARD MANUFACTURING PROCESS
FOR
AROCLOR BLENDS

Department 826.47

Prepared by: M. J. Williams
Prod. ~~Foreman~~

Reviewed by: R. A. Haydel
Prod. Supervisor

H. L. Williams
Prod. Superintendent

Issued: August 1968

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140

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WATER_PCB-SD0000050791

STANDARD MANUFACTURING PROCESS
FOR
AROCLOR BLENDS

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DSW 053330

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STANDARD MANUFACTURING PROCESS
FOR
AROCLOR BLENDS

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WATER_PCB-SD0000050793

STANDARD MANUFACTURING PROCESS
FOR
AROCLOR BLENDS

AMENDING RECORD SHEET

Amendment No.	To: Std. Manufacturing Process	Title

OSW 053332

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APPROVAL OF SAFETY REVIEW COMMITTEE

Signed by H. E. Schulte
H. E. Schulte

Signed by P. K. Ward
P. K. Ward

J. C. Landwehr
J. C. Landwehr

MONSANTO COMPANY
ANNISTON PLANT

28 JUL 70

TENTATIVE AMENDMENT "C"

TO

AROCLOR BLENDS - STANDARD MANUFACTURING PROCESS

Dated August 1968

TITLE: PRODUCE VARIOUS BLENDS OF AROCLORS 1221, 5432, 5442 AND 5460.

OBJECTIVE: Make Aroclor blends to replace the plasticizer grade Liquid Aroclors which will be discontinued 31 Aug 70.

PRESENT PROCEDURE: These blends are not presently made.

PROPOSED AMENDMENT: These blends will be made in the 2000 gallon blend tank by adding the two ingredients in their approximate proportionate weights. Agitation, sample analysis, and further adjustments will be made to get the blend to meet the tentative specifications. The blended batch will then be drummed for storage and/or subsequent sales.

DSW 053333

WATER_PCB-SD0000050795

Initially the following blends are expected to be made:

Blend Name	Approximate Composition	Replaces
Aroclor 6090	90% 5460; 10% 1221	Aroclor 4465
Aroclor 6070	70% 5460; 30% 1221	Aroclor 1260
Aroclor 6062	62% 5460; 38% 1221	Aroclor 1254
Aroclor 6050	50% 5460; 50% 1221	Aroclor 1248
Aroclor 6040	40% 5460; 60% 1221	Aroclor 1242
Aroclor 4272	72% 5442; 28% 1221	Aroclor 1254
Aroclor 3270	70% 5442; 30% 5460	Aroclor 4465

Further blends may be required to meet marketing needs under this proposed amendment and will be done so as the need arises.

SOURCE OF DATA: 1. Letter J. W. Baker to J. T. Bell, 15 Jul 70

2. Letter W. S. Clark to A. W. M. Coaker, 10 Jul 70

SAFETY: This proposed amendment will not affect the safety of the Aroclor department.

QUALITY: The properties of the blends will be measured against the tentative specs issued 7/27/70.

EXTENT OF TRIAL: Six months will be needed to work out the proportions of the ingredients for each blend necessary to meet the desired sales specs. Research will be contacted for any changes necessary to produce a more marketable product.

Originated by: V. R. Haupt

:kd

WATER_PCB-SD0000050796

APPROVALS:

Department Supervisor: Orig. signed by G. W. Miller — 8/17/70
G. W. Miller — Date

Production Superintendent: Orig. signed by J. L. Corder — 8/31/70
J. L. Corder — Date

Plant Manager: Orig. signed by G. L. Jessee — 8/31/70
G. L. Jessee — Date

PR&D Group Leader: Orig. signed by J. L. Brown — 9/1/70
J. L. Brown — Date

Research Group Leader: Orig. signed by J. W. Baker — 9/10/70
J. W. Baker — Date

Mgr. of Research & Dev.: Orig. signed by M. W. Farrar — 9/14/70
M. W. Farrar — Date

Manufacturing Manager: Orig. signed by J. E. Smith/J. R. Savage — 9/13/70
J. E. Smith — Date

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MONSANTO COMPANY
ANNISTON PLANT

March 17, 1970

TENTATIVE AMENDMENT "B"

TO

AROCLOR BLENDS - STANDARD MANUFACTURING PROCESS

Dated: August, 1968

TITLE: Produce Inerteen 54201-A9 by blending Aroclor 1242 and TCB in proportions such that final blend is approximately 65% 1242 and 35% TCB.

OBJECTIVE:

To produce new blend for sales.

PRESENT PROCEDURE:

Blend is not presently made. However, it will be similar to Inerteen 54201-A6 except that the components will be blended in different ratios.

PROPOSED PROCEDURE:

Aroclor 1242 and TCB will be blended in an agitated, aluminum tank to produce a blend which is approximately 65% Aroclor 1242 and 35% TCB. Actual ratios of the components will vary somewhat in individual blends depending on exact composition of the components. Upon producing each individual blend, control analyses will be run in the Lab to assure material meets specs before packaging for sales.

DSW 053336

WATER_PCB-SD0000050798

SOURCE OF DATA:

Lab made pilot blend of the A-9 and developed the tentative specs based on analyses of this pilot blend.

SAFETY: This process has no affect on the safety of the operations.

QUALITY: The quality of each batch produced will be lab monitored to insure shipment of in spec material.

R. A. Haydel
Department Supervisor

/md

APPROVALS:

Department Supervisor	R. A. Haydel	3-17-70 Date
Production Superintendent	H. L. Williams	3/17/70
Plant Manager	G. L. Jessee	3-17-70
Research Manager	Master copy signed W. R. Richard	3/27/70
Technical Prod. Manager	Master copy signed J. R. Savage	4/2/70

DSW 053337

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MONSANTO COMPANY
ANNISTON PLANT

March 21, 1969

FINAL AMENDMENT "A"

TO

AROCLOR BLENDS - STANDARD MANUFACTURING PROCESS

Dated: August, 1968

TITLE: Production of Aroclor 4465 by blending Aroclors 1262 and 5460

BACKGROUND:

Prior to 1969, Aroclor 4465 was produced by the chlorination of a mixture of 60% Biphenyl and 40% Santowax R. The resulting crude 4065 was distilled to obtain the end product, Aroclor 4465. Specification product has the following properties:

Softening Point	-	60-66°C
Color	-	2.0 NPA (Maximum)
Solubility	-	No precipitate formation in acetone for 24 hours (Internal control).

Precipitation (in the acetone solubility test) occurred in the distilled product because some of the Biphenyl in the starting raw material mixture chlorinated to Aroclor 1268 (or higher) which is insoluble in acetone.

DSW 053338

WATER_PCB-SD0000050800

Experimentation in Anniston's PR&D Lab showed that Aroclor 4465 which met all specifications could be produced by blending Aroclor 1262 and Aroclor 5460 in approximately 1:1 ratios. Lab batches of this material were sent to all major customers who deemed that the material was suitable for their purposes.

PRESENT SITUATION:

All of the Aroclor 4465 produced in 1969 has been produced by blending Aroclors 1262 and 5460 and has proven to be acceptable to all customers. Approximate proportions are 52-53% Aroclor 5460 and 47-48% Aroclor 1262. (This is varied to attain desired softening point.) The blending is accomplished in an agitated, stainless steel tank.

SOURCE OF DATA:

Anniston Research and Development Report No. 1 of Job 446-505.

SAFETY:

This process change has no effect on the safety of operation.

QUALITY:

A quality improvement resulted over the traditional chlorination and distillation process of Aroclor 4465 production, since it eliminated formation of insolubles in the product.

R A Haydel

R. A. Haydel
Dept. Supervisor

:md

DSW 053339

WATER_PCB-SD0000050801

SYNOPSIS OF
PROCESS

DSW 053340

WATER_PCB-SD0000050802

STANDARD MANUFACTURING PROCESS
FOR
AROCLOR BLENDS

I. SYNOPSIS OF PROCESS

Production of Pyranols is a blending process. Distilled Aroclors, and other raw materials, are pumped to one of two Pyranol mix tanks. These raw materials may come from a filtrate tank, storage tank, tank car or drums. Each mix tank is equipped with an agitator for thorough mixing of material.

Quality of a Pyranol mix is analyzed by the laboratory and when in specification it is loaded into tank cars or drawn into suitable containers.

DSW 053341

WATER_PCB-SD0000050803

DSW 053342

WATER_PCB-SD0000050804

STANDARD MANUFACTURING PROCESS
FOR
AROCLOR BLENDS

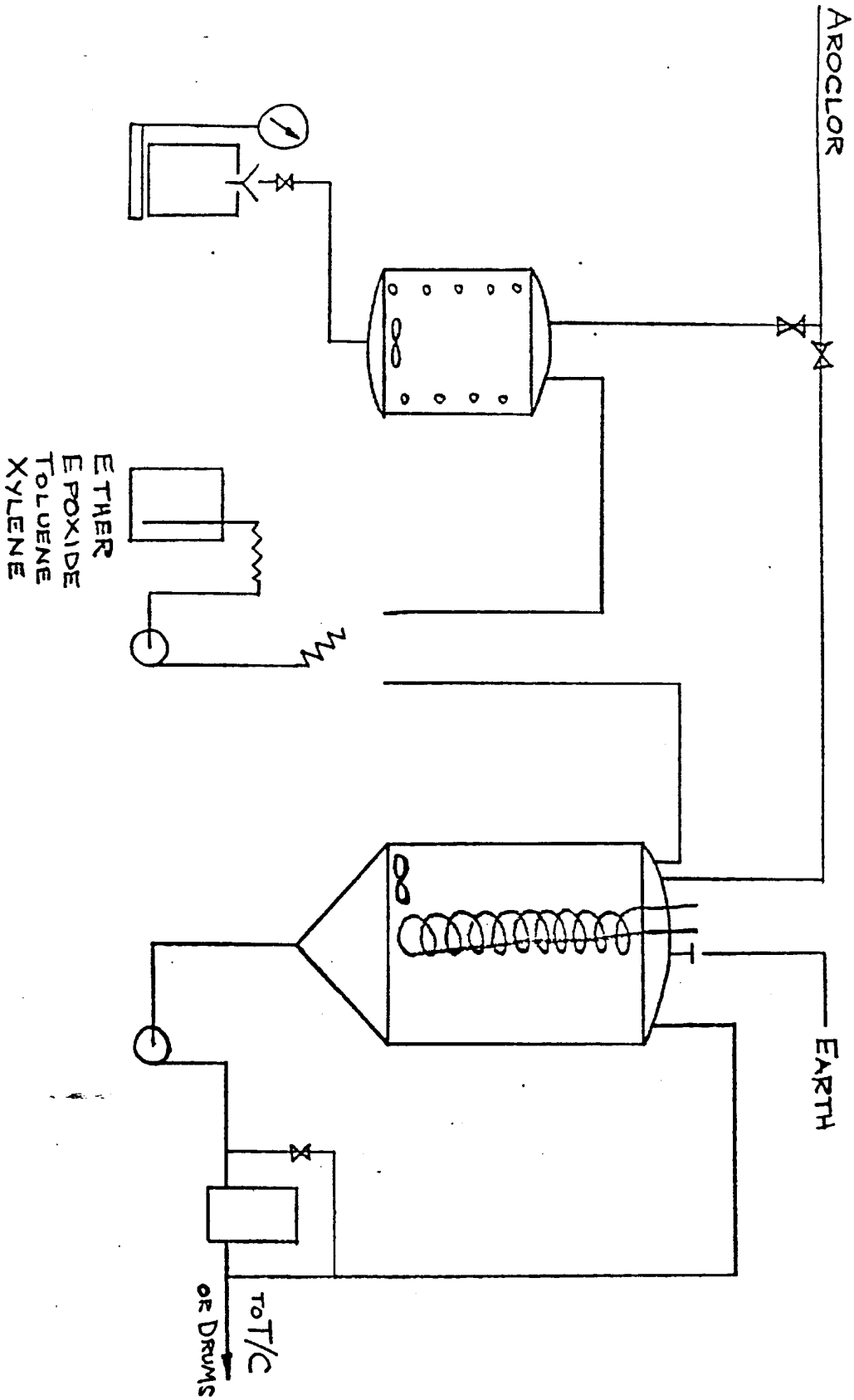
II. FLOW SHEETS

DSW 053343

WATER_PCB-SD0000050805

BY VRH DATE 4/4/68 SUBJECT PYRANOL BLENDS FLOW SHEET SHEET NO ..... OF

CHKD. BY ..... DATE ..... JOB NO. .....



053344

PROCESS IN
DETAIL

DSW 053345

WATER_PCB-SD0000050807

STANDARD MANUFACTURING PROCESS
FOR
AROCLOR BLENDS

III. PROCESS IN DETAIL

A. Pyranol Mixes Produced

Most Pyranols are produced by the mixing of distilled Aroclor with various other raw materials. Some of the Pyranols are treated with attapulgus earth and filtered prior to loading for shipment. There are three Pyranol blends that are produced by the mixing of distilled Aroclors only.

The Pyranol area is actually a part of the Aroclor Department and all Pyranol mixes are made by the Aroclor operators.

The quality of each mix is analyzed by the laboratory and when approved it is loaded into tank cars or drawn out into drums.

See Table I for raw materials and quantity of each used in the production of each product or mix.

B. Mix Tank Area

There are two mix tanks used in the production of Pyranol mixes. One is a 12,000 gallon tank and the other is a 2,000 gallon tank. Each tank is equipped with an agitator to assure good mixing. Each tank is also equipped with a steam coil to provide desired temperature. Sales demand for some of the mixes does not warrant production of large batches which accounts for the second, or small mix tank. All mixes produced in the large tank are filtered through a Sparkler filter. Mixes produced in the small tank are not treated with attapulgus earth and are packaged in drums only and filtered through a diaper cloth sock on the end of the draw-out line.

WATER_PCB-SD0000050808

TABLE

PRODUCT	ARO.% 1242	ARO. % 1248	ARO. % 1254	ARO. % 1260	ARO. % 1262	ARO.% 4465	% Toluene	% Xylene	% PPO	% TCB	% TTCB	% EARTH	% EP221
1254 - 10% Toluene			90.00				10.00						
1260 - 10% Toluene				90.00			10.00						
1262-10% Toluene					90.00		10.00						
1262-10% Xylene					90.00			10.00					
Pyranol A13B3B				45.00							55.00	0.03	0.125
Inerteen PPO				60.00					0.20	40.00		0.01	
Inerteen 54201-KA			70.00						0.20	30.00		0.03	
Inerteen 54201-CM	100.00								0.20			0.01	
Inerteen 54201-A-6	75.00									25.00		0.01	
Therminol FR-0	80.00										20.00		
Therminol FR-Lo Temp.	50.00										50.00		
Santicizer 794		50.00		50.00									
Aroclor Blend			85.00			15.00							
Aroclor Blend	28.00	72.00											

DSW 053347

WATER_PCB-SD0000050809

COMMENTS ON
PROCESS

WATER_PCB-SD0000050810

STANDARD MANUFACTURING PROCESS
FOR
AROCLOR BLENDS

IV. COMMENTS ON THE PROCESS

Do not allow temperature on mix tanks to exceed 120°C. TCB and TTCB will begin to vaporize above this temperature.

The large pyranol mix tank is calibrated in outage whereas other tanks are calibrated in innage.

All drums filled with pyranol mixes containing toluene are stenciled TOLUOL rather than toluene.

When a tank car is loaded from the large pyranol mix tank samples are taken from the car and analyzed for lot number. If the remaining material in the mix tank is drawn out in drums then samples must be taken from the drums and analyzed for another lot number.

The area where pyranol mixes are produced is considered a part of the Aroclor Department and these mixes are made by Aroclor operators.

Each car of TCB and TTCB must be analyzed and approved by the laboratory before being used, to prevent high chemical instability in the finished product.

Special precautions are necessary when making Inerteen 54201-KA:

1. TCB is earth treated to bring power factor below a value of ten.

2. TCB plus 1254 mix is earth treated until power factor is below a value of one.

3. Ether is added only after earth has been filtered out and filter cleaned.

4. Tank car is loaded only when power factor has a value of three max.

5. Most important, nitrogen is blown into mix tank through the bottom nozzle during the earth treatment to supplement the extremely poor agitation system presently employed.

WATER_PCB-SD0000050811

APPENDICIES

DSW 053350

WATER_PCB-SD0000050812

STANDARD MANUFACTURING PROCESS
FOR
AROCLOR BLENDS

APPENDIX A - EQUIPMENT LIST

DSW 053351

WATER_PCB-SD0000050813

Item	Equipment	Equip.No.	Description
205	South (large) Pyranol Mix Tank	22-0108	14'-0" I.D. x 10'-0" high. Dwg. D-6455 zinc-tin lined carbon steel.
206	North (small) Pyranol Mix Tank		6'-6" I.D. x 8'-2" jacketed 316 S.S. tank.
643	Pyranol Filter	15-0029	Model 18-S-23 horizontal plate type 304 S.S. w/scavenger plate feature on pipe legs. Purchased from Sparkler Mfg. Co.

Other equipment used in the production of Pyranol mixes is considered Aroclor equipment.

DSW 053352

WATER_PCB-SD0000050814

APPENDIX B - MATERIAL SPECIFICATIONS

I. Finished Goods

Material Code	Product
826.64	Aroclor 1254 - 10% Toluene
826.59	Aroclor 1260 - 10% Toluene
826.61	Aroclor 1262 - 10% Toluene
826.56	Aroclor 1262 - 10% Xylene
826.58	Pyranol A13B3B
826.49	Inerteen PPO
826.81	Inerteen 54201-KA
826.90	Inerteen 54201-CM
826.89	Inerteen 54201-A-6
826.12	Therminol FR-1
826.41	Therminol FR-2
826.13	Therminol FR-3
826.85	Therminol FR-0
826.88	Therminol FR-Lo Temp.
826.03	Therminol 66
826.78	Santicizer 794
826.79	Aroclor 1254 - 4465
826.87	Aroclor 1242 - 1248

WATER_PCB-SD0000050815

Monsanto
ORGANIC CHEMICALS DIVISION

FINISHED PRODUCT SPECIFICATION

PRODUCT		DEPT.
Aroclor 1260 - 10% Toluene Mix		28
PLANT	PRODUCT CODE	USE
Anniston	826.59	Sales
DATE EFFECTIVE	SALES CODE	
3-11-66	1040-295-04-009	

APPROVALS

PRODUCTION	RESEARCH
R. G. Moody /s/ 12-29-65	L. R. Stark /s/ 3-8-66
SALES	QUALITY CONTROL (Chief Chemist)
W. E. Ault /s/ 3-2-66	O. E. Dolin /s/ 12-29-65

GENERAL DESCRIPTION: Mixture

CHEMICAL FORMULA:

MOL WT.

SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
4-17-58	2 x 16 oz. W. M. Bottles	J. A. Liddle 12-14-65

CHARACTERISTIC	LIMITS	METHOD
UNRESTRICTED INFORMATION		
(R) Appearance	Syrupy Liquid	G-1
(R) Color	Light yellow	G-1
*(R) Composition, %		
Aroclor 1260	90.8 - 89.3	
Toluene	9.2 - 10.7	
(R) Specific Gravity @ 40/15.5°C (Aroclor-Toluene Mix)	1.481 - 1.491	052
RESTRICTED INFORMATION		
**Specific Gravity of Aroclor 1260 @ 90/15.5°C	1.558 - 1.565	052
***Specific Gravity of Toluene @ 15/15.5°C	0.870	052

*Normally determined by specific gravity
**Specific Gravity temperature coef. for 1260 is .001/°C
***Specific Gravity temperature coef. for toluene is 0.00089/°C

DSW 053354

WATER_PCB-SD0000050816

Monsanto
ORGANIC CHEMICALS DIVISION

FINISHED PRODUCT SPECIFICATION

PRODUCT		DEPT.
Aroclor 1262 - 10% Toluol Mix		28
PLANT	PRODUCT CODE	USE
Anniston	826.61	Sales
DATE EFFECTIVE	SALES CODE	
3-15-66	1040-310-04-009	

APPROVALS

PRODUCTION	RESEARCH
R. G. Moody /s/ 12-29-65	L. R. Stark /s/ 3-8-66
SALES	QUALITY CONTROL (Chief Chemist)
W. E. Ault /s/ 3-2-66	O. E. Dolin /s/ 12-29-65

GENERAL DESCRIPTION: Mixture

CHEMICAL FORMULA:

(MOL WT.

SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
4-17-58	2 x 16 oz. W.M. Bottles	J. A. Liddle 12-13-65

CHARACTERISTIC	LIMITS	METHOD
UNRESTRICTED INFORMATION		
(R) Appearance	Syrupy liquid	G-1
(R) Color	Light yellow	G-1
*(R) Composition, %		
Aroclor 1262	91.0 - 89.5	
Toluene	9.0 - 10.5	
(R) Specific Gravity @ 40/15.5°C. Aroclor-Toluene Mix	1.504 - 1.514	052
RESTRICTED INFORMATION		
**Specific Gravity of Aroclor 1262 @ 90/15.5°C.	1.574 - 1.583	052
***Specific Gravity of Toluene @15.5/15.5°C.	0.870	052

*Normally determined by specific gravity
**Specific Gravity temperature coeff. for 1262 is 0.001 °/C
***Specific Gravity temperature coeff. for Toluene is 0.00089 °/C

DSW 053355

WATER_PCB-SD0000050817

IN 88

MONSANTO CHEMICAL COMPANY
ORGANIC CHEMICALS DIVISION
W. G. Krummrich Plant

T E N T A T T I V E
SPECIFICATION

PRODUCT CODE	Dept. or Job
81097	WGK 246
Sales Code	
1050-300-16-03/09	
Proposed By	

Distribution
P. E. Heisler
E. E. Martin
D. T. Mayer
K. L. McHugh
W. E. Ault
W. J. Gresham
H. O. Hehner
J. R. Kuster

MATERIAL
Transformer Pyranol A13B3B

CHEMICAL FORMULA
Mixture of:
45% Aroclor 1260
55% Tri-Tetrachlorobenzene
ERLA-4221

MOL. WT.

Date Proposed	Effective Until	Sample for Analysis
2/4/63	8/4/63	3 x 5 pint amber bottles

Note: All samples processed by this tentative specification will require disposition of the authorized releasing agent.

UNRESTRICTED INFORMATION

Routine Tests

Property	Specification	Method Number
Color, APHA	150, max.	10,084
Condition	Clear	10,084
Sp. Gr. @ 15.5/15.5°C	1.563-1.571	10,114
Acidity (mg. KOH/g.)	0.014, max.	10,087
Moisture (H_2O)	30 ppm., max.	10,620
Refractive Index @ 25°C	1.6075-1.6085	10,125
Inorg. (Free) Chlorides	0.10 ppm., max.	10,118
Dielectric Strength @ 25°C	35 K.V., min.	11.605
Resistivity (500 VDC @ 100°C; 0.1" gap as ohms/cm. x 10^9)	100, min.	11,607
Viscosity @ 100°F	41-45 SUS	10,086
Pour Point	-44°C, max.	10,115
Active ERLA 4221	0.115-0.135	T-2152
Distillation Range (ASTM D-20, Corrected)		10,117
First Drop	210°C, min.	
35% by vol.	240-256°C	
55% by vol.	290-330°C	
65% by vol.	385-400°C	
90% by vol.	395-415°C	
Corrosion Test (6 hrs. @ 210°C with bright aluminum foil)		10,126
Change in weight of Al %	0.0	
AC Color	APHA 200, max.	10,084
AC Condition	Clear	10,084
AC Acidity (mg. KOH/g.)	0.014, max.	10,087
AC Inorg. (Free) Chlorides	5.0 ppm., max.	10,118

DSW 053356

WATER_PCB-SD0000050818

GENERAL TESTS (Made only on request)

Property	Specification	Method Number
Dielectric Constant 1000 cycles, 100°C	3.8-4.2	11,608
Fixed Chlorine	60.0-61.0	10,088
Fire Point	None to Boiling Pt.	10,123
Arc-Formed Combustible Gases	1.0%, max.	10,711
Electrical Stability (Aged 96 hours @ 100°C covered jar, 15% air)	1.0%, max.	10,121
Decrease in Resistivity	10%, max.	

GENERAL INFORMATION

Dielectric Constant (1000 cycles @ 25°C)	4.5-4.9	11,608

Retyped 9/12/63
/gm

DSW 053357

WATER_PCB-SD0000050819

MONSANTO CHEMICAL COMPANY
ORGANIC CHEMICALS DIVISION
NISTON and W.G.KRUMMRICH Plt.
FINISHED PRODUCT
SPECIFICATION

PRODUCT CODE: 81092 - WGK / 82649-Anniston
DEPT. OR JOB: Ann-27;WGK-246
USE: Sales
SALES CODE: 1050-200-16-03/09

Issued 3/6/62
W.G.Krummrich Plant
By E. O. Maki

PRODUCT (Trade Name): TRANSFORMER INERTEEN P.P.O.
TYPE:
PRODUCT (Chemical Name):
TYPE:

CHEMICAL FORMULA

Mixture - 60% Aroclor 1260: 40% Trichlorobenzene
Plus 0.20% Phenoxypropene Oxide
(Westinghouse Inerteen 7336-9)

MOL WT. ---

SUPERSEDES SPECS OF: 4/14/61
SAMPLE FOR ANALYSIS: 3 x 5 pt. Amber Bottles

UNRESTRICTED INFORMATION

Routine Tests

Property	Specification	Method No.
Color	APHA 150, max.	10,084
Condition	Clear	10,084
Specific Gravity @ 15.5/15.5°C	1.560-1.568	10,114
Acidity (mg. KOH/g.)	0.014, max.	10,087
Moisture (H_2O)	30 ppm., max.	10,620
Refractive Index @ 25°C	1.6137-1.6147	10,125
Inorganic (Free) Chlorides	0.10 ppm., max.	10,118
Dielectric Strength	35 KV, min.	11,605
Resistivity @ 100°C 500 VDC and 0.1" gap	100 x 10^9 ohm-cm,min.	11,607
Viscosity @ 100°F	52-56 SUS	10,085
Pour Point	-32°C, max.	10,115
Distillation Range: (ASTM D-20, Corrected)		10,117
First Drop	200°C, min.	
Below 270°C, by wt.	40%, max.	
90% by wt.	395-415°C	
Corrosion Test, 6 hrs. @ 210°C with bright aluminum foil		10,126
Change in weight of Al.	0.0%	
A. C. Color	APHA 200, max.	10,084
A. C. Condition	Clear	10,084
A. C. Acidity (mg. KOH/g.)	0.014, max.	10,087
A. C. Inorganic (Free) Chlorides	2.0 ppm, max.	10,118
Phenoxypropene Oxide	0.18 - 0.22%	11,865
Fire Point	None to Boiling Point	10,123

General Tests (Made only on request)

Dielectric Constant 1000 cycles, 100°C	3.7-4.0	10,608
Fixed Chlorine	59.1%, min.	10,088

DSW 053358

WATER_PCB-SD0000050820

General Tests (Made only on request) Continued

Property	Specification	Method No.
Arc Formed Combustible Gases	1.0%, max.	10,711
Electrical Stability (aged 96 hrs. @ 100°C, covered jar, 15% air)		10,121
Decrease in Resistivity	10%, max.	
Analysis of each 10 ml. fraction of a fractional distillation		
Chlorine/Hydrogen Ratio	1, min.	
Arc Formed Combustible Gases	1.5%, max.	

GENERAL INFORMATION

Dielectric Constant 1000 cycles, 25°C	4.0 - 4.3

DSW 053359

WATER_PCB-SD0000050821

INERTEEN PPO-70-30

(70% Aroclor 1254 + 30% TCB + 0.2% PPO)

Properties	Typical
Visc. at 37.8° C., (ASTM D88)	56 to 61 SUS
Specific Gravity at 15.5/15.5° C. (ASTM D1810)	1.518 to 1.528
Color APHA	100 max.
Condition	Clear
Acidity, mg. KOH/g. (ASTM D974, D664)	0.014 max.
Pour Point, °C. (ASTM D-97)	-30° C. or lower
Inorganic Chlorides, ppm. (ASTM D1821)	0.05 max.
Refractive index at 25° C. (ASTM D1807)	1.6153 to 1.6173
Distillation range (ASTM D20)	1st drop - 200° C. min.
Corrected for stem and barometric pressure	Below 270° C. - 35% max. 90% - 379 - 394° C.
Corrosion	After heating with aluminum for six hours at 200-220° C., the aluminum must not be corroded either on visual or weight inspection, and the askarel should meet the following specs:
	Color, APHA — 200 max.
	Acidity, mg. KOH/g. — 0.014 max.
	Inorganic chlorides ppm. — 2 max.
	Condition — Clear
Water content ppm. (ASTM D1533)	30 max.
Resistivity 100° C. 500 Volts, DC 0.1" gap (ASTM D1169)	100×10^9 ohm-cm, min.
Dielectric Strength, 25° C (ASTM D877)	35 KV, min.
Dielectric Constant, 100° C 1000 cycles* (ASTM D924)	4.2 - 4.5
Phenoxy Propene Oxide or Glycidyl Phenyl Ether (ASTM D1701)	0.18% - 0.22% by weight
Burn point, (ASTM D92)*	None to boiling point
Fixed Chlorine*	55.6 min.
Coefficient of Thermal Expansion* (ASTM D1903)	0.0007 cc/cc/° C.

*Not determined unless by special request.

DSW D53360

WATER_PCB-SD0000050822

TENTATIVE SPECIFICATIONS FOR INERTEEN 54201-KA

MIXTURE OF 69.9% AROCLOR 1254, 29.9% TCB, 0.2% PPO

Property	Specification
Color, APHA	50 max.
Condition	Clear
Sp. Gr. @ 15.5/15.5°C	1.515 - 1.525
Refractive Index @ 25°C	1.6165 - 1.6175
Moisture, ppm	30 max.
Inorganic Chlorides, ppm	0.05 max.
Acid Number (mg KOH/gr)	0.014 max.
Viscosity @ 100°F, SUS	58 - 62
PPO, %	0.18 - 0.22
Pour Point, °C	-30 or below
Fine Point, °C	None to Boiling
Dielectric Strength @ 25°C	35 KV Min.
Resistivity @ 100°C, ohm/cm	500 x 10^9 Min.
Dielectric Constant @ 100°C, IKC	Report
*Power Factor @ 100°C, IKC	0.5% max.
60 cycles	5% max.
Distillation, First Drop °C	200 Min.
Below 270°C, %	35 max.
90%, °C	379 - 394

Corrosion Test

Change in Wt. Al.	None
Inorganic Chloride, ppm	2.0 Max.
Condition	Clear
Acid Number (mg KOH/gr)	0.014
Color, APHA	200 Max.

*Values for power factor are internal specification for a tank car sample. If the power factor @ 60 cycles is above 3% for a sample from the storage tank, the power must be determined on a sample from the tank car to assure that the car is not above 5%.

Revised 7-29-65

DSW 053361

WATER_PCB-SD0000050823

Monsanto
ORGANIC CHEMICALS DIVISION

TENTATIVE SPECIFICATION

PRODUCT		DEPT.
Inerteen 54201-CM		28
PLANT	PRODUCT CODE	USE
Anniston	826.90	Sales
DATE EFFECTIVE	SALES CODE	
2-22-68	1050-215-16-09	

AUTHORIZED BY

SOURCE OF SPECIFICATION

GENERAL DESCRIPTION

CHEMICAL FORMULA

99.8% Aroclor 1242
0.2% Phenoxypropene Oxide

MOL WT. ISSUE#	EFFECTIVE UNTIL	SAMPLE FOR ANALYSIS	ISSUED BY
	8-22-68	3 x 5 pt. Amber bottles	G. W. Miller

CHARACTERISTIC	LIMITS	METHOD
Color, APHA	60 Max.	046
Condition	Clear	G-1
Specific Gravity @ 25°/15.5°C	1.381-1.392	052
Acidity (Mg KOH/g)	0.010 Max.	050
Moisture, ppm	35 Max.	047
Refractive Index @ 25°C	1.6240-1.6260	048
Inorganic (Free) Chlorides, ppm	0.05 Max.	045
Pour Point, °C	-17 or lower	053
Resistivity, ohm-cm	100 x 10^9 Min.	121
500 VDC @ 100°C 0.1" Gap		
Distillation Range (ASTM D-20, corrected)		054
10% Distilled by wt.	325°C Min.	
90% Distilled by wt.	360°C Max.	
Dielectric Strength @ 25°C	35 KV Min.	043
Fire Point	None to Boiling	114
Viscosity @ 100°F, SUS	82-92	049
Phenoxypropene Oxide, %	0.18-0.22	071
Corrosion Test - 6 hrs. @ 210°C		136
with bright Al foil		
Change in wt. of Al foil, %	0.0	
Color, APHA	100 Max.	046
Condition	Clear	G-1
Acidity (mg KOH/g)	0.010 Max.	050
Inorganic (Free) Chlorides, ppm	0.05 Max.	014

/s/G. W. Miller - 2/23/68
G. W. Miller - Chief Chemist

/s/H. L. Williams - 2/23/68
H. L. Williams - Production

/s/W. E. Ault - 2/27/68
W. E. Ault - Sales

/s/W. R. Richard - 2/28/68
W. R. Richard - Research

DSW 053362

(R) Routine Analysis, All others Analyzed by request only.

WATER_PCB-SD0000050824

Monsanto
ORGANIC CHEMICALS DIVISION

TENTATIVE SPECIFICATION

PRODUCT		DEPT.
Inerteen 54201-A-6		27
PLANT	PRODUCT CODE	USE
Anniston		Sales
DATE EFFECTIVE	SALES CODE	
1-20-68	1060-100-16-09	

AUTHORIZED BY: G. W. Miller

SOURCE OF SPECIFICATION:

GENERAL DESCRIPTION

CHEMICAL FORMULA

Mixture: 75% Aroclor 1242
25% Trichlorobenzene

MOL WT.

ISSUE#	EFFECTIVE UNTIL	SAMPLE FOR ANALYSIS	ISSUED BY
1	7-20-68	3 x 5 pt. Amber bottles	G. W. Miller

CHARACTERISTIC	LIMITS	METHOD
(R) Color, APHA	50 Max.	046
(R) Condition	Clear	G-1
(R) Specific Gravity @ 15°/15.5C	1.408 - 1.421	052
(R) Acidity (mg KOH/gm)	0.014 Max.	050
(R) Moisture, H_2O, ppm	35	047
(R) Inorganic (free) Chlorides, ppm	0.10 Max.	045
(R) Viscosity @ 100°F, SUS	40 - 50	049
(R) Resistivity @ 100°C ohm-cm	500 x 10^9 Min.	121
(R) Dielectric Strength @ 25°C, KV	35 Min.	043
(R) Refractive Index @ 25°C	1.6105 - 1.6125	048
(R) Distillation		
1st Drop °C	200°C Min.	054
Below 270°, % by wt.	25%, Max.	
90% by wt.	360 Max.	
(R) Pour Point, °C	-40 Max.	053
(R) Hydrolysis Stability Test (as chlorides) ppm	0.5 Max.	010
(R) Monsanto Stability Test (as chlorides) ppm	0.4 Max.	133

DSW 053363

WATER_PCB-SD0000050825

Monsanto
ORGANIC CHEMICALS DIVISION

FINISHED PRODUCT SPECIFICATION

PRODUCT		DEPT.
Therminol FR-1		27-L
PLANT	PRODUCT CODE	USE
Anniston	826.12-245-11-09	Sales
DATE EFFECTIVE	SALES CODE	
12/21/65	1040-245-11-09	

APPROVALS

PRODUCTION	RESEARCH
R. G. Moody /s/R. G. Moody 11/30/65	L. R. Stark /s/L. R. Stark 12/15/65
SALES	QUALITY CONTROL (Chief Chemist)
W. F. Ault /s/W. F. Ault 12/7/65	O. E. Dolin /s/O. E. Dolin 11/30/65

GENERAL DESCRIPTION: Mixture

CHEMICAL FORMULA:

MOL WT.

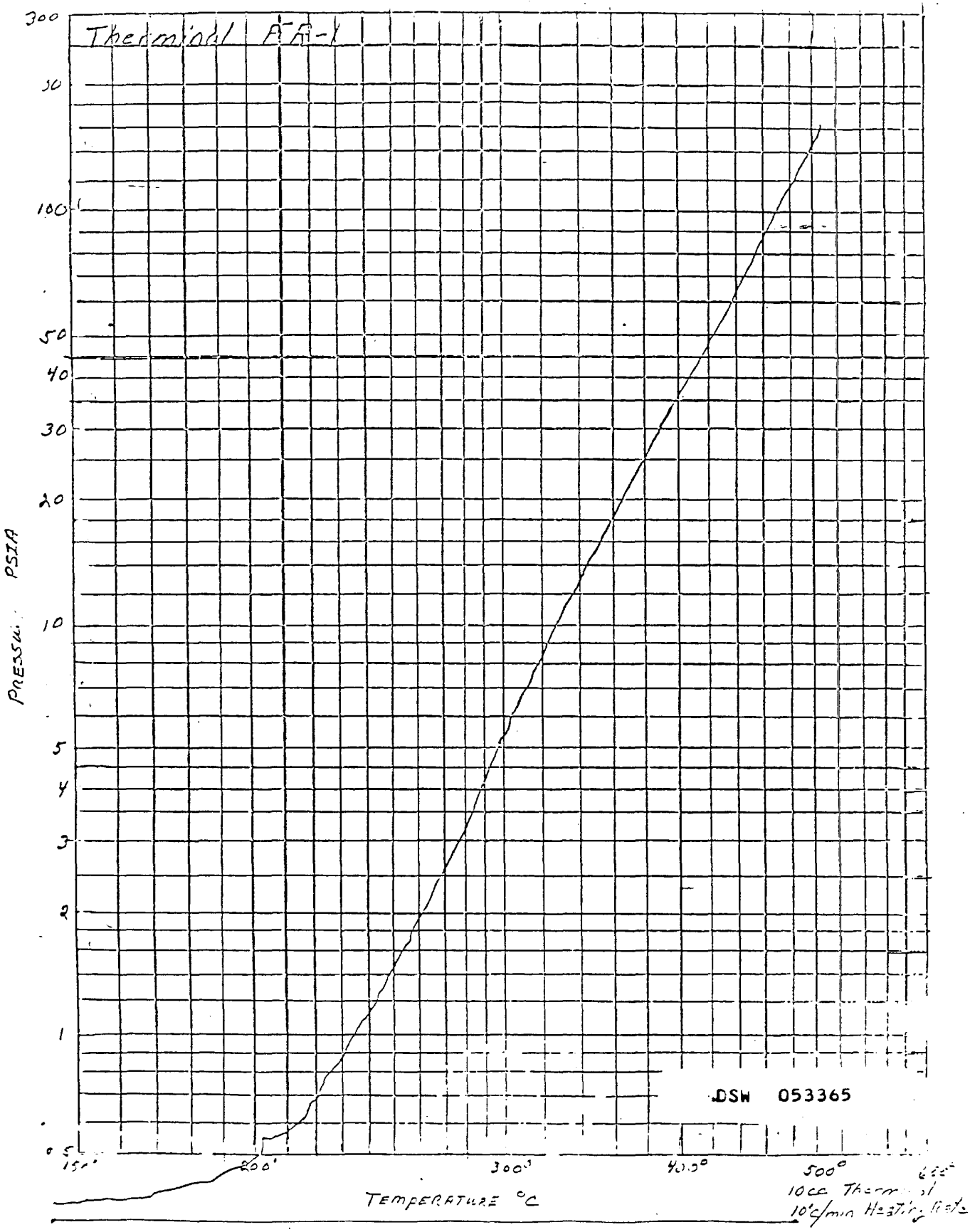
SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
New	3 x 1/2 Gallon Amber Bottle	J. A. Liddle 11/30/65

CHARACTERISTIC	LIMITS	METHOD
UNRESTRICTED INFORMATION		
(R) Appearance	Clear, colorless liquid	G-1
(R)*Density lbs./cu. ft. @ 25°C.	86.2 - 86.9	052
(R) Acid No. (Mg. KOH/g.)	0.01 Max.	050
(R) Moisture, ppm	50 Max.	047
(R)**Thermal Stability	See standard curve	Determined by Research
(R)***Viscosity, @ 100°F. Centipoise	26 Max.	G-14
Fire Point, °F.	None to Boiling	114
Specific Heat, BTU/lb. °F.	0.28 Min. @ 85°F.	Determined by Research
Thermal Conductivity BTU/hr. sq. ft., °F/ft.	0.0608 Min. @ 85°F.	Determined by Research
***Viscosity @ 210°F. Centipoise	3.5 Max.	G-14
600°F. Centipoise	0.35 Max.	
**Vapor Pressure	See standard	Determined by Research

*Report both specific gravity and density in pounds/cu. ft.
**Only significant deviations from a constant slope will be rejectable.
***Report Viscosity in both Centipoise and SUS.

DSW 053364

WATER_PCB-SD0000050826



WATER_PCB-SD0000050827

Monsanto
ORGANIC CHEMICALS DIVISION

FINISHED PRODUCT SPECIFICATION

PRODUCT		DEPT.
Therminol FR-2		27-L
PLANT	PRODUCT CODE	USE
Anniston	826.41-265-11-09	Sales
DATE EFFECTIVE	SALES CODE	
12/21/65	1040-265-11-09	

APPROVALS

PRODUCTION	RESEARCH
R. G. Moody /s/R. G. Moody 11/30/65	L. R. Stark /s/L. R. Stark 12/15/65
SALES	QUALITY CONTROL (Chief Chemist)
W. E. Ault /s/W. E. Ault 12/7/65	O. E. Dolin /s/O. E. Dolin 11/30/65

GENERAL DESCRIPTION

Mixture

CHEMICAL FORMULA

MOL WT.

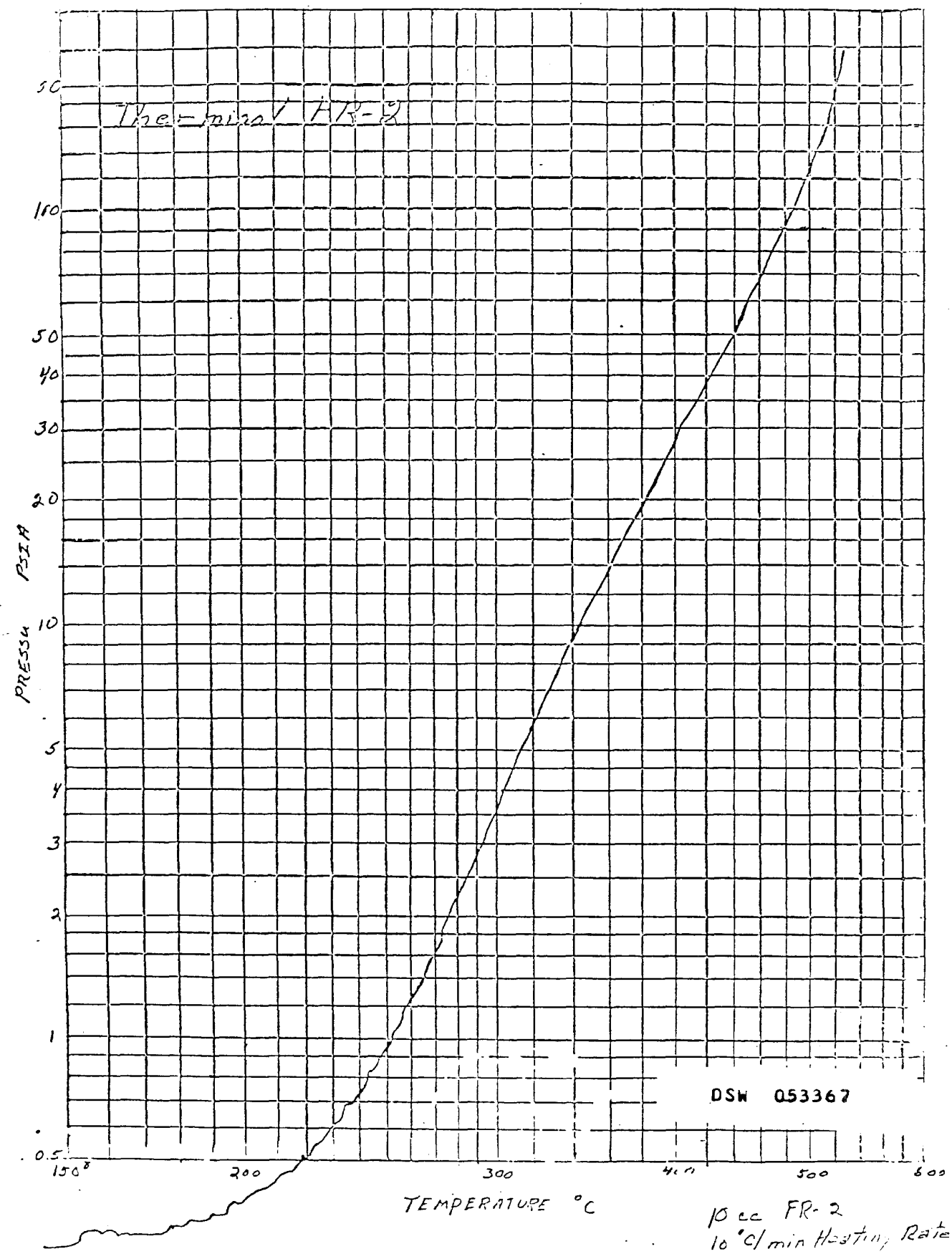
SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
New	3 x 1/2 Gallon Amber Bottle	J. A. Liddle 11/30/65

CHARACTERISTIC	LIMITS	METHOD
UNRESTRICTED INFORMATION		
(R) Appearance	Clear, colorless liquid	G-1
(R)*Density, lbs./cu. ft. @ 65°C.	87.7 - 88.5	052
(R) Acid No. (Mg. KOH/gm.)	0.01 Max.	050
(R) Moisture, ppm	50 Max.	047
(R)**Thermal Stability	See standard curve	Determined by Research
(R)***Viscosity @ 100°F., Centipoise	75 Max.	G-14
Fire Point, °F.	None to Boiling	114
Specific Heat BTU/lb. °F.	0.26 Min. @ 85°F.	Determined by Research
Thermal Conductivity BTU/hr., sq. ft., °F.	0.0587 Min. @ 85°F.	Determined by Research
***Viscosity @ 210°F. Centipoise 600°F. Centipoise	5.0 Max. 0.36 Max.	G-14
Vapor Pressure	See standard curve	Determined by Research

*Report both Specific Gravity and Density in pounds/cu. ft.
**Only significant deviations from a constant slope will be rejectable.
***Report Viscosity in both Centipoise and SUS.

DSW 053366

WATER_PCB-SD0000050828



WATER_PCB-SD0000050829

Monsanto
ORGANIC CHEMICALS DIVISION

FINISHED PRODUCT SPECIFICATION

PRODUCT		DEPT.
Therminol FR-3		27-L
PLANT	PRODUCT CODE	USE
Anniston	826 13-285-11-09	Sales
DATE EFFECTIVE	SALES CODE	
12/31/65	1000-285-11-09	

APPROVALS

PRODUCTION	RESEARCH
R. G. Moody /s/R. G. Moody 11/30/65	L. E. Stark /s/L. E. Stark 12/15/65
SALES	QUALITY CONTROL (Chief Chemist)
W. E. Ault /s/W. E. Ault 12/7/65	O. E. Dolin /s/O. E. Dolin 11/30/65

GENERAL DESCRIPTION — CHEMICAL FORMULA

Mixture

MOL WT.

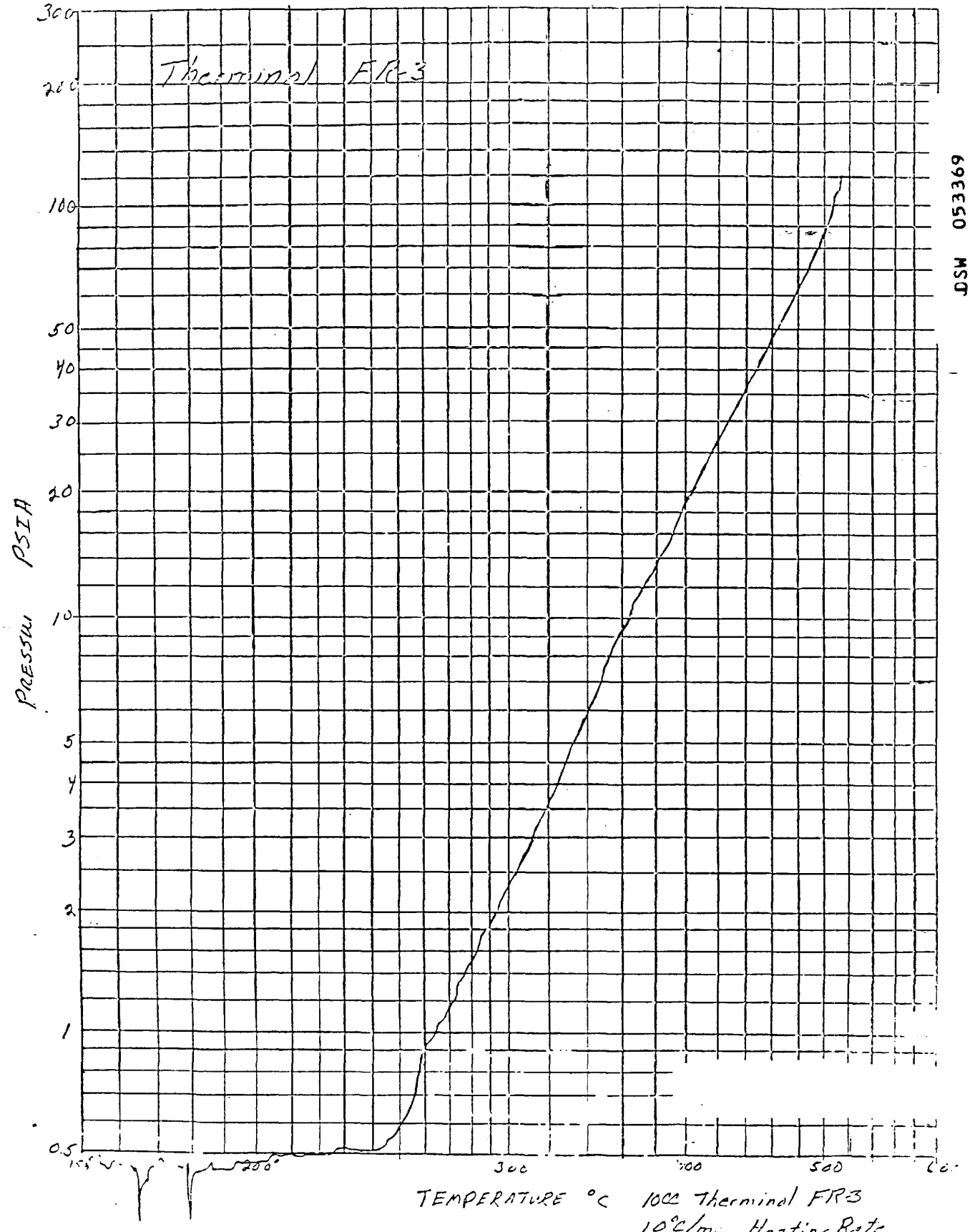
SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
New	3 x 1/2 Gallon Amber Bottle	J. A. Liddle 11/30/65

CHARACTERISTIC	LIMITS	METHOD
UNRESTRICTED INFORMATION		
(R) Appearance	Clear, colorless liquid	G-1
(R)*Density, lbs./cu. ft. @ 65°C.	93.2 - 93.9	052
(R) Acid No. (Mg. KOH/gm.)	0.01 Max.	050
(R) Moisture, ppm	50 Max.	047
(R)**Thermal Stability	See standard curve	Determined by Research
(R)***Viscosity @ 210°F., Centipoise	10 Max.	G-14
Fire Point, °F.	None to Boiling	114
Specific Heat BTU/lb. °F.	0.24 Min. @ 130°F.	Determined by Research
Thermal Conductivity BTU/hr., Cu. ft., °F./ft.	0.0569 Min. @ 90°F.	Determined by Research
***Viscosity @ 600°F., Centipoise	0.42 Max.	G-14
Vapor Pressure	See standard curve	Determined by Research

*Report both Specific Gravity and Density in pounds/cu. ft.
**Only significant deviations from a constant slope will be rejectable.
***Report Viscosity in both Centipoise and SUS.

DSW 053368

WATER_PCB-SD0000050830



DSW 053369

WATER_PCB-SD0000050831

Monsanto
ORGANIC CHEMICALS DIVISION

FINISHED PRODUCT SPECIFICATION

PRODUCT		DEPT.
Therminol FR-O		27-L
PLANT	PRODUCT CODE	USE
Anniston	826.85-000-11-009	Sales
DATE EFFECTIVE	SALES CODE	
3-9-66	6145-000-11-09	

APPROVALS

PRODUCTION	RESEARCH
R. G. Moody /s/ 12-20-65	L. R. Stark /s/ 12-27-65
SALES	QUALITY CONTROL (Chief Chemist)
W. E. Ault /s/ 3-2-66	O. E. Dolin /s/ 12-20-65

GENERAL DESCRIPTION

Mixture

MOL WT.

CHEMICAL FORMULA

SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
New	3 x 1/2 Gallon Amber Bottle	J. A. Liddle 11-30-65

CHARACTERISTIC	LIMITS	METHOD
UNRESTRICTED INFORMATION		
(R) Appearance	Clear, colorless liquid	G-1
(R)*Density lbs./cu. ft. @ 25°C.	87.4 - 88.7	052
Sp. G. =	1400 - 1420?	
(R) Acid No. (Mg. KOH/g.)	0.05 Max.	050
) Moisture, ppm	75 Max.	047
(R)**Thermal Stability	See standard curve	Determined by Research
(R)***Viscosity @ 100°F., Centipoise	10.5 - 12.5	G-14
Fire Point, °F.	None to Boiling	114
Specific Heat, BTU/lb. °F.	0.27 Min. @ 100°F.	Determined by Research
Thermal Conductivity BTU/hr., Cu. ft., °F./ft.	0.0610 Min. @ 100°F.	Determined by Research
***Viscosity @ 210°F., Centipoise	2.0 Max.	G-14
@ 600°F., Centipoise	- - -	
**Vapor Pressure	See standard curve	Determined by Research

*Report both Specific Gravity and Density in pounds/cu. ft.
**Only significant deviations from a constant slope will be rejectable.
***Report Viscosity in both Centipoise and SUS.

DSW 053370

TENTATIVE SPECIFICATIONS
Therminol FR-O Lo Temp

Appearance	clear, colorless liquid
Density (lbs./cu.ft./25°C.)	89.2 - 90.5
Acid No. (Mg. KOH/g.)	0.05 max.
Moisture - Ppm.	75 max.
◆ Viscosity at 70°F. - centipse.	8.0 - 9.0
Fire Point, °F.	None to boiling
Specific heat, Btu/lb.°F.	0.26 min. at 100°F.
Thermal conductivity Btu/hr.cu.ft.,°F./ft.	.062 min. at 100°F.
◆ Viscosity at 100°F. centp.	5.1 max.
◆ at 210°F. centp.	-

◆ Report viscosity in centipoise and SUS.

1-25-67

DSW 053371

WATER_PCB-SD0000050833

FG

SPECIFICATION SANTICIZER 794

TENTATIVE 10/28/65

Composition: 50% Aroclor 1248
50% Aroclor 1260

PROPERTY	SPECIFICATION
Appearance	Clear, Water White to light yellow liquid
Acidity, MgKOH/gr	0.012 Max.
Color, APHA	125 Max.
Moisture, ppm	50 Max.
Refractive Index @ 25°C	1.6375-1.6395
Specific Gravity @ 25°C	1.488-1.500

O. E. Dolin

/gm
11/2/65

DSW 053372

WATER_PCB-SD0000050834

Specification

10/5/65

Mix of

85% Aroclor 1254

15% Aroclor 4465

PROPERTY	SPECIFICATION
Specific Gravity @ 65°C	1.512 - 1.526
Refractive Index @ 25°C	1.6400 - 1.6420
Viscosity @ 210°F, SUS	49 - 55
Acid Number	0.05
Color, NPA	2
Appearance	Clear

DSW 053373

WATER_PCB-SD0000050835

APPENDIX B - MATERIAL SPECIFICATIONS

II. Raw Materials

Material Code	Product
826.12	Aroclor 1242
826.41	Aroclor 1248
826.13	Aroclor 1254
826.14	Aroclor 1260
826.15	Aroclor 1262
826.19	Aroclor 4465
58900	Toluene
64020	Xylene
36100	Phenyl Glycidyl Ether
60200	Trichlorobenzene
58500	Tri-Tetrachlorobenzene
19400	Attapulgus Earth
61325	EP-221

WATER_PCB-SD0000050836

Monsanto
ORGANIC CHEMICALS DIVISION
ANNISTON AND KRUMMRICH

FINISHED PRODUCT SPECIFICATION

PRODUCT		DEPT.
Aroclor 1242, Electrical Grade		246 27 L
PLANT	PRODUCT CODE	USE
WGK, Ann.	81101 - 82612	Sales
DATE EFFECTIVE	SALES CODE	
6/17/66	1040-240-04/11/16-03/09	

APPROVALS

PRODUCTION: P. E. Heisler	RESEARCH: R. W. Bucknell
SALES: W. E. Ault	QUALITY CONTROL (Chief Chemist): O. E. Dolin / W. J. Gresham

GENERAL DESCRIPTION

Also known as Pyranol 1499

CHEMICAL FORMULA

MOL WT.

SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
4-13-62	3 x 5 pt. Amber Bottles	J. P. Prader

CHARACTERISTIC		LIMITS	WGK METHOD	Anniston METHOD
UNRESTRICTED INFORMATION				
(R)	Color (APHA)	40, max.	10084	14-44-54
(R)	Condition	Clear	10084	G-1
(R)	Sp. Gr. @ 25/15.5°C.	1.381 - 1.392	10114	14-49-54
(R)	Acidity (mg. KOH/g.)	0.010, max.	10087	14-42-54
(R)	Moisture (H_2O)	35 ppm., max.	10620	14-53-54
(R)	Refractive Index @25°C.	1.6240 - 1.6260	10125	14-34-54
(R)	Inorganic (Free) Chlorides	0.05 ppm., max.	12741	014
R)	Pour Point	-14°C. or Lower	10115	14-47-54
(R)	Dielectric Constant (1000 cycles @ 100°C.)	4.70 - 4.90	11608	14-36-54
(R)	Resistivity (500 VDC @ 100°C. 0.1" Gap) As OHM-CM x 10^9	500, min.	11607	14-35-57
(R)	Hydrolysis Stability Test (As Chlorides)	0.5 ppm, max.	12672	010
(R)	Monsanto Stability Test (As Chlorides)	0.4 ppm., max.	11503	14-61-57
(R)	Distillation Range (ASTM D-20, Corrected)	...	10117	14-31-54
	10% Distilled by wt.	325°C., min.		
	90% Distilled by wt.	360°C., max.		
	Sulfates	None	12169	------
	Dielectric Strength @ 25°C.	35 KV, min.	11605	043
	Flash Point (°F)	338 - 392	10123	14-28-54
	Fire Point	None	10123	14-28-54
	Corrosion Test (6 hrs. @ 210°C. with bright aluminum foil)		10126	14-55-57
	Change in wt. of AL %	0.0		
	A.C. Color (APHA)	60, max.	10084	14-44-54
	A.C. Condition	Clear.	10084	G-1
	A.C. Acidity (mg. KOH/g.)	0.010, max.	10087	14-42-54
	A.C. Inorganic (Free) Chlorides	0.05 ppm., max.	12741	014
	Visc. @ 100°F. (SUS)	82 - 92	10086	14- 4-52

(Over)

DSW 053375

WATER_PCB-SD0000050837

GENERAL INFORMATION

Specific Heat @ 25°C.	0.30
Coefficient of Expansion (25 - 65°C)	0.00068 cc/°C.
Fixed Chlorine	42.5 - 53.5%
Power Factor @ 100°C.	(Typical Values)
60 cycles	5
1000 cycles	0.30

SPECIAL CUSTOMER REQUIREMENTS

General Electric

Thermal Chemical Chlorides	0.65 ppm., max.	12722

Westinghouse

Hydrolizable Chlorine (Westinghouse Stability Test)	1.0 ppm., max.	T-2219

OSW 053376

WATER_PCB-SD0000050838

Monsanto
ORGANIC CHEMICALS DIVISION

W. G. Krummrich & Anniston
FINISHED PRODUCT
SPECIFICATION

PRODUCT		DEPT.
Aroclor 1248 Non-Electrical Grade		WFK 2-16
PLANT	PRODUCT CODE	USE
WGK & Ann.	81102 - 82641	Sales
DATE EFFECTIVE	SALES CODE	
9/25/67	1040-260-04/11/16-03/09	

APPROVALS

PRODUCTION	RESEARCH
P. E. Heisler	M. E. Gibbs
SALES	QUALITY CONTROL (Chief Chemist)
W. E. Ault	W. J. Gresham

GENERAL DESCRIPTION: Mixture

CHEMICAL FORMULA:

MOL WT.:

SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
7/15/64	3 x 16 oz. W.M. Bottles	L. E. Hornback

UNRESTRICTED INFORMATION

	CHARACTERISTIC	LIMITS	METHOD WGK	METHOD Anniston
(R)	Appearance	Colorless to light yellow-green liquid	10084	G-1
(R)	Condition	Clear	10084	G-1
(R)	Color, APHA	100 max.	10084	046
(R)	Sp. Gr. @65/15.5°C.	1.405 - 1.415	10114	052
(R)	Acidity (mg. KOH/g.)	0.010, max.	10087	050
(R)	Moisture (H_2O) (ppm)	50, max.	10620	047
(R)	Viscosity @130°F. (SUS)	73 - 80	10086	049
	Flash Point (°F)	370, min.	10123	14-28-5

DSW 053377

WATER_PCB-SD0000050839

UNRESTRICTED INFORMATION (continued)

Property	Specification	Method No. WGK	Method No. Annin
Restricted Information			
Monsanto Stability Test (As Chlorides in ppm.)	0.7, Max.	11,503	14-61-57
General Information			
Evaporation Loss after 6 hrs. @ 100°C (%)	0.2, Max.	10,116	14-32-54
Stability test - after 30 days at 100°C in glass sealed in air	No liberation of chlorine or chlorides	------	--------

Retyped:
March 7, 1963

/gm

DSW 053378

WATER_PCB-SD0000050840

Monsanto
ORGANIC CHEMICALS DIVISION

FINISHED PRODUCT SPECIFICATION

PRODUCT		DEPT.
Aroclor 1254 Electrical Grade		246 -
PLANT	PRODUCT CODE	USE
WGK and Ann.	81103 82613	Sales
DATE EFFECTIVE	SALES CODE	
JUN 28 1965	1040-280-04/11/16-03/09	

APPROVALS

PRODUCTION	RESEARCH
P. E. Heisler	R. W. Bucknell
SALES	QUALITY CONTROL (Chief Chemist)
W. E. Ault	W. J. Gresham. O. E. Dolin

GENERAL DESCRIPTION

Also called Pyranol 1476

CHEMICAL FORMULA

MOL WT.

SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
4-13-62	3 x 5 pt. Amber Bottles	M. D. Dealy

CHARACTERISTIC	LIMITS	METHOD	
		WGK	Ann.
UNRESTRICTED INFORMATION			
(R) Color, APHA	50, max.	10084	14-44-54
(R) Condition	Clear	10084	G-1
(R) Sp. Gr. @65/15.5°C	1.495 - 1.505	10114	14-49-54
(R) Acidity (mg. KOH/gm.)	0.010, max.	10087	14-42-54
(R) Moisture (H_2O)	35 ppm, max.	10620	14-53-54
(R) Refractive Index @25°C	1.6370 - 1.6390	10125	14-34-54
(R) Inorganic (Free) Chlorides	0.05 ppm., max.	T-2092	014
(R) Pour Point	7 - 12°C	10115	14-27-54
(R) Dielectric Constant (1000 cycles @100°C)	4.15 - 435	11608	14-36-54
(R) Resistivity (500 VDC @100°C 0.1" GAP) as OHM-CM x 109	500, min.	11607	14-35-57
(R) Hydrolysis Stability Test (as Chlorides)	1.0 ppm., max.	T-2087	010
(R) Monsanto Stability Test (as Chlorides)	0.5 ppm., max.	11503	14-61-57
(R) Distillation Range (ASTM D-20, Corrected)		10117	14-31-54
10% Distilled by Wt.	366 - 378°C		
50% Distilled by Wt.	371 - 383°C		
90% Distilled by Wt.	379 - 394°C		
Sulfates	None	12169	
Dielectric Strength @25°C	35KV, min.	11605	043
Flash Point	None	10123	14-28-54
Fire Point	None	10123	14-28-54
Visc. @210°F (SUS)	44-48	10086	14-4-52
Corrosion Test (6 hrs @210°C with bright aluminum foil)		10126	14-55-57
Change in wt. of Al (%)	0.0		
A. C. Color, APHA	60. max.	10084	14-44-54
A. C. Condition	Clear	10084	G-1
A. C. Acidity (mg.KOH/g.)	0.010. max.	10087	14-42-54
A. C. Inorganic (Free) Chlorides	0.05 ppm., max.	10118	010

DSW 053379

WATER_PCB-SD0000050841

IN C4 MONSANTO CHEMICAL COMPANY
ORGANIC CHEMICALS DIVISION

FINISHED PRODUCT SPECIFICATION

PRODUCT CODE: 82614 - Anniston; 81105 - WGK
Department: 27 - Anniston; 246 - WGK
SALES CODE: 1040-290-04/11/16/-03/09

Issued 2/7/62
W. G. Krummrich Plant
By E. O. Martin

PRODUCT (Trade name): AROCLOR 1260
TYPE: Electrical Grade
PRODUCT (Chemical name):
TYPE: (Pyranol 1482)
CHEMICAL FORMULA: MIXTURE
MOL WT.: ---
USE: Sales

SUPERSEDES SPECS OF	SPECIAL JOB NO.	SAMPLE FOR ANALYSIS
3/28/58		3 x 5 pt. Amber Bottles

UNRESTRICTED INFORMATION

Routine Tests:

Property	Specification	Method No. WGK	Method No. Anniston
Color (APHA)	150, Max.	10,084	14-44-54
Condition	Clear	10,084	--------
Specific Gravity @ 90/15.5°C	1.555-1.566	10,114	14-49-54
Acidity (mg KOH/g.)	0.014, Max.	10,087	14-42-54
Moisture (H_2O) (ppm.)	35, Max.	10,620	14-53-54
Viscosity @ 210°F (SUS)	72-78	10,086	14- 4-52
Refractive Index @ 25°C	1.6455-1.6470	10,125	14-34-54
Inorganic (Free) Chlorides	No detectable amt.	10,118	14-48-57
Pour Point (°C)	25-34	10,115	14-47-54
Distillation Range (ASTM D-20, Corrected)		10,117	14-32-54
10% Distilled by wt.	385-398°C		
50% Distilled by wt.	390-404°C		
90% Distilled by wt.	400-420°C		
Corrosion Test (6 hrs. @ 210°C with bright aluminum foil)		10,126	14-55-57
Change in weight of Al (%)	0.0		
A.C. Color (APHA)	150, Max.	10,084	14-44-54
A.C. Condition	Clear	10,084	--------
A.C. Acidity (mg.KOH/g.)	0.014, Max.	10,087	14-42-54
A.C. Inorganic (Free) Chlorides	No detectable amt.	10,118	14-48-57

General Tests (made only on request)

Flash Point	None	10,123	14-28-54
Fire Point	None	10,123	14-28-54
Fixed Chlorine (%)	59.5-60.5	10,088	14-13-54
Dielectric Strength @ 50°C	30 K.V., Min.	11,605	--------
Resistivity (500 VDC @ 100°C 0.1" gap as ohm-cm. x 10^9)	500, Min.	11,607	14-35-57
Dielectric Constant 1000 cycles, 100°C	3.6-3.8	11,608	14-36-45

DSW 053380

WATER_PCB-SD0000050842

Monsanto
ORGANIC CHEMICALS DIVISION

ANNISTON AND KRUMMRICH
FINISHED PRODUCT
SPECIFICATION

PRODUCT: AROCLOR DISTILLED 1262			DEPT. Ann-; WGK-2
PLANT: ANN. & WGK	PRODUCT CODE: 82615-Ann. 81107-WGK	USE: Sales	
DATE EFFECTIVE: MAR 02 1966	SALES CODE: 1040-300-04/11/16-03-09		

APPROVALS

PRODUCTION: P. E. Heisler	RESEARCH: W. D. Robinson
SALES: W. E. Ault	QUALITY CONTROL (Chief Chemist): W. J. Gresham; O. E. Dolin

GENERAL DESCRIPTION

CHEMICAL FORMULA

MOL WT.

SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
1/24/62	2 x 16 oz. W.M. Bottles	J. P. Prader

CHARACTERISTIC		LIMITS	METHOD
UNRESTRICTED INFORMATION			
(R)	Appearance	Viscous liquid	10084
(R)	Color	APHA 150, max.	10084
(R)	Specific Gravity @ 90/15.5°C.	1.572 - 1.583	10114
(R)	Acid No. (mg. KOH/g.)	0.014, max.	10087
(R)	Viscosity @ 210°F.	86 - 100 SUS	10086
GENERAL INFORMATION			
	Pour Point (ASTM)	35 - 38°C.	
	Distilling Range	390 - 425°C.	
	Total Chlorine	61.5 - 62.5%	
	Specific Gravity Temperature Coefficient (85 - 130°C.)	0.001/°C.	

DSW 053381

(R) Routine Analysis. All others Analyzed by request Only

WATER_PCB-SD0000050843

Monsanto
ORGANIC CHEMICALS DIVISION

FINISHED PRODUCT SPECIFICATION

PRODUCT		DEPT.
Aroclor 4465		27-S
PLANT	PRODUCT CODE	USE
Anniston	826.19	Sales
DATE EFFECTIVE	SALES CODE	
3-11-66	1040-430-04-11-16-009	

APPROVALS

PRODUCTION	RESEARCH
R. G. Moody /s/ 2-29-66	L. R. Stark /s/ 3-8-66
SALES	QUALITY CONTROL (Chief Chemist)
W. E. Ault /s/ 3-2-66	O. E. Dolin /s/ 12-29-65

GENERAL DESCRIPTION

Mixture

CHEMICAL FORMULA

MOL WT.

SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
4-25-61	1 x 16 oz. Can or W.M. Bottle	J. A. Liddle 11-30-65

CHARACTERISTIC	LIMITS	METHOD
UNRESTRICTED INFORMATION		
(R) Appearance and Color	Clear, light yellow resin	G-1
(R) Color, NPA, Molten	2 Max.	G-4
(R) Softening Point, °C	60 - 66	115
Acid No., mg KOH/g	0.05 Max.	116

DSW 053382

(R) Routine Analysis, All others Analyzed by request Only

WATER_PCB-SD0000050844

IN ▪▪ MONSANTO CHEMICAL COMPANY
ORGANIC CHEMICALS DIVISION
ANNISTON, ALABAMA

RAW MATERIAL SPECIFICATION

PRODUCT CODE	64010
METHOD IDENTITY	
SUPPLIER	See Below

Issued 3/11/59

STANDARDS DEPT.
Anniston, Ala. Plant

By: W. W. Klemme

MATERIAL: Xylene

CHEMICAL FORMULA: $C_6H_4(CH_3)_2$

MOL. WT.: 106.16

SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS
11/25/58	1 x 8 oz. Bottle

CLASSIFIED SPECIFICATION

General Tests	Specification
Color	Essentially water white
Specific Gravity @ 20/15.5°C.	0.855 - 0.875
Moisture (% H_2O)	0.10, maximum
Acidity	No free acidity
Boiling Range	Must include 139.3°C.
Sulfur Compounds	Free of H_2S and SO_2

Suppliers:

Woodward Iron Company
St. Louis Solvents & Chemical Company (Cosden)

Note:

Any new supplier must first be approved by the Research Formulation Group.

Basis of Specification:

Typical laboratory analyses and ASTM Specification D844-50.

DSW 053383

WATER_PCB-SD0000050845

Monsanto
ORGANIC CHEMICALS DIVISION

RAW MATERIAL
SPECIFICATION

MATERIAL CODE	MATERIAL
36100	Phenoxypropene Oxide
PLANT	**USING DEPTS.**
Anniston	28
DATE EFFECTIVE	**SUPPLIER**
8-28-67	Shell Chemical Co.

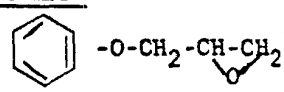
APPROVALS

PRODUCTION	RESEARCH
H. L. Williams /s/ H. L. Williams	L. R. Stark /s/ L. R. Stark
PROCUREMENT	**QUALITY CONTROL** *(Chief Chemist)*
H. L. Phillips /s/ H. L. Phillips	G. W. Miller /s/ G. W. Miller

GENERAL DESCRIPTION

$C_9H_{10}O_2$

CHEMICAL FORMULA



Mol. wt. 150.17

SUPERSEDES SPECS OF	SAMPLE FOR ANALYSIS	ISSUED BY
New	1 x 16 oz. W.M. bottle	J. A. Liddle 8-14-67

CHARACTERISTIC	LIMITS	METHOD
UNCLASSIFIED INFORMATION		
(R) Specific Gravity @ 20/20°C	1.105 - 1.115	052
(R) Total Chlorine	0.2% Max.	
(R) Inorganic (free) Chlorides, ppm	40 Max.	014
Purity (based on Epoxide content percent by weight)	98%	
Color, APHA	30 Max.	
Impurity A (as determined by Anniston GLC method)	0.05 Max.	

General Information (from supplier's technical bulletin)

Boiling Point @ 760 mm	245°C
Melting Point	3.5°C
Flash Point	175°F
Refractive Index @ 20°C	1.5314
Viscosity @ 20°C	7.05 CS
@ 30°C	4.88 CS

DSW 053384

(R) Routine Analysis. All others Analyzed by request only.

WATER_PCB-SD0000050846

Monsanto
ORGANIC CHEMICALS DIVISION

RAW MATERIAL SPECIFICATION

MATERIAL CODE	MATERIAL
60200	Trichlorobenzene
PLANT	USING DEPTS.
Anniston	28
DATE EFFECTIVE	SUPPLIER
3-7-67	Hooker

APPROVALS

PRODUCTION	RESEARCH
R. G. Moody /s/R. G. Moody 2-24-67	L. R. Stark /s/L. R. Stark 3-2-67
PROCUREMENT	QUALITY CONTROL (Chief Chemist)
H. L. Phillips /s/H. L. Phillips 2-24-67	G. W. Miller /s/G. W. Miller 2-24-67

GENERAL DESCRIPTION

Mixture

CHEMICAL FORMULA

SUPERSEDES SPECS OF	SAMPLE FOR ANALYSIS	ISSUED BY
New	2 x 5 pt. Amber bottles	J. A. Liddle 2-21-67

CHARACTERISTIC	LIMITS	METHOD
UNCLASSIFIED INFORMATION		
Routine Tests		
(R) Color, APHA	15 Max.	046
(R) Condition	Clear	G-1
(R) Specific Gravity @ 15.5/15.5°C	1.460 - 1.477	052
(R) Acidity (mg KOH/g.)	0.014 Max.	050
(R) Moisture (H_2O) ppm	75 Max.	047
(R) Refractive Index @ 25°C	1.5680 - 1.5715	048
(R) Free Chlorides, ppm	0.10 Max.	014
(R) Crystallizing Point	10°C Max.	
(R) Dielectric Strength @ 25°C	30 KV, Min.	
(R) Distillation Range (ASTM D850, Modified) (Corrected for Stem and Barometric Pressure)		053
First Drop	205°C, Min.	
5% by Volume	210°C, Min.	
50% by Volume	213°C, Min.	
90% by Volume	215°C, Min.	
(R) Corrosion Test - 6 hours @ 210°C with bright aluminum foil		
Change in weight of Al	0.0%	136
Color, APHA	200 Max.	046
Condition	Clear	G-1
Acidity (mg KOH/g.)	0.014 Max.	050
Free Chlorides, ppm	0.10 Max.	014
General Tests (made only on request)		
Fire Point	None to Boiling Point	114
Fixed Chlorine	58.5% Min.	
Power Factor @ 60 cycles	10% Max.	121
Power Factor @ 1 KC	1% Max.	121
Resistivity, x 10^9	100 Min.	121

CSW 053385

(R) Routine Analysis. All others Analyzed by request only.

WATER_PCB-SD0000050847

MONSANTO CHEMICAL COMPANY
ORGANIC CHEMICALS DIVISION
W. G. KRUMMRICH PLANT

RAW MATERIAL SPECIFICATION

PRODUCT CODE: 58500
METHOD IDENTITY: --
SUPPLIER: Hooker Electrochemical

Issued 1/21/59
W.G.Krummrich Plt.
by E. O. Martin

MATERIAL: TRI-TETRACHLOROBENZENE BLEND
CHEMICAL FORMULA: Mixture

MOL. WT.: --

SUPERSEDES SPECS. OF: 3/10/55
SAMPLE FOR ANALYSIS: 3 x 5 pt. amber bottles

UNRESTRICTED INFORMATION

Routine Tests:

Property	Specification	Method No.
Color	APHA 15, max.	10,105
Condition	Clear	10,105
Specific Gravity at 15.5/15.5°C	1.510-1.522	10,114
Acidity (mg KOH/g.)	0.014, max.	10,087
Moisture (H_2O)	75 ppm., max.	10,620
Refractive Index at 25°C	1.5775-1.5790	10,125
Free Chlorides	0.10 ppm., max.	10,118
Crystallizing Point	-15°C, or lower	12,035
Last Crystal Point	0°C, max.	12,033
Dielectric Strength at 25°C	30 KV., min.	11,605
Distillation Range (ASTM D-850, Modified)		12,034
First Drop	210°C, min.	
5% by volume	215°C, min.	
65% by volume	228°C, min.	
90% by volume	255°C, max.	
95% by volume	265°C, max.	
Dry Point	278°C, max.	
Corrosion Test 6 hrs. at 210°C with bright aluminum foil		10,126
Change in weight of Al	0.0%	
Color	APHA 100, max.	10,105
Condition	Clear	10,105
Acidity (mg KOH/g.)	0.014, max.	10,087
Free Chlorides	0.10 ppm., max.	10,118
Chemical Composition		12,036
Trichlorobenzene	58.5%, min.	
1,2,3,4 Tetrachlorobenzene	26.0-29.0%	
1,2,4,5 Tetrachlorobenzene	3.0%, max.	
Pentachlorobenzene	5.5%, max.	

General Tests (made only on request)

Fire Point	None to boiling point	10,123

General Information

Dielectric Constant 1000 cycles, 100°C	4.8-5.1
Viscosity at 100°F	28-32 SUS

DSW 053386

WATER_PCB-SD0000050848

IN ▫ MONSANTO CHEMICAL COMPANY
ORGANIC CHEMICALS DIVISION
ANNISTON PLANT
RAW MATERIAL SPECIFICATION

PRODUCT CODE: 19400
METHOD IDENTITY:
SUPPLIER: Minerals and Chemicals Corp. America

Issued Sept. 9, 1957
STANDARDS DEPT.
Anniston, Ala. Plant
By W. B. Dunlap
W. B. Dunlap

MATERIAL: Attapulgus Earth - RVM Grade

CHEMICAL FORMULA: Impure Hydrous Magnesium Aluminum Silicate

MOL. WT.:

SUPERSEDES SPECS. OF: App. 1951

SAMPLE FOR ANALYSIS:

UNCLASSIFIED SPECIFICATIONS

General Tests	Specification	Test No.
Screen Analysis:		
Through 200 Mesh (%)	95 min.	20-42-56
Loss on Ignition (% at 950°C)	15 max.	20-43-56

Typical Analysis from supplier (May 29, 1956)

SiO_2 (%)	67.5
Al_2O_3 (%)	12.8
Fe_2O_3 (%)	4.5
MgO (%)	11.1
CaO (%)	1.6
K_2O (%)	0.8
Na_2O (%)	0.1
TiO_2 (%)	0.6
Other (%)	1.0

Basis of Specifications: Supplier's Finished Goods Specifications (5/29/56) and W. G. Krummrich Plant analytical history.

DSW 053387

WATER_PCB-SD0000050849

Monsanto
ORGANIC CHEMICALS DIVISION
Krummrich & Anniston
RAW MATERIAL
SPECIFICATION

MATERIAL CODE	MATERIAL
61325	EP-221
PLANT	**USING DEPTS.**
WGK & Ann.	A-246 WGK 27 Ann.
DATE EFFECTIVE	**SUPPLIER**
7/21/66	Union Carbide

APPROVALS

PRODUCTION P. E. Heisler	**RESEARCH** M. E. Gibbs
PROCUREMENT R. H. Burnett	**QUALITY CONTROL (Chief Chemist)** W. J. Gresham O. E. Dolin

GENERAL DESCRIPTION

CHEMICAL FORMULA

SUPERSEDES SPECS OF	SAMPLE FOR ANALYSIS	ISSUED BY
NEW	1 - 16 oz. W M Bottle	J. P. Prader

UNRESTRICTED INFORMATION

	CHARACTERISTIC	LIMITS	METHOD
(R)	Appearance	Clear liq., free from dirt fibers, or other contamination	13019
(R)	Assay	88%, min.	13017
	Color	150 APHA, max.	10084
	Total Free Chlorides	10 ppm, max.	13021
	Refractive Index @25°C.	Report	13020
	Moisture	0.1%, max.	10620
	Acidity	0.2 mg KOH/gm, max.	10087
	Sp. Gr. @90/15.5°C.	Report	13018

Supplier's certificate of analysis to be sent on day of shipment to:
Chief Chemist, Monsanto Co., Monsanto, Ill.

OR Chief Chemist, Monsanto Co., Anniston, Ala.

DSW 053388

(R) Routine Analysis. All others Analyzed by request only.

WATER_PCB-SD0000050850

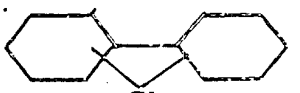
APPENDIX C - PHYSICAL CONSTANTS OF FINISHED GOODS, INTERMEDIATES, AND MAJOR RAW MATERIALS

DSW 053389

WATER_PCB-SD0000050851

JIN 619

PHYSICAL CONSTANTS DATA

SUBSTANCE	STRUCTURAL FORMULA
AROCLOR 1242	
COMPILED BY: A. M. Ellerburg	DATE: 4-25-57

NAME		SOURCE & DATE
Formula	$C_{12}H_7Cl_3$	
Molecular Weight	257 (avg.)	
Appearance	Colorless Mobile Oil	Monsanto Bull. OP-115 (.956
Boiling Point at 760 mm Range	325 - 360°C.	"
Boiling Point at 3 mm "	155-195°C.	"
Boiling Point at mm		
Boiling Point at mm		
Crystallizing Point	Non-crystallizing	"
Melting Point		
Solution Point		
Specific Gravity @ 25/25°C.	1.380	"
Specific Gravity @ 25/15.5°C.	1.381 - 1.392	Specification 2-14-55
Pounds per Gal. @ 25°C	11.50	M. B. OP-115
Coefficient of Expansion 25-65°C.	0.00068 cc/cc/°C.	"
Refractive Index @ 25°C. n_D	1.6245 - 1.6265	Specification 2-14-55
Infra Red Spectrum *(Reference)*		
Ultra Violet Spectrum *(Reference)*		
Viscosity @ 210°F.	34-35 SUS	M. B. OP-115
Viscosity @ 100°F.	82-92 SUS	"
Surface Tension Dynes/cm @ 20°C.	45.3	J. Coll. Sci. —, 166, (1952)
Solubility in Water	Insoluble	M. B. OP-115
Solubility in 3A Alcohol @ 29°C.	23.3 g./100 cc	"
Solubility in Pyridine @ 30°C.	132.5 g./100 cc	"
Flash Point °C *(Method)* c.o.c.	180°C.	"
Fire Point °C c.o.c.	None	"
Heat of Combustion		
Heat of Formation		
Thermal Stability (cal./kg./min.)		
Latent Heat of Fusion		
Latent Heat of Vap. cal/gm.	61	Calculated
Specific Heat @ 25°C.	0.293	M. B. OP-115
Critical Temperature		
Critical Pressure		
Dissociation Constant		
Specific Heat @ 300°C.	0.380	"
Other Constants		
Pour Point	-14°C. or lower	"
Thermal Conductivity, cal/cm/°C/sec.	24.0 @ 28°C.	To be published
Dielectric Constant, 100°C., 60 cy.	4.7 - 4.9	M. B. OP-115
		DSW 053390
Toxicity *(Give Reference)*	Contact Medical Dept.	M. B. OP-115

NOTE: *These data should not be released outside of Monsanto Chemical Company. Use additional sheets if necessary.*

WATER_PCB-SD0000050852

IN 619

PHYSICAL CONSTANTS DATA

SUBSTANCE	STRUCTURAL FORMULA
AROCLOR 1254	
COMPILED BY: A. M. Ellenberg	DATE: 4-25-47

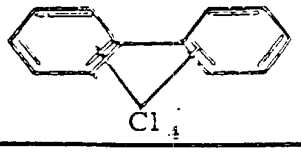
NAME		SOURCE & DATE
Formula	$C_{12}H_4Cl_6$	
Molecular Weight	326 (Avg.)	
Appearance	Pale Yellow viscous oil	Monsanto Bull OP-115/1956
Boiling Point at 760 mm Range	365-400°C	"
Boiling Point at 3 mm "	180-220°C	"
Boiling Point at mm		
Boiling Point at mm		
Crystallizing Point	Non-crystallizing	"
Melting Point		
Solution Point		
Specific Gravity @ 25/25°C.	1.538	"
Specific Gravity @ 65/15.5°C.	1.495-1.505	Specifications 2/14/55
Pounds per Gal. @ 25 °C	12.82	MB OP-115
Coefficient of Expansion 25-65°C.	0.00066 cc/cc/°C.	"
Refractive Index @ 25°C n D	1.6370-1.6390	Specification 2/14/55
Infra Red Spectrum *(Reference)*		
Ultra Violet Spectrum *(Reference)*		
Viscosity @ 210°F	44-48 SUS	MB OP-115
Viscosity @		
Surface Tension Dynes/cm	50.3 @25°C, 42.0 @100°C	"
Solubility in Water	Insoluble	"
Solubility in 3A Alcohol @25°C	10 g./100 cc	"
Solubility in Pyridine @ 31°C.	114 g./100 cc	"
Flash Point °F *(Method)* c.o.c.	None	"
Fire Point °C c.o.c.	None	"
Heat of Combustion		
Heat of Formation		
Thermal Stability (cal./kg/min.)		
Latent Heat of Fusion		
Latent Heat of Vap. cal/gm.	50	Calculated
Specific Heat @ 25°C.	0.261	MB OP-115
Critical Temperature		
Critical Pressure		
Dissociation Constant		
Specific Heat @ 300°C.	0.336	"
Other Constants		
Pour Point	7-12°C.	"
Thermal Conductivity, Cal/cm/°C/Sec.	23.9 @ 28°C	To be published
Dielectric Constant, 100°C. 60 cy.	4.15-4.35	MB-OP-115
		DSW 053391
Toxicity *(Give Reference)*	Company Medical Dept.	M P OP 115

NOTE: *These data should not be released outside of Monsanto Chemical Company. Use additional sheets if necessary.*

WATER_PCB-SD0000050853

JTN 612

PHYSICAL CONSTANTS DATA

SUBSTANCE	STRUCTURAL FORMULA
AROCLOR 1248	
COMPILED BY: A. M. Ellenburg	DATE: 4-25-57

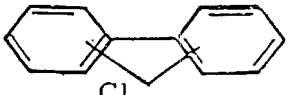
NAME		SOURCE & DATE
Formula	$C_{12}H_6Cl_4$	
Molecular Weight	292 (Avg.)	
Appearance	Yellow Tinted Mob. Oil	Monsanto Bull. OP-115(195
Boiling Point at 760 mm Range	345-385°C.	"
Boiling Point at 3 mm "	165-210°C.	"
Boiling Point at mm		
Boiling Point at mm		
Crystallizing Point	Non-crystallizing	"
Melting Point		
Solution Point		
Specific Gravity @ 25/25°C.	1.445	"
Specific Gravity @ 65/15.5°C.	1.405-1.415	Specifications 9/9/54
Pounds per Gal. @ 25 °C	12.04	M.B. OP-115
Coefficient of Expansion 25-65°C.	0.00070 cc/cc/°C.	"
Refractive Index @ 25°C n D	1.6285-1.6305	Specification 9/9/54
Infra Red Spectrum *(Reference)*		
Ultra Violet Spectrum *(Reference)*		
Viscosity @ 130°F.	73-80 SUS	M.B. OP-115
Viscosity @		
Surface Tension Dynes/cm @20°C.	44.2	J. Coll. Sci. 7. 166. (1952)
Solubility in Water	Insoluble	M.B. OP-115
Solubility in 3A Alcohol @ 25°C.	15 g./100 cc	"
Solubility in Pyridine @ 29°C.	111.4g./100 cc	"
Flash Point °K *(Method)* c.o.c.	196°C.	"
Fire Point °C c.o.c.	None	"
Heat of Combustion		
Heat of Formation		
Thermal Stability (cal./kg./min.)		
Latent Heat of Fusion		
Latent Heat of Vap. cal/gm.	54	Calculated
Specific Heat @ 25°C.	0.277	M.B. OP-115
Critical Temperature		
Critical Pressure		
Dissociation Constant		
Specific Heat @ 300°C.	0.356	"
Other Constants: Pour Point	0°C. or lower	"
Other Constants: Thermal Conductivity, cal/cm/°C/sec.	23.6 @ 28°C.	To be published
Other Constants: Dielectric Constant, 100°C., 60 cy.	4.5-4.7	M.B. OP-115
		DSW 053392
Toxicity *(Give Reference)*	Contact Medical Dept.	M.B. OP-115

NOTE: *These data should not be released outside of Monsanto Chemical Company. Use additional sheets if necessary.*

WATER_PCB-SD0000050854

IN 619

PHYSICAL CONSTANTS DATA

SUBSTANCE	STRUCTURAL FORMULA
AROCLOR 1260	 Cl 6.25
COMPILED BY: A. M. Ellenburg	DATE: 4/25/57

NAME		SOURCE & DATE
Formula	$C_{12}H_{3.75}C_{16.25}$	
Molecular Weight	361 (Avg.)	
Appearance	Lt. Yell. soft sticky resin	Monsanto Bull. OP-115/1956
Boiling Point at 760 mm Range	385-420°C.	"
Boiling Point at 5 mm "	195-245°C.	"
Boiling Point at mm		
Boiling Point at mm		
Crystallizing Point	Non-Crystallizing	"
Melting Point		
Solution Point		
Specific Gravity @ 25/25/°C.	1.620	"
Specific Gravity @ 90/15.5°C.	1.555-1.566	Specification 2/14/55
Pounds per Gal. @ 25 °C	13.50	MB OP-115
Coefficient of Expansion 20-100°C.	0.00067 cc/cc/°C.	
Refractive Index @ 25°C nD	1.6455-1.6465	Specification 2/14/55
Infra Red Spectrum *(Reference)*		
Ultra Violet Spectrum *(Reference)*		
Viscosity @ 210°F.	72-78 SUS	MB OP-115
Viscosity @		
Surface Tension		
Solubility in Water	Insoluble	" "
Solubility in		
Solubility in		
Flash Point °F *(Method)* c.o.c.	None	"
Fire Point °C c.o.c.	None	"
Heat of Combustion		
Heat of Formation		
Thermal Stability (cal./kg/min.)		
Latent Heat of Fusion		
Latent Heat of Vap. cal/gm	48	Calculated'
Specific Heat @ 25°C.	0.228	MB OP-115
Critical Temperature		
Critical Pressure		
Dissociation Constant		
Specific Heat @ 300°C.	0.303	"
Other Constants: Pour Point	25-34°C.	"
Dielectric Constant, 100°C. 60 cy.	3.6-3.8	"
		JDSW 053393
Toxicity *(Give Reference)*	Contact Medical Dept.	MB OP-115

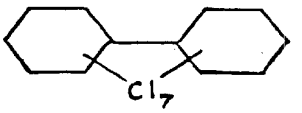
NOTE: *These data should not be released outside of Monsanto Chemical Company. Use additional sheets if necessary.*

WATER_PCB-SD0000050855

IN 619

PHYSICAL CONSTANTS DATA

SUBSTANCE: AROCLOR 1262

STRUCTURAL FORMULA: 

COMPILED BY: A. M. Ellenburg

DATE: 7/3/57

NAME		SOURCE & DATE
Formula	$C_{12}H_3Cl_7$	
Molecular Weight	395	
Appearance	Light yell. sticky Resin	Monsanto Bulletin OP-115
Boiling Point at 760 mm	390-425°C	" (1956)
Boiling Point at mm		
Boiling Point at mm		
Boiling Point at mm		
Crystallizing Point		
Melting Point		
Solution Point		
Specific Gravity @ 90/15.5°C	1.577-1.587	Specs. 4/11/55
Specific Gravity @ 25/25°C	1.646	MB OP-115
Pounds per Gal. @ 25 °C	13.72	"
Coefficient of Expansion 25-65°C	0.00064 cc/cc/°C	"
Refractive Index @ 25°C n_D	1.648-1.650	"
Infra Red Spectrum *(Reference)*		
Ultra Violet Spectrum *(Reference)*		
Viscosity @ 210°F	86-100 SUS	Specs. 4/11/55
Viscosity @		
Surface Tension		
Solubility in Water		
Solubility in		
Solubility in		
Flash Point °F *(Method)*	None	MB OP-115
Fire Point °C	None	"
Heat of Combustion		
Heat of Formation		
Thermal Stability (cal./kg./min.)		
Latent Heat of Fusion		
Latent Heat of Vap.		
Specific Heat		
Critical Temperature		
Critical Pressure		
Dissociation Constant		
Pour Point	35-38°C	
Other Constants		
		DSW 053394
Toxicity *(Give Reference)*	Contact Med. Dept.	MB OP-115

NOTE: *These data should not be released outside of Monsanto Chemical Company. Use additional sheets if necessary.*

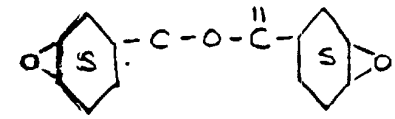
WATER_PCB-SD0000050856

N 619

PHYSICAL CONSTANTS DATA

SUBSTANCE: UNOX EPOXIDE 221

(dicyclo diepoxy carboxylate)

STRUCTURAL FORMULA: 

COMPILED BY: VR HAUPT 4-5-68 DATE:

NAME		SOURCE & DATE
Formula	O(C$_6$H$_8$)CH$_2$OCO(C$_6$H$_8$)O	REF 1
Molecular Weight	252.31	
Appearance		
Boiling Point at 760 mm	354°C	REF 1
Boiling Point at mm < 0.01 mm	20°C	
Boiling Point at mm		
Boiling Point at mm		
Crystallizing Point	-20°C	REF 1
Melting Point		
Solution Point		
Specific Gravity @ 20/20°C	1.1750	REF 1
Specific Gravity @		
Pounds per Gal. @ 20°C	9.76	REF 1
Coefficient of Expansion		
Refractive Index @ n_D		
Infra Red Spectrum *(Reference)*		
Ultra Violet Spectrum *(Reference)*		
Viscosity @		
Viscosity @		
Surface Tension		
Solubility in Water @ 20°C	0.03 wt %	REF 1
Solubility in		
Solubility in WATER IN 221	2.8 wt %	REF 1
Flash Point °F *(Method)* CLEVE OPEN CUP	400°F	REF 1
Fire Point °C		
Heat of Combustion		
Heat of Formation		
Thermal Stability (cal./kg/min.)		
Latent Heat of Fusion		
Latent Heat of Vap.		
Specific Heat		
Critical Temperature		
Critical Pressure		
Dissociation Constant		

Other Constants

References:

1. 1967 ED - PHYS PROPS - UNION CARBIDE CHEMICALS

DSW 053395

Toxicity *(Give Reference)*

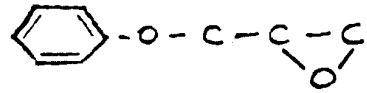
NOTE -

WATER_PCB-SD0000050857

IN 619

PHYSICAL CONSTANTS DATA

SUBSTANCE: PHENYL GLYCIDYL ETHER (PPO)
(1,2-EPOXY-3-PHENOXYPROPANE)

STRUCTURAL FORMULA: 

COMPILED BY: VRHAUPT DATE: 11-5-68

NAME			SOURCE & DATE
Formula	$(C_6H_{11})OCH_2CH_2O$		REF 1
Molecular Weight	143.21		CALC
Appearance			
Boiling Point at 760 mm	245°C		REF 1
Boiling Point at 11.41 mm @	120°C	126.47 @ 180	REF 1
Boiling Point at 28.30 mm @	140°C	235.9 @ 200	REF 1
Boiling Point at 62.59 mm @	160°C		REF 1
Crystallizing Point			
Melting Point	3.5°C		REF 1
Solution Point			
Specific Gravity @ 20/4°C	1.1092		REF 1
Specific Gravity @			
Pounds per Gal. @			
Coefficient of Expansion			
Refractive Index @ 20°C n_D	1.5314		REF 1
Infra Red Spectrum (Reference)			
Ultra Violet Spectrum (Reference)			
Viscosity @ 20°C	7.05 cp		REF 1
Viscosity @ 30°C	4.88 cp		REF 1
Surface Tension			
Solubility in Water @ 20°C	0.24 wt%		REF 1
Solubility in OCTANE @ 20°C	12.9 wt%		REF 1
Solubility in ACETONE & TOLUENE	MISCIBLE		REF 1
WATER IN GPE	0.4 wt%		REF 1
OCTANE IN GPE	10.0 wt%		REF 1
Flash Point °F (Method) TAG OPEN CUP	> 175°F		REF 1
Fire Point °C			
Heat of Combustion			
Heat of Formation			
Thermal Stability (cal./kg/min.)			
Latent Heat of Fusion			
Latent Heat of Vap.			
Specific Heat			
Critical Temperature			
Critical Pressure			
Dissociation Constant			

Other Constants

References:
1 SHELL CHEM CORP TECH BUL SC:55-76

Toxicity (Give Reference)

DSW 053396

NOTE: [illegible]

WATER_PCB-SD0000050858

111 C10

PHYSICAL CONSTANTS DATA

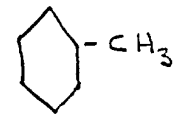
SUBSTANCE: TOLUENE

(METHYL BENZENE

COMPILED BY: VREHAUFT

DATE: 4-6-68

STRUCTURAL FORMULA



NAME		SOURCE & DATE
Formula	$(C_6H_5)CH_3$	REF 1
Molecular Weight	92.13	REF 1
Appearance	COL LQ	REF 1
Boiling Point at 760 mm	110.8 °C	REF 1
Boiling Point at 9.62 mm	5.4 °C	REF 1
Boiling Point at 40.00 mm	59.1 °C	REF 1
Boiling Point at 90.00 mm	404.6 °C	REF 1
Crystallizing Point		
Melting Point	- 95 °C	REF 1
Solution Point		
Specific Gravity @ 20/4 °C	0.866	REF 1
Specific Gravity @		
Pounds per Gal. @		
Coefficient of Expansion		
Refractive Index @ n_D		
Infra Red Spectrum *(Reference)*		
Ultra Violet Spectrum *(Reference)*		
Viscosity @		
Viscosity @		
Surface Tension		
Solubility in Water		
Solubility in		
Solubility in ALCOHOL, ETHER	MISCIBLE	REF 1
AUTOIGNITION PT	1026 °F	REF 1
EXPLOSIVE LIMITS % VOL	1.27 - 7.0	REF 1
Flash Point °F *(Method)* OPEN CUP	45 °F	REF 1
Fire Point °C		
Heat of Combustion		
Heat of Formation		
Thermal Stability (cal./kg/min.)		
Latent Heat of Fusion		
Latent Heat of Vap.		
Specific Heat		
Critical Temperature		
Critical Pressure		
Dissociation Constant		

Other Constants

References:

1. LANGE'S HANDBOOK OF CHEMISTRY

Toxicity *(Give Reference)*

DSW 053397

WATER_PCB-SD0000050859

PHYSICAL CONSTANTS DATA

SUBSTANCE: TRI-TETRA BLEND

STRUCTURAL FORMULA: Composition

1, 2, 3, 4-Tetra	26-29%
1, 2, 4, 5-Tetra	0- 3%
Penta	0- 5.5%
Trichlorbenzene	Remainder

Syst. No. 464 f V. 204

COMPILED BY: D. K. Lynch

DATE: 12/13/54

NAME		SOURCE & DATE
Formula	Mixture	Specification
Molecular Weight	---	
Appearance	W. W. Liquid	(GE material D5 P 69)
Boiling Point at 760 mm	210-278°C.	
Boiling Point at mm		
Boiling Point at mm		
Boiling Point at mm		
Crystallizing Point	-15°C. (Max.)	
Melting Point		
Solution Point	0°C	
Specific Gravity @ 15.5/15.5°C.	1.510-1.520	
Specific Gravity @		
Pounds per Gal. @ 15.5°C	12.6	
Coefficient of Expansion		
Refractive Index @ 25°C. n_D	1.5775-1.5790	
Infra Red Spectrum (Reference)		
Ultra Violet Spectrum (Reference)		
Viscosity @		
Viscosity @		
Surface Tension		
Solubility in Water		
Solubility in		
Solubility in		
Flash Point °F (Method)		
Fire Point °C	None to B.P.	
Heat of Combustion		
Heat of Formation		
Thermal Stability (cal./kg/min.)		
Latent Heat of Fusion		
Latent Heat of Vap.		
Specific Heat		
Critical Temperature		
Critical Pressure		
Dissociation Constant		

60200

PHYSICAL CONSTANTS DATA

SUBSTANCE: TRICHLOROBENZENE

(Mixture of 1, 2, 3 & 1, 2, 4 T.C.B.)

STRUCTURAL FORMULA

COMPILED BY: Hooker Electrochemical Company

DATE: 7-25-57

NAME		SOURCE & DATE
Formula	$C_6H_3Cl_3$	Ref. 1
Molecular Weight	181.5	Ref. 1
Appearance	Clear colorless	Ref. 1
Boiling Point at 760 mm		
Boiling Point at mm		
Boiling Point at mm 50 psig	280°C	Ref. 2
Boiling Point at mm		
Crystallizing Point		
Melting Point	10°C, Max.	Ref. 3
Solution Point		
Specific Gravity @ 15.5°C/15.5°C	1.460-1.475	Ref. 3
Specific Gravity @		
Pounds per Gal. @ 15.5 °C	12.2	Ref. 2
Coefficient of Expansion Cubical	.00086	Ref. 2
Refractive Index @ 20 nD	1.570	
Infra Red Spectrum *(Reference)*		
Ultra Violet Spectrum *(Reference)*		
Viscosity @ 100° F	1.100 Centistokes	Ref. 2
Viscosity @ 210° F	0.549 Centistokes	Ref. 2
Surface Tension @25°C	38.9 dynes/cm	Ref. 2
Solubility in Water		
Solubility in water @ 25°C	.0025 grams/100 grams	Ref. 2
Solubility in		
Flash Point °F *(Method)* Cleveland open cup	None	Ref. 2
Fire Point °C " " "	None up to boiling pt.	Ref. 2
Heat of Combustion		
Heat of Formation		
Thermal Stability (cal./kg/min.)		
Latent Heat of Fusion		
Latent Heat of Vap.	54 cal/gram	
Specific Heat @ 25°C	0.20	Ref. 2
Critical Temperature		
Critical Pressure		
Dissociation Constant		
Moisture content	.05%, Max.	Ref. 3
Distillation range	5°C, Max. incl 216°C	Ref. 3
Decomposition temperature	300 + °C	Ref. 2
Density correction factor	.00124 per 1°C	Ref. 2
Isomer distribution	Mixture 1, 2, 3 & 1, 2, 4	Ref. 2

Comments

References (1) Langes Handbook

References (2) Hooker Data Sheet

References (3) Hooker Specification

Index (Give Reference)

DSW 053399

WATER_PCB-SD0000050861

PHYSICAL CONSTANTS DATA

[illegible]	STRUCTURAL FORMULA
AROCLOR 1260 - 10% Toluol Mix	Mixture by Weight 90% - Aroclor 1260 10% - Toluol
SUBMITTED BY: [illegible]	DATE: 7/3/57

NAME		SOURCE & DATE
[illegible]		
[illegible]		
[illegible]	Syrupy liquid	Specs 4/11/55
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible] 15 5°C	1.475-1.495	"
Specific [illegible]		
[illegible] °C	12.5	"
[illegible]		
[illegible]		
[illegible] (Reference)		
[illegible] (Reference)		
[illegible] 100°F	50.2 cs. (232 SUS)	WGK Lab 3/8/56
[illegible] 210°F	3.5 cs. (38 SUS)	"
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible] Tag open cup	105	WGK Lab 12/5/46
[illegible] " " "	110	"
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		

Other Constants

DSW 053400

[illegible] not to be released outside of Monsanto Chemical Company [illegible] without [illegible]

PHYSICAL CONSTANTS DATA

SUBSTANCE: Aroclor 1262 - 10% Toluol Mix

STRUCTURAL FORMULA: Mixture by Weight
90% - Aroclor 1262
10% - Toluol

SUBMITTED BY: [illegible] Eluerbourg

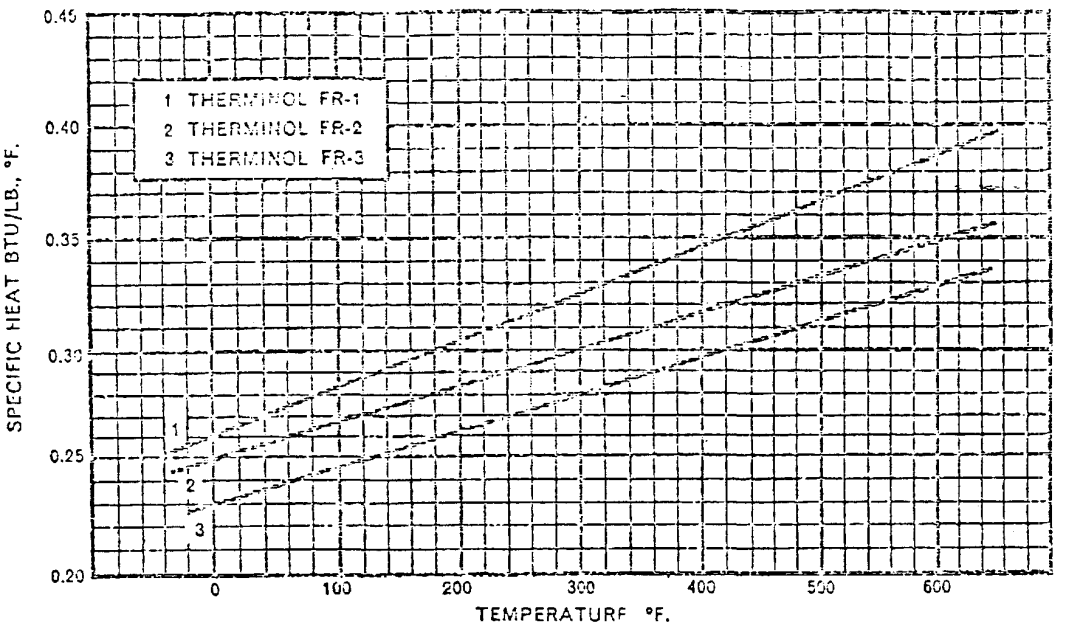
DATE: 5/3/55

NAME		SOURCE & DATE
Physical State		
Color		
Odor	Syrupy Liquid	Spec. 4/11/55
Boiling Point (760 mm)		
Boiling Point (mm)		
Boiling Point (mm)		
Boiling Point (mm)		
Melting Point		
Freezing Point		
Specific Gravity 20/15.5°C	1.497-1.516	"
Vapor Density		
Vapor Pressure 25 °C	12.7	"
Critical Temperature		
Refractive Index 25		
Surface Tension (Calculated)		
Surface Tension (Measured)		
Viscosity 100°F	103.3 cs. (477 SUS)	WCK Lab 3/3/53
" 210°F	4.5 cs. (41 SUS)	" "
Heat of Combustion		
Heat of Fusion		
Heat of Vaporization		
Specific Heat		
Solubility in Water	0°C	WCK Lab 12/5/[illegible]
Flash Point °F (Cleveland Open cup	105	" "
Fire Point °F " " "	110	" "
Ignition Temperature		
Explosive Properties		
Explosive Limits (Lower)		
Explosive Limits (Upper)		
Explosive Mixtures		
Explosive Hazard		
Explosive Rating		

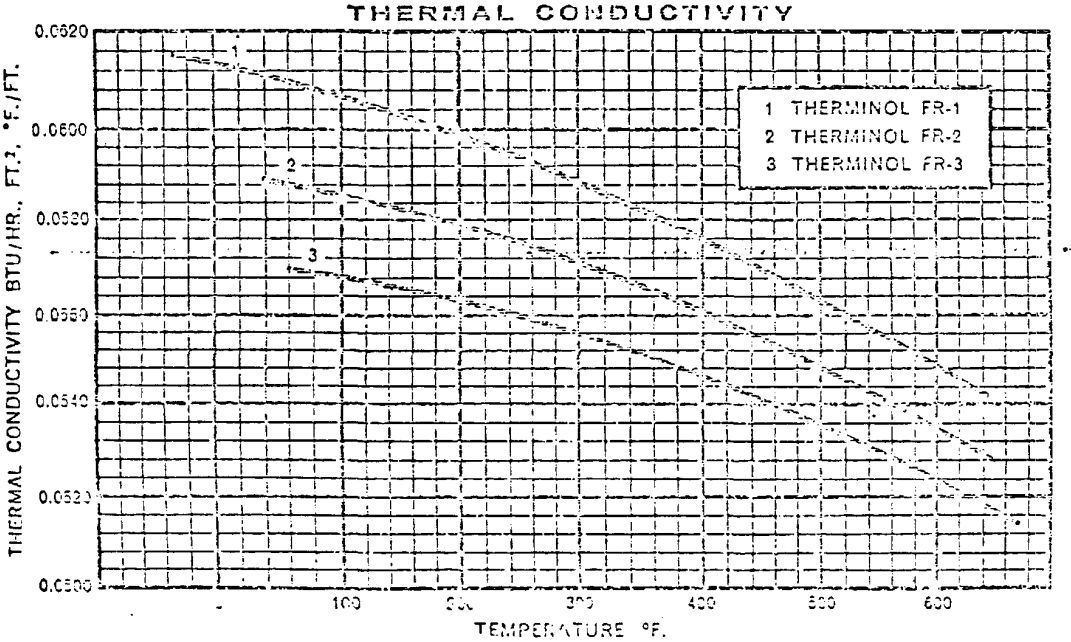
DSW 053401

WATER_PCB-SD0000050863

SPECIFIC HEAT



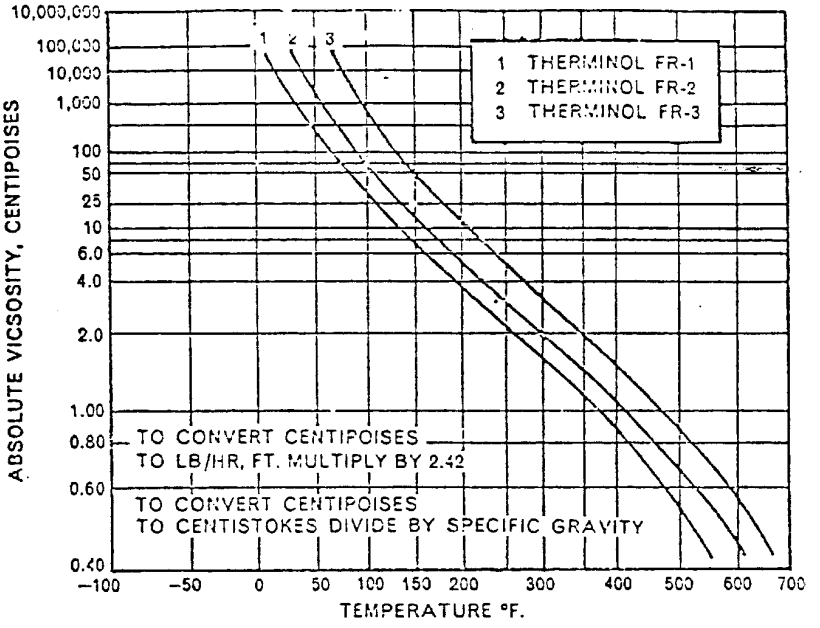
THERMAL CONDUCTIVITY



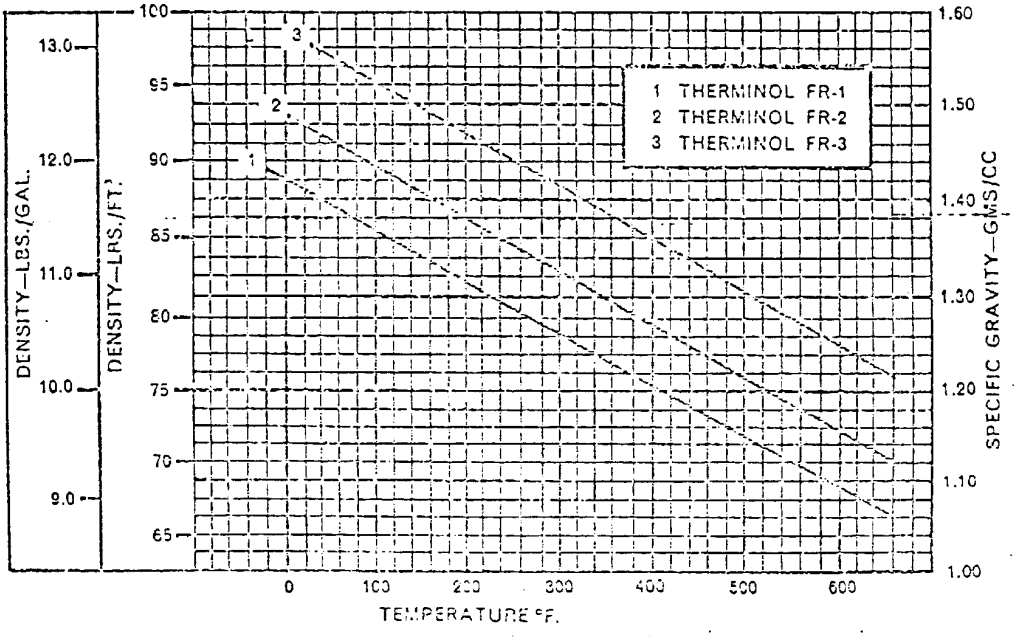
DSW 053402

WATER_PCB-SD0000050864

VISCOSITY-TEMPERATURE CHART



DENSITY AND SPECIFIC GRAVITY



DSW 053403

WATER_PCB-SD0000050865

PROPERTIES IMPORTANT TO HEAT TRANSFER DESIGN

THERMINOL FR-1

Temperature °F.	Temperature °C.	Enthalpy BTU/Lb.	Specific Heat BTU/Lb.—°F.	Thermal Conduct. BTU/Ft², Hr., °F./Ft.	Density Lb./Gal.	Viscosity Lb./Hr.—Ft.	Vapor Pres. mm. Hg. Absolute
50	10.0	4.855	0.272	0.06093	11.633	745.36	
100	37.8	18.68	0.282	0.06050	11.458	56.144	
150	66	32.95	0.291	0.06021	11.216	15.972	
200	93	48.07	0.3047	0.05976	10.991	8.2431	
250	121	63.50	0.3151	0.05927	10.760	5.5270	
300	149	79.45	0.3255	0.05875	10.523	3.4156	
350	177	95.94	0.3359	0.05819	10.296	2.4753	10
400	204	112.93	0.3464	0.05760	10.055	1.8898	27
450	232	130.48	0.3568	0.05697	9.833	1.5028	65
500	260	148.52	0.3672	0.05630	9.601	1.2351	143
550	288	167.03	0.3776	0.05560	9.370	1.0428	291
600	316	186.16	0.3880	0.05487	9.138	0.90031	550
650	343	205.79	0.3985	0.05409	8.906	0.79125	18.8 psia
700	371	225.92	0.4089	0.05329	8.675	0.70731	31.9 psia

THERMINOL FR-2

Temperature °F.	Temperature °C.	Enthalpy BTU/Lb.	Specific Heat BTU/Lb.—°F.	Thermal Conduct. BTU/Ft², Hr., °F./Ft.	Density Lb./Gal.	Viscosity Lb./Hr.—Ft.	Vapor Pres. mm. Hg. Absolute
50	10.0	4.59	0.257	0.05831	12.225	7090.6	
100	37.8	17.61	0.265	0.05552	12.000	151.01	
150	66	31.09	0.274	0.05201	11.750	27.83	
200	93	45.11	0.2840	0.05728	11.525	11.971	
250	121	59.43	0.2922	0.05748	11.293	6.949	
300	149	74.14	0.3003	0.05703	11.062	4.531	
350	177	89.26	0.3084	0.05655	10.830	3.201	6
400	204	104.81	0.3166	0.05603	10.598	2.399	15
450	232	120.74	0.3247	0.05548	10.367	1.881	37
500	260	137.08	0.3328	0.05488	10.135	1.529	84
550	288	153.85	0.3410	0.05424	9.903	1.2795	173
600	316	170.99	0.3491	0.05357	9.672	1.0971	340
650	343	188.58	0.3573	0.05286	9.440	0.9596	615
700	371	203.45	0.3654	0.05211	9.208	0.8535	20.3 psia

THERMINOL FR-3

Temperature °F.	Temperature °C.	Enthalpy BTU/Lb.	Specific Heat BTU/Lb.—°F.	Thermal Conduct. BTU/Ft², Hr., °F./Ft.	Density Lb./Gal.	Viscosity Lb./Hr.—Ft.	Vapor Pres. mm. Hg. Absolute
50	10.0	4.28	0.239	0.05700	13.002	——	
100	37.8	16.37	0.245	0.05680	12.760	1628.6	
150	66	29.05	0.256	0.05634	12.534	101.64	
200	93	41.95	0.2629	0.05620	12.292	24.262	
250	121	55.36	0.2714	0.05593	12.061	12.091	
300	149	69.20	0.2799	0.05556	11.829	7.116	
350	177	83.46	0.2884	0.05513	11.597	4.669	3
400	204	98.15	0.2969	0.05465	11.366	3.305	9
450	232	113.26	0.3054	0.05415	11.134	2.476	24
500	260	128.77	0.3139	0.05360	10.902	1.937	55
550	288	144.73	0.3223	0.05302	10.671	1.5599	114
600	316	161.11	0.3308	0.05241	10.439	1.3095	223
650	343	177.92	0.3393	0.05176	10.207	1.1188	413
700	371	192.24	0.3478	0.05107	9.975	0.97531	735

DSW 053404

WATER_PCB-SD0000050866

Introducing Therminol FR-O...

Newest member of the growing line of Monsanto heat transfer fluids. Therminol FR-O was formulated specifically to eliminate freeze-up during cold weather shut down for in-transit heating of sulfur, pitch, asphalt, naphthalene, bunker "C" fuel oil, and high melting resin materials. Therminol FR-O eliminates the need for high temperature reheating in order to pump out the material at its destination. Low temperature pumpability makes it ideally suited for space heating applications, outdoor plants in Northern climates, or in any application where good fluidity at low temperatures is a prerequisite.

Fire-Resistance...

Therminol FR-O permits installation of a non-pressurized system operating with a liquid that has no fire point, and will not support combustion ...so fire-resistant, Therminol fluids have achieved recognition by Underwriters' Laboratory, Factory Mutual, and Factory Insurance Association. Because of this extreme fire-resistance and its listing by insurance companies, important savings can be made in designing a process heating system around Therminol FR-O fluid.

Chemically Speaking...

Therminol FR-O fluid is a chlorinated biphenyl, manufactured under exacting process control to rigid specifications for long term thermal stability, specific heat, thermal conductivity, vapor pressure and viscosity. The liquid is an oily, clear, nearly colorless, fluid with a pour point of −15°F and a minimum pumpable temperature of −5°F.

Therminol FR-O fluid is recommended for use up to 500°F and will not show measurable change after years of exposure to such temperatures. The fluid is non-corrosive with all common metals used in heat transfer system designs.

TYPICAL PROPERTIES OF THERMINOL FR-O

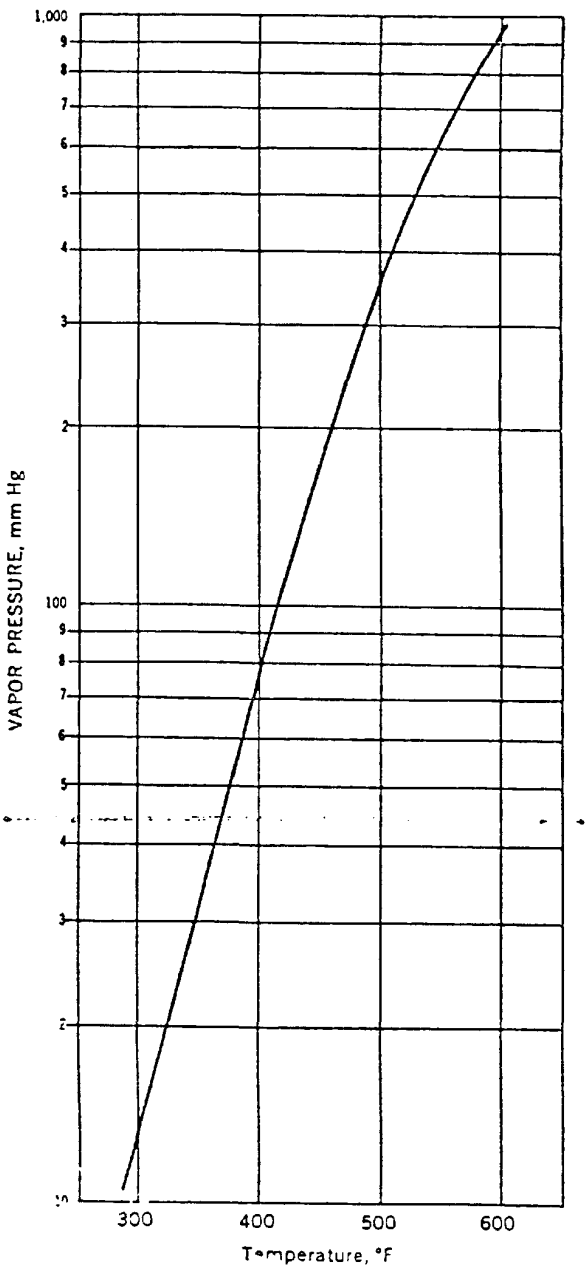
	Temperature, °F								
Property	−5	+10	40	100	200	300	400	500	600
Kinematic Viscosity, cs.	4545	1007	92.55	8.10	1.70*	0.95	—	—	—
Saybolt Viscosity, SSU	20850	4640	429	52.43	7.99*	4.54	—	—	—
Vapor Pressure, mm Hg	—	—	—	—	1.35	13.00	76.0	315	915
Specific Heat, BTU/lb.°	—	—	—	0.27	0.29	0.31	0.33	0.35	0.36
Thermal Conductivity, BTU/°F-Ft-Hr.°	—	—	—	0.061	0.060	0.059	0.058	0.057	0.056
Density, g/cc	—	1.45	1.43	1.40	1.34	1.28	1.23	1.17	1.11
Density, lbs./gal.	—	12.10	11.92	11.70	11.19	10.69	10.27	9.76	9.27

* Viscosity at 210°F
° Calculated values

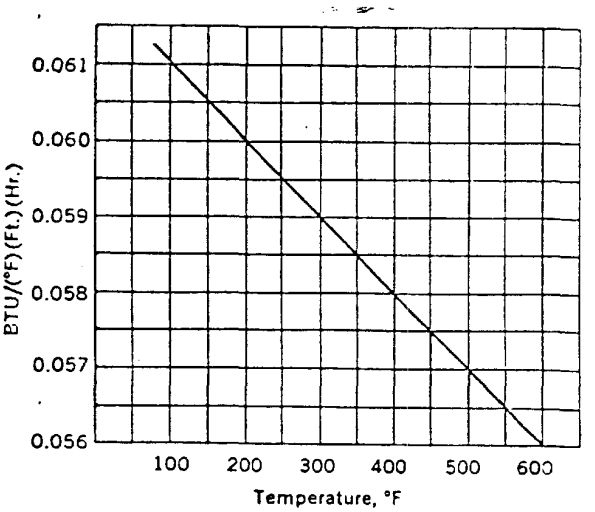
DSW 053405

WATER_PCB-SD0000050867

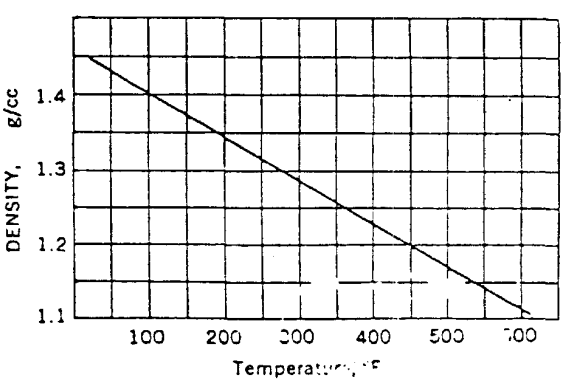
VAPOR PRESSURE



THERMAL CONDUCTIVITY
(calculated)



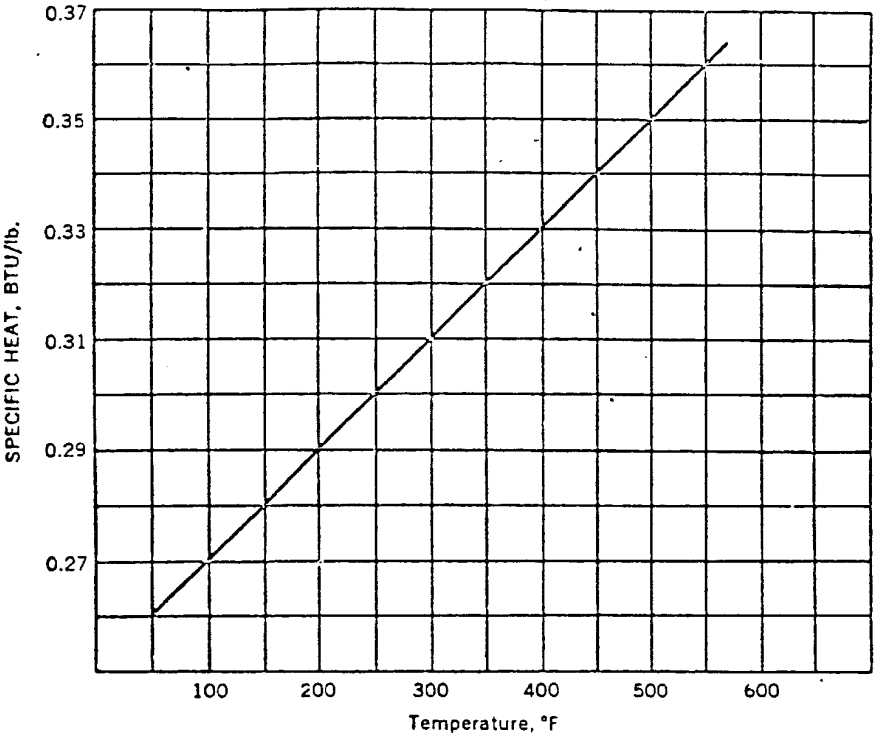
DENSITY



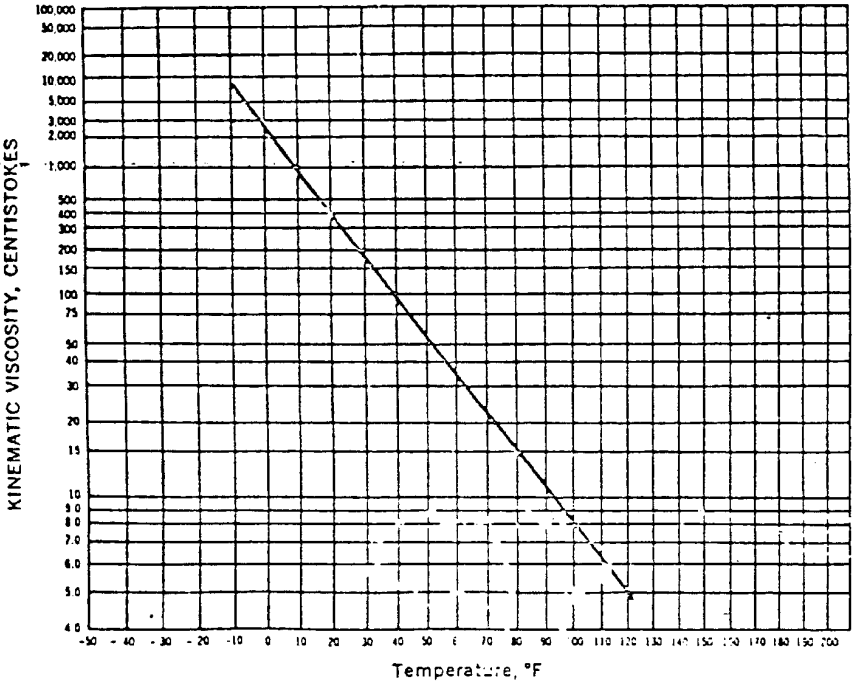
DSW 053406

WATER_PCB-SD0000050868

SPECIFIC HEAT



KINEMATIC VISCOSITIES



DSW 053407

WATER_PCB-SD0000050869

THERMINOL®
FR LO-TEMP
FIRE RESISTANT
HEAT TRANSFER
FLUID

. . . the fire-resistant, low-temperature liquid phase heat transfer fluid with very low temperature pumpability.

TECHNICAL BULLETIN (T-LT)

DSW 053408

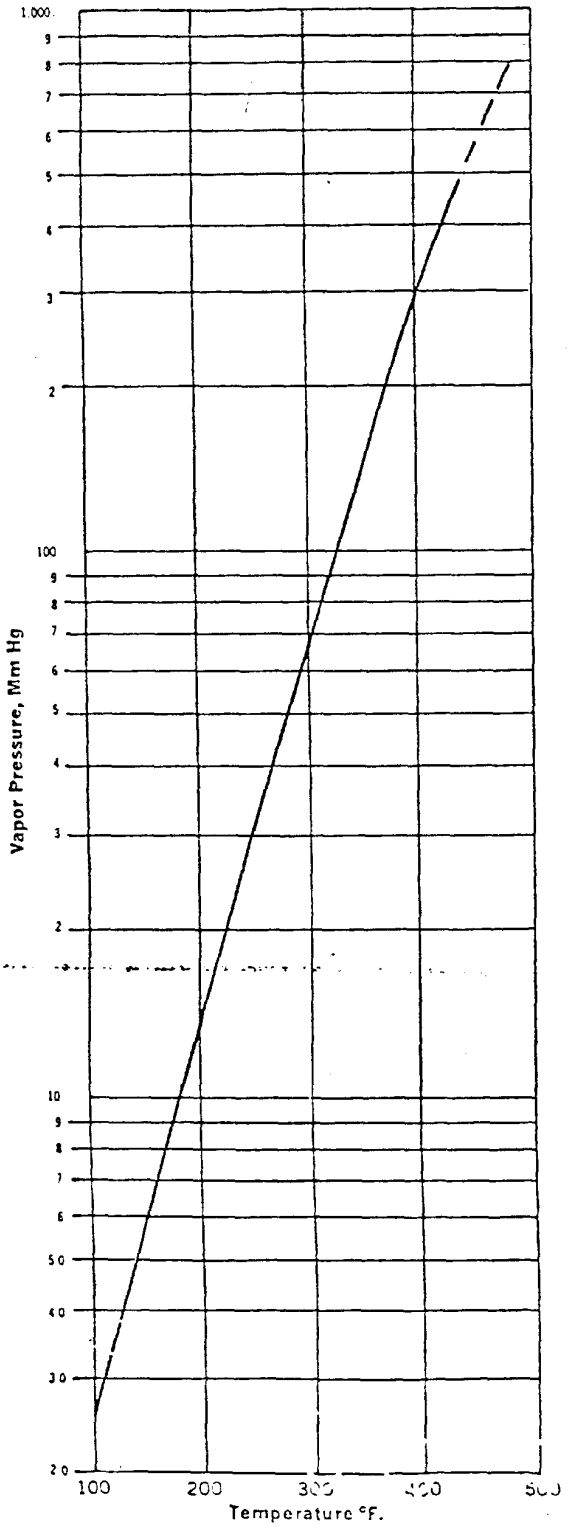
"Nothing contained herein is to be construed as a recommendation to use any product in conflict with any patent. MONSANTO MAKES NO WARRANTIES AS TO THE FITNESS OR MERCHANTABILITY OF ANY PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained [illegible] recommendations, and disclaims all liability for any resulting loss or damage."

Organic Division/800 N. Lindbergh Blvd /St. Louis, Missouri 63166

FUNCTIONAL FLUIDS

WATER_PCB-SD0000050870

THERMINOL® FR Lo-Temp
Vapor Pressure



Introducing Therminol® FR Lo-Temp

Therminol FR Lo-Temp is our newest fire-resistant heat transfer fluid formulated specifically for practical pumpability at −40°F.

This low-temperature fluid permits installation of a non-pressurized system operating with a liquid which has no fire point and will not support combustion.

The recommended operating range of Therminol FR Lo-Temp is −40°F to 400°F. It will not show measurable change after years of exposure at such temperatures.

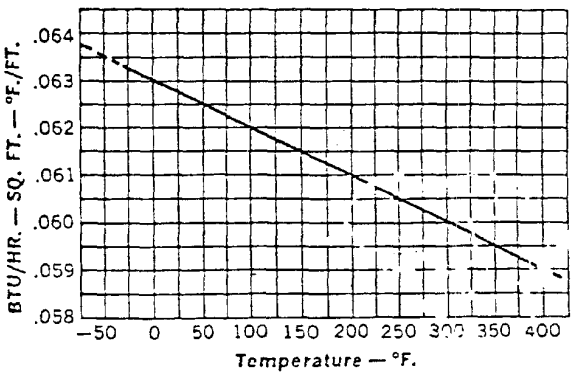
The fluid is a chemically inert, noncorrosive compound with a pour point of −60°F and a vapor pressure of only 300 mm of mercury at 400°F.

Listed as a fire resistant heat transfer media by Underwriters Laboratories, it can be installed for a wide range of uses in both space heating and cooling, gas processing and distribution, and industrial heating and cooling under conditions of low ambient temperatures.

TYPICAL PROPERTIES

Composition	Chlorinated biphenyls and hydrocarbons
Appearance	Oily, clear, nearly colorless liquid
Pour Point	−60° F.
Flash Point	280° F.
Flame Point	None to boiling
Autoignition Temperature	Over 1100° F.
Boiling Range	432° F. — 627° F.

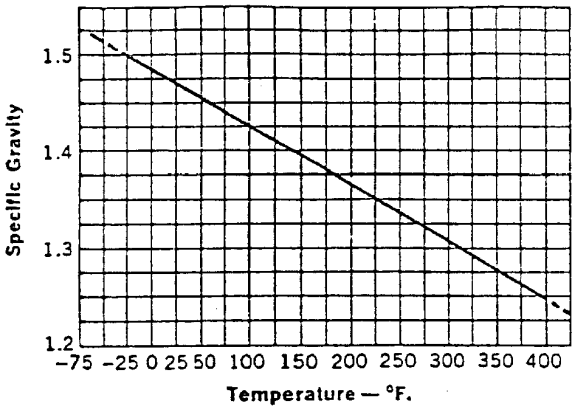
THERMINOL® FR Lo-Temp
Thermal Conductivity



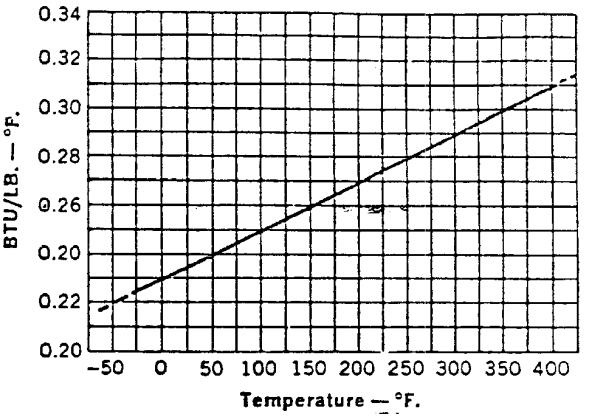
DSW 053409

WATER_PCB-SD0000050871

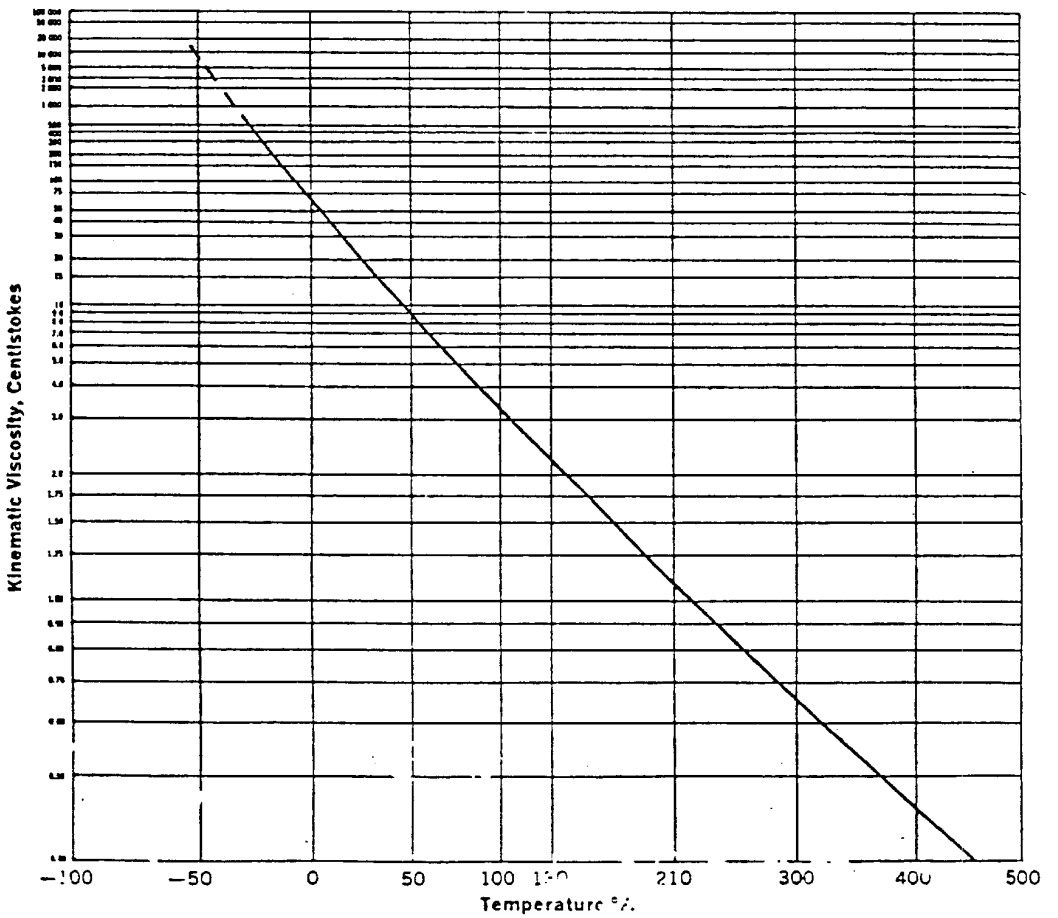
THERMINOL® FR Lo-Temp
Specific Gravity



THERMINOL® FR Lo-Temp
Specific Heat



THERMINOL® FR Lo-Temp
Viscosity



DSW 053410

WATER_PCB-SD0000050872

THERMINOL® 66 HEAT TRANSFER FLUID

...for use in liquid phase between 0-650°F without system pressurization

TECHNICAL BULLETIN (T-66)

"Nothing contained herein is to be construed as a recommendation to use any product in conflict with any patent. MONSANTO MAKES NO WARRANTIES AS TO THE FITNESS OR MERCHANTABILITY OF ANY PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and disclaims all liability for any resulting loss or damage."

Organic Division / 800 N. Lindbergh Blvd. / St. Louis, Missouri 63166

FUNCTIONAL FLUIDS

Monsanto

DSW 053411

WATER_PCB-SD0000050873

Therminol® 66

a heat transfer fluid for use in
veen 0-650°F without system
low pour point of this product
at fluid temperatures as low

oxidation, systems with Thermi-
blanketed with an inert atmos-
relief valve should also be
ol 66 is ideally suited to replace
that have lower boiling points and
er system pressure at 650°F.

support combustion and should
th Monsanto's Therminol FR

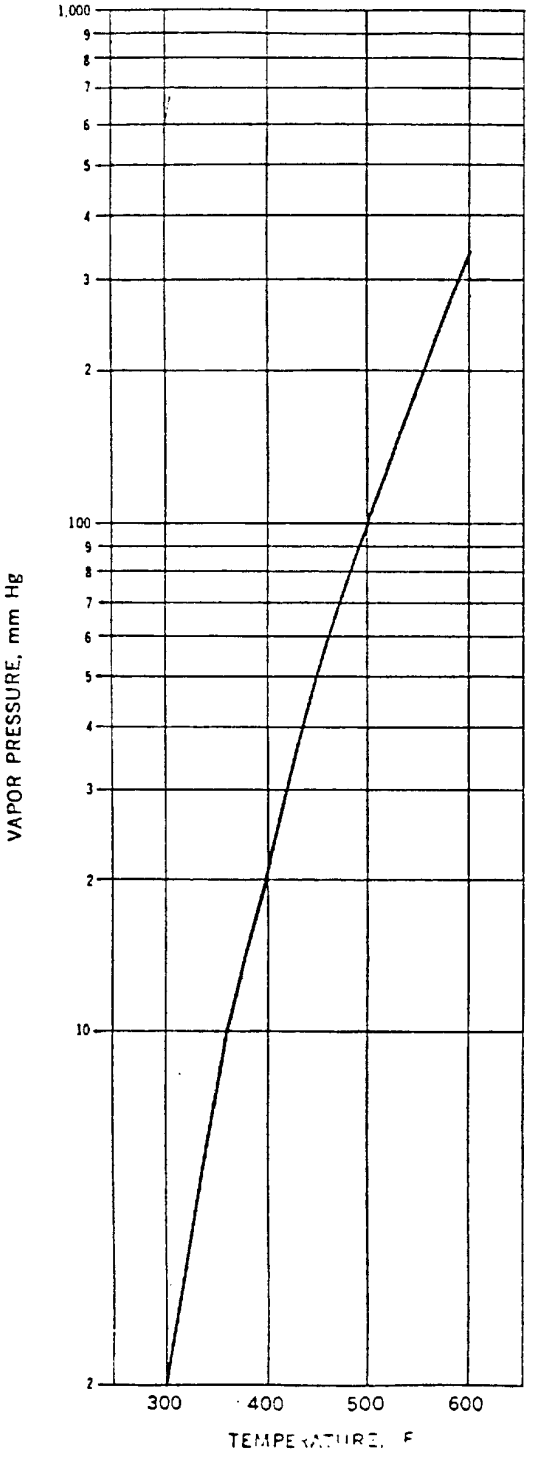
TYPICAL PROPERTIES OF THERMINOL® 66

Composition	Modified terphenyls
Appearance	Oily liquid
Color	Practically colorless
Odor	Faint, characteristic
Pour Point	−26° — −28°C. −15° — −18°F.
Flash Point	168° — 180°C. 334° — 356°F.
Flame Point	190° — 202°C. 374° — 392°F.
Autoignition Temp.	364°C. 705°F.
Coefficient of Expansion	0.000741 cc/cc/°C.
Boiling Range	340° — 396°C 644° — 745°F

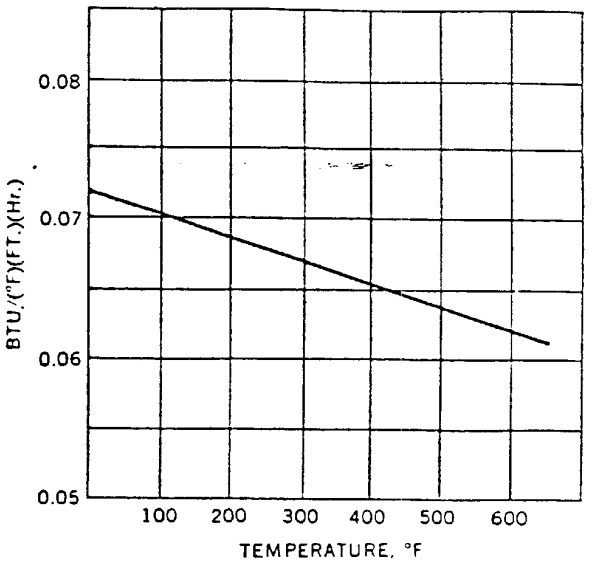
DSW 053412

WATER_PCB-SD0000050874

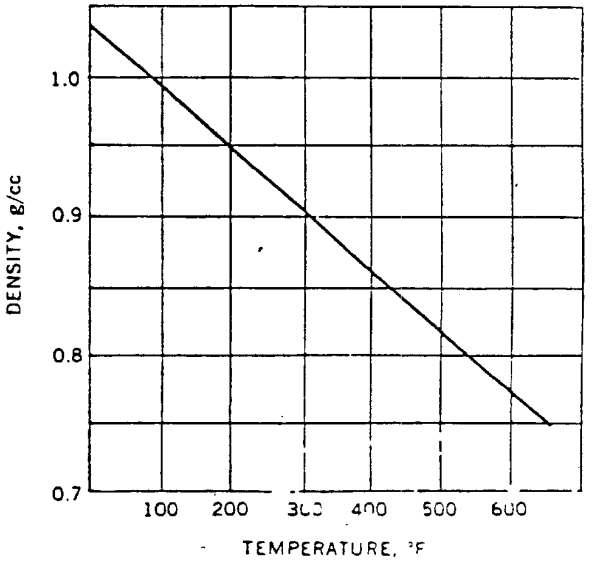
VAPOR PRESSURE



THERMAL CONDUCTIVITY
(calculated)



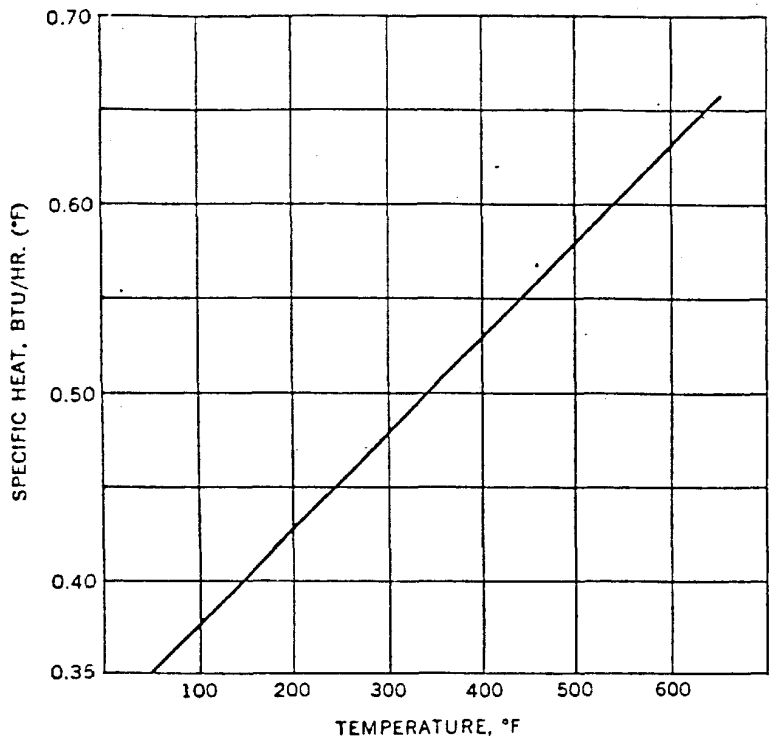
DENSITY



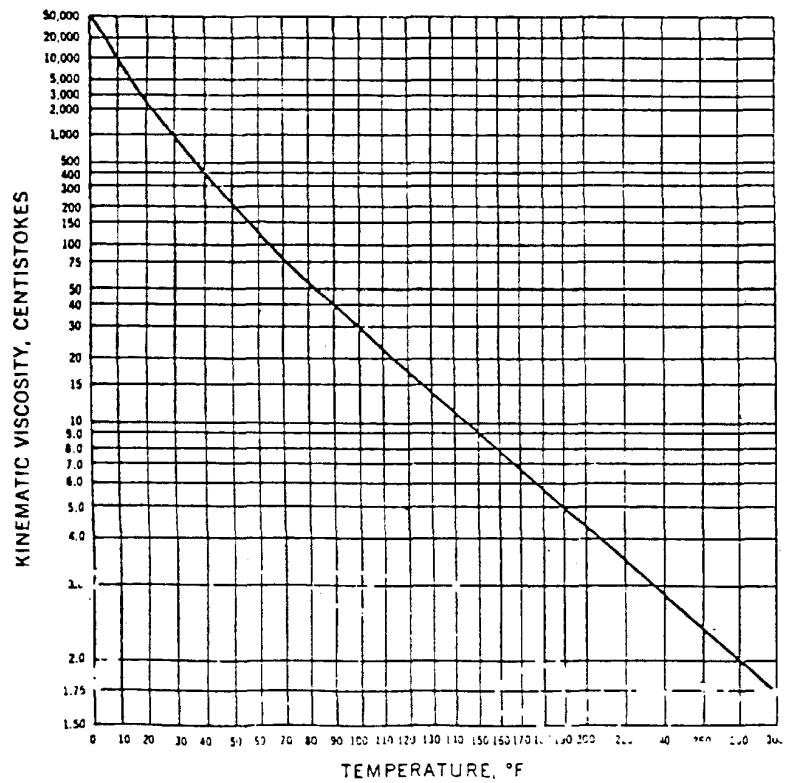
DSW 053413

WATER_PCB-SD0000050875

SPECIFIC HEAT



KINEMATIC VISCOSITIES



DSW 053414

WATER_PCB-SD0000050876

[illegible]

[illegible] INERTEEN P.P.O.	STRUCTURAL FORMULA Mixture 60% Aroclor 1260 40% Trichlorobenzene 0.2% Phenoxypropene Oxide
[illegible] A. M. Ellenburg — DATE 7-9-57	

NAME		SOURCE & DATE
[illegible]		
[illegible]		
[illegible]	Yellow tinted mobile oil	Ref. 1
[illegible] Range	200 - 415°C.	Ref. 1
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible] 15.5/15.5°C.	1.560 - 1.568	Ref. 1
[illegible]		
[illegible] 15.5°C	13.05	Ref. 1
[illegible] (30 - 100°C.)	0.0007 cc/cc/°C.	Ref. 1
[illegible] 25°C. [illegible]	1.6137 - 1.6157	Ref. 1
[illegible] (Reference)		
[illegible] (Reference)		
[illegible] 100°F.	52 - 56 SUS	Ref. 1
[illegible] 20°C.	15 cs.	Ref. 2
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible] COC	None to boiling	Ref. 1
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible] 25°C. - 80°C.)	0.26	Ref. 2
[illegible]		
[illegible]		
[illegible]		
Pour Point	-32°C. or lower	Ref. 1
Other Constants: Dielectric Constant, 100°C. 60 cy	3.7 - 4.0	Ref. 1
Thermal Conductivity, cal/cm/sec/°C.	20 x 10[illegible] at 50°C.	Ref. 2
Reference (1) Specifications	6-6-55	
Reference (2) Monsanto Chemical Ltd		
[illegible]	Contact Medical Dept.	

DSW 053415

NOTE: These data should not be released outside of Monsanto Chemical Company. Use additional sheets if necessary.

WATER_PCB-SD0000050877

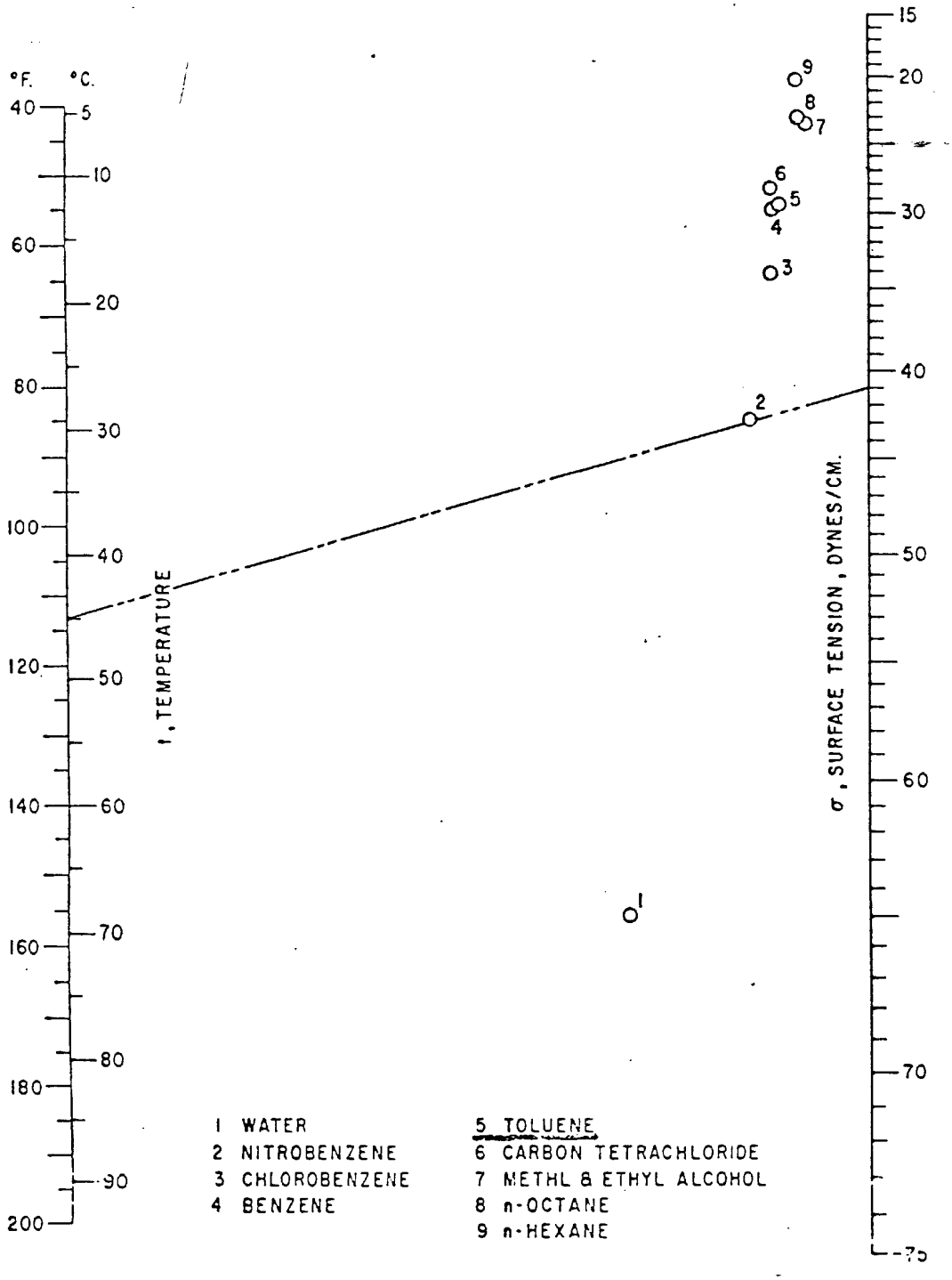


Figure 23.1. Surface tension of some common liquids. (Reproduced by permission *British Chemical Engineering*, Vol. 4, page 38, copyright 1958.)

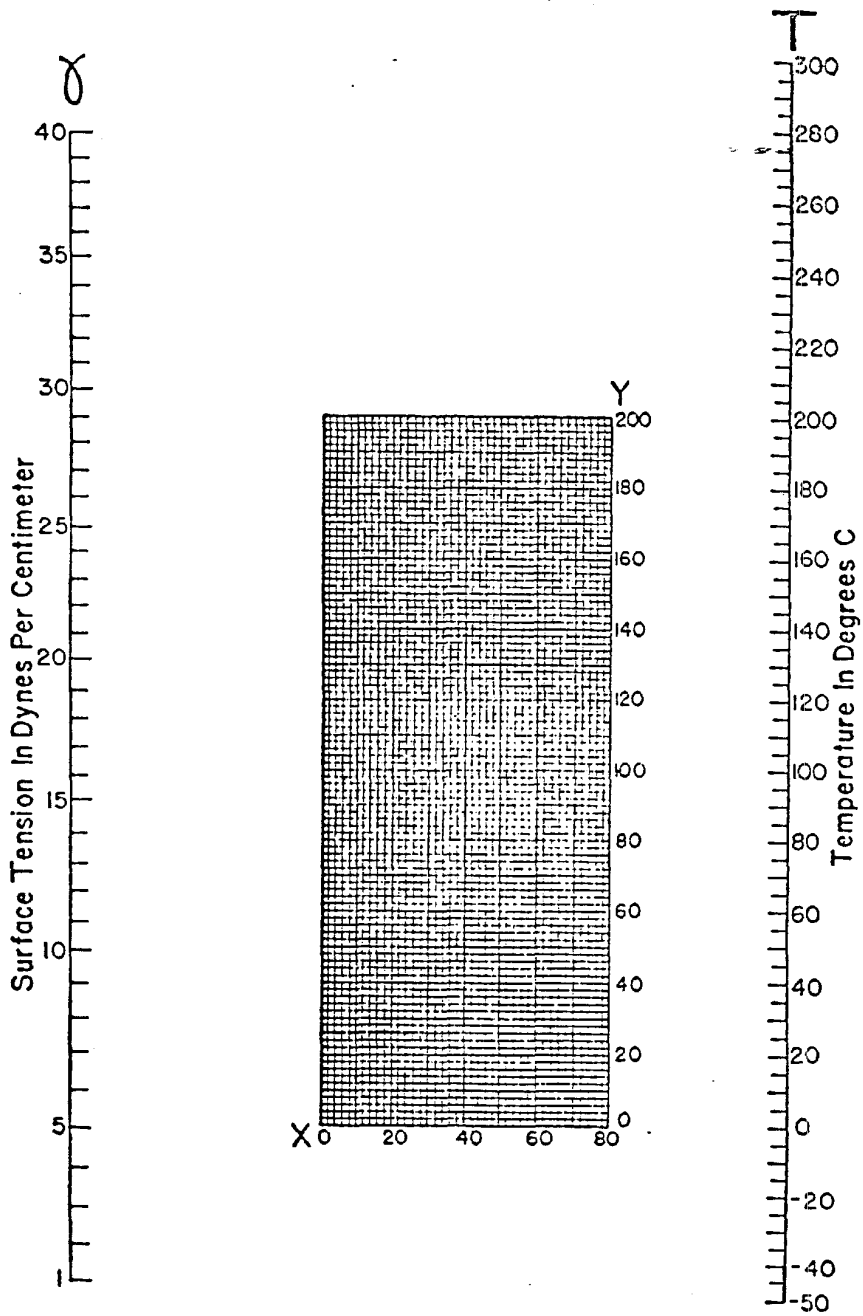
DSW 053416

WATER_PCB-SD0000050878

Table 22.1

X AND Y VALUES FOR SURFACE TENSION NOMOGRAPH

Compound	X	Y
Acetal	19	83
Acetaldehyde	33	78
Acetaldoxime	23.5	127
Acetamide	17	192.5
Acetic acid	17.1	116.5
Acetic anhydride	25	129
Acetone	28	91
Acetonitrile	33.5	111
Acetophenone	18	163
Allyl alcohol	12	111.5
Anethole	13	158.1
Aniline	22.9	171.8
Anisole	24.4	138.9
Ammonia	56.2	63.5
Isoamyl acetate	16.4	103.1
Isoamyl alcohol	6	106.8
Benzene	30	110
Benzonitrile	19.5	159
Benzylamine	25	136
Bromobenzene	23.5	145.5
Isobutyl acetate	16	97.2
n-Butyl alcohol	9.6	107.5
Isobutyl alcohol	5	103
n-Butyric acid	14.5	115
Isobutyric acid	14.8	107.4
n-Butyronitrile	20.3	113
Carbon disulfide	35.8	117.2
Carbon tetrachloride	26	104.5
Chloral	30	113
Chlorine	45.5	59.2
Chlorobenzene	23.5	132.5
p-Chlorobromobenzene	14	162
Chloroform	32	101.3
p-Chlorotoluene	18.7	134
o-Cresol	20	161
m-Cresol	13	161.2
p-Cresol	11.5	160.5
Cyclohexane	42	86.7
Diethyl ketone	20	101
Diethyl oxalate	20.5	130.8
Diethyl sulfate	19.5	139.5
Diethyl aniline	17	142.6
Dimethyl sulfate	23.5	158
Dimethylamine	16	66
[illegible]methyl aniline	20	140
[illegible]yl acetate	27.5	92.4
Ethyl acetoacetate	21	132
Ethyl alcohol	10	97
Ethyl benzoate	14.8	131
Ethyl bromide	31.6	90.2
Ethyl n-butyrate	17.5	102
Ethyl isobutyrate	20.9	93.7
Ethyl ether	27.5	64
Ethyl formate	30.5	88.8
Ethyl iodide	28	113.2
Ethyl mercaptan	35	81
Ethyl propionate	22.6	97
Ethylamine	11.2	83
Ethyl benzene	22	118
Ethylene chloride	32	120
Ethylene oxide	42	83
n-Hexane	22.7	72.2
Hydrogen cyanide	30.6	66
Mesitylene	17	119.8
Methyl acetate	34	90
Methyl alcohol	17	93
Methyl n-butyrate	25	88
Methyl isobutyrate	24	93.3
Methylchloride	45.8	53.2
Methyl ether	44	37
Methyl ethyl ketone	23.6	97
Methyl formate	38.5	88
Methyl propionate	29	95
Methyl amine	42	58
Naphthalene	22.5	165
Nitroethane	25.4	126.1
Nitromethane	30	139
Nitrosyl chloride	38.5	93
Nitrous oxide	62.5	0.5
n-Octane	17.7	90
Paraldehyde	22.3	103.8
Phenetole	20	134.2
Phenol	20	168
Phosphorus oxychloride	26	125.2
Piperidine	24.7	120
Propionic acid	17	112
Propionitrile	23	108.6
n-Propyl acetate	23	97
n-Propyl alcohol	8.2	105.2
n-Propyl formate	24	97
n-Propylamine	25.5	87.2
p-Isopropyl toluene	12.8	121.2
[illegible]line	24	139.2
[illegible]line	19.5	185
[illegible]ophene	35	121
Toluene	24	113
Trethylamine	20.1	63.9
Trimethylamine	21	53.6
Tripalmitin	2	151
Triphenyl methane	12.5	182.7
o-Xylene	20.5	119
p-Xylene	19	117



Values for X and Y, taken from Table 22.1, are used for any particular compound to give a point on the central grid. Using this point as a pivot for a straight line, the value of the surface tension may be read from the intersection of this line with the γ scale against the value of the temperature read from the intersection of this line with the T scale.

Figure 22.1. Surface tension of liquids as a function of temperature. (Reproduced by permission, *Industrial & Engineering Chemistry*, Vol. 40, page 886, copyright 1948, The American Chemical Society.)

DSW 053417

WATER_PCB-SD0000050879

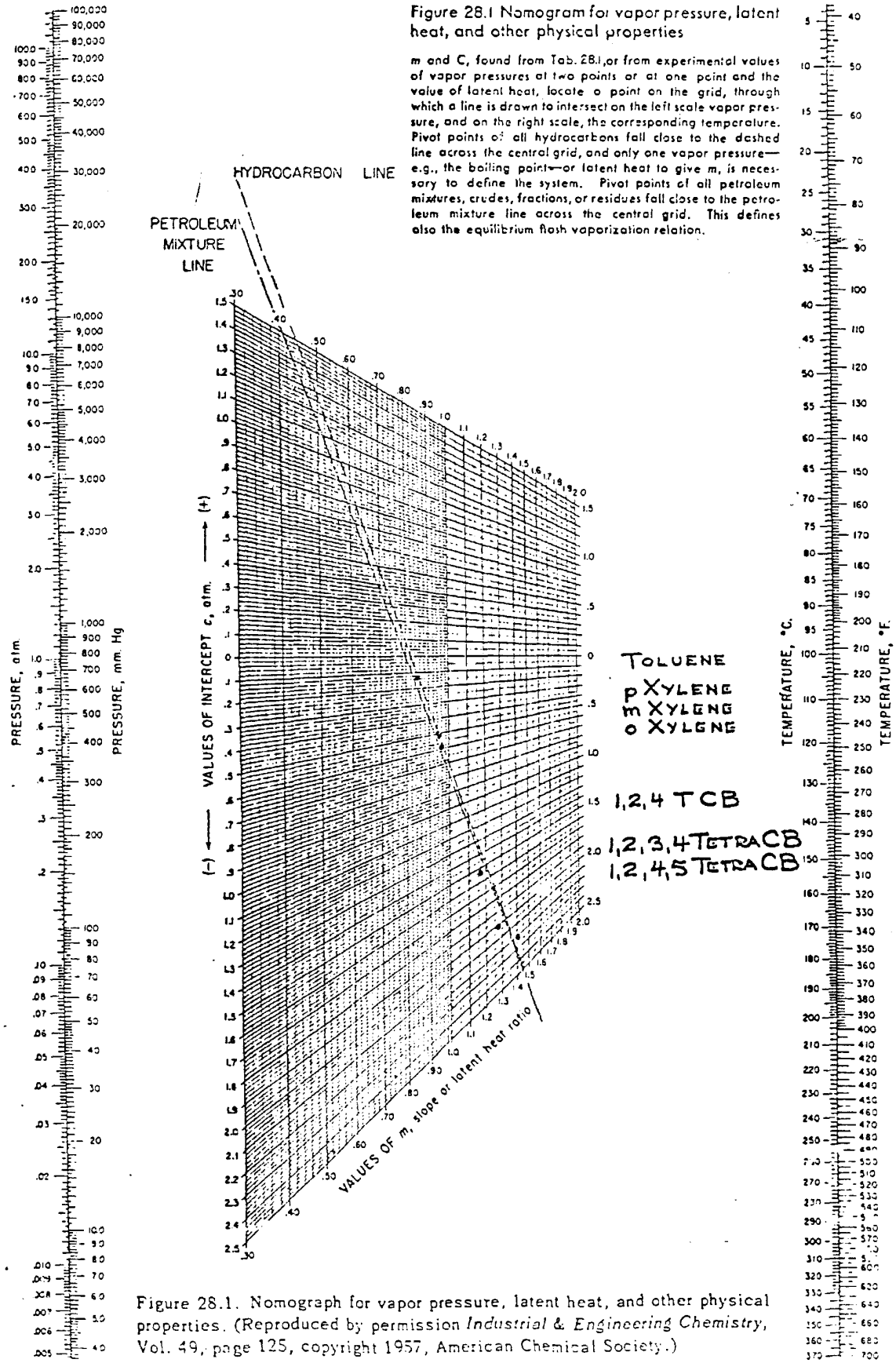


Figure 28.1 Nomogram for vapor pressure, latent heat, and other physical properties

m and C, found from Tab. 28.1, or from experimental values of vapor pressures at two points or at one point and the value of latent heat, locate a point on the grid, through which a line is drawn to intersect on the left scale vapor pressure, and on the right scale, the corresponding temperature. Pivot points of all hydrocarbons fall close to the dashed line across the central grid, and only one vapor pressure—e.g., the boiling point—or latent heat to give *m*, is necessary to define the system. Pivot points of all petroleum mixtures, crudes, fractions, or residues fall close to the petroleum mixture line across the central grid. This defines also the equilibrium flash vaporization relation.

Figure 28.1. Nomograph for vapor pressure, latent heat, and other physical properties. (Reproduced by permission *Industrial & Engineering Chemistry*, Vol. 49, page 125, copyright 1957, American Chemical Society.)

OSW 053416

WATER_PCB-SD0000050880

APPENDIX D - UTILITIES

The following is a list of utilities supplied to the Pyranol mix area.

Steam

Steam is supplied to the department through a 6" main at 120 psig. Standard practice on steam is 25 lbs/cwt.

Recovered Water

Water is not used in this department.

Electricity

Electrical power is supplied at 440 volts for power and 110 volts for lighting. Standard practice is 500 KWH/cwt.

DSW 053419

WATER_PCB-SD0000050881

APPENDIX E - PERSONNEL

Production of Pyranol mixes is a part time operation. When these mixes are produced they do not require constand attention of an operator.

All Pyranol mixes are produced by Aroclor department operators.

DSW 053420

WATER_PCB-SD0000050882

APPENDIX F - PACKAGING AND SHIPPING

Pyranols are packaged in 55 gallon steel drums, 33 gallon galvanized drums and five gallon steel cans. These containers are transferred to warehouse for storage until time of shipment.

Some Pyranols are loaded into tank cars for shipment.

All tank cars are entered, cleaned and inspected prior to loading.

DSW 053421

WATER_PCB-SD0000050883

APPENDIX G - MATERIAL BALANCE

Standard and theoretical usages of raw materials for each Aroclor Blend is shown in Figure I.

DSW 053422

WATER_PCB-SD0000050884

FIGURE NO. I

THEORY AND STANDARD USAGE FOR PYRANOLS
LBS. PER CWT OF BLEND

PRODUCT	THEORY	STANDARD
Aroclor 1254 - 10% Toluene		
Aroclor 1254	90.00	90.90
Toluene	10.00	10.10
Aroclor 1260 - 10% Toluene		
Aroclor 1260	90.00	90.90
Toluene	10.00	10.10
Aroclor 1262 - 10% Toluene		
Aroclor 1262	90.00	90.90
Toluene	10.00	10.10
Aroclor 1262 - 10% Xylene		
Aroclor 1262	90.00	90.90
Xylene	10.00	10.10
Pyranol A13B3B		
Aroclor 1260	45.00	45.45
Tri-Tetrachlorobenzene	55.00	56.12
Epoxide 221	--	0.13
Inerteen PPO		
Aroclor 1260	60.00	60.60
Trichlorobenzene	40.00	40.82
Glycidyl Phenyl Ether	--	0.22
Inerteen 54201-KA		
Aroclor 1254	70.00	70.71
Trichlorobenzene	30.00	30.61
Glycidyl Phenyl Ether	--	0.22

DSW 053423

WATER_PCB-SD0000050885

FIGURE NO. I

PRODUCT	THEORY	STANDARD
Inerteen 54201-CM		
Aroclor 1242	100.00	100.10
Glycidyl Phenyl Ether	--	0.22
Inerteen 54201-A-6		
Aroclor 1242	75.00	75.75
Trichlorobenzene	25.00	25.25
Therminol FR-0		
Aroclor 1242	80.00	80.80
Tri-Tetrachlorobenzene	20.00	20.20
Therminol FR-Lo Temp		
Aroclor 1242	50.00	50.50
Tri-Tetrachlorobenzene	50.00	50.50
Santicizer 794		
Aroclor 1248	50.00	50.50
Aroclor 1260	50.00	50.50
Aroclor 1254-Aroclor 4465		
Aroclor 1254	85.00	85.50
Aroclor 4465	15.00	15.50
Aroclor 1242 - Aroclor 1248		
Aroclor 1242	28.00	28.28
Aroclor 1248	72.00	72.73
Aroclor 1260 - 5% Toluene		
Aroclor 1260	95.00	95.95
Toluene	5.00	5.05

WATER_PCB-SD0000050886

APPENDIX H - ATMOSPHERIC & STREAM DISCHARGE & WASTE DISPOSAL

The following is an estimate of the atmospheric and stream discharge from the Pyranol operations.

	Type	Amount
Toluene	Atmospheric	Negligible
Xylene	Atmospheric	Negligible
Trichlorobenzene	Atmospheric	Negligible
Tri-Tetrachlorobenzene	Atmospheric	Negligible

WATER_PCB-SD0000050887

APPENDIX I - PROCESS CONTROL PROCEDURES

Raw materials are analyzed by the laboratory before being used in a Pyranol mix.

Control samples are taken by the operator from the mix tank at various stages throughout the blending process. These samples are analyzed by the laboratory. The following control tests are performed by the laboratory.

Test	Anniston Analytical Method No.
Specific Gravity	14-49-54
Moisture	14-53-54
Refractive Index	14-34-54
Resistivity	14-35-57
Power Factor	--
Chlorides	014

A complete analysis is run by the laboratory on all final lot samples.

All Aroclor 1242 used in the I-54201-CM blend is analyzed for TCC, HST, and Monsanto Stability to assure top quality 1242 in the blend.

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APPENDIX J - SAFETY & TOXICITY DATA AND ACCIDENT REPORTS

Safety of operations in the Aroclor Plant depends on the individual operator. Materials being handled and operations must be observed closely to guard against the following:

	Cause and Action to Prevent
1. Chlorine Gas	Chlorine gas is a very toxic corrosive gas. Leaks or high pressure can occur to liberate it.

Action to Prevent:

a. Report chlorine gas exposure immediately for treatment with Antidote. Milk may be used in mild cases to relieve throat irritation. Oxygen from the resuscitator in the Dispensary is available.

b. Keep gas mask in good condition. Keep a good canister in the mask. Use these type masks only in chlorine concentrations to 2-3% chlorine in air.

c. Use a Scott Air Pak in concentrations of chlorine gas above 3% in air. Three units are available in the Aroclor-Biphenyl Department.

d. If caught in chlorine gas without a mask, hold your breath and go cross wind until you are out of range of the gas. Place a handkerchief over your nose in small quantities of chlorine.

e. Report all chlorine leaks for repair immediately. Make temporary repairs with tape if possible.

f. In case of a major chlorine leak, the source of chlorine gas must be stopped.

Notify the chlorine plant immeidately if the pressure on the chlorine manifold exceeds 30 psig. Cut off liquid chlorine from the car.

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Cause and Action to Prevent

2. Thermal Burns

Contact with hot uninsulated product lines at the chlorinators and still areas.

Contact with uninsulated steam lines and open steam.

Contact with hot Aroclors from broken lines or leaks.

Contact with open flames at stills or from heating lines in the department.

Action to Prevent:

a. Know that contact with equipment and product will cause a thermal burn due to the high temperatures. Make changes in operations with this hazard in mind.

b. Know the first aid treatment for burns. Cold Water Treatment (See Appendix A - Emergency Section of Operating Instructions.

c. Wear gloves and long sleeve shirt with the sleeves rolled down when operating. Gloves and clothing can make the difference between first and second degree burns.

d. Report uninsulated lines for repair of insulation.

e. Use only steam lines with hose and hose clamps in good condition.

f. The following operations are hazardous and should be done with care:

(1) Catching samples at the Aroclor chlorinator circulating lines.

(2) Sampling the Solid Aroclor still receiver.

(3) Drawing bottoms on the Aroclor stills.

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Cause and Action to Prevent

3. Explosion

An explosion could occur in the chlorinators by slugging liquid chlorine to the distributor. Slugs of liquid chlorine could react fast enough to cause excessive pressure in the vessel. A rupture of the chlorinator could occur.

Action to Prevent:

a. Observe operation of the chlorine vaporizer and do not let liquid chlorine get into the rotameters. Pipe lines will be frosted.

b. In case chlorine feed lines are frosted, close liquid chlorine feed valve to the vaporizer. Check steam addition to the vaporizer. Do not start up until source of trouble has been located.

c. Do not close valve in water discharge line from the chlorinator coil.

d. Observe temperature of the chlorinator periodically and be sure it is not too hot (180°C. maximum).

4. Falls

Slipping on cement floors, stairs, Aroclor on floor, ice conditions; tripping over objects (hose, pipe, valve handles, etc.); or losing footing on ladders, etc., can cause falls.

Action to Prevent:

a. The majority of minor, serious, and near-miss injuries in the Aroclor Dept. are the result of falls. Prevention is always within the ability of the operator by use of expert operating practices.

b. The following items should be done:

(1) Return hose to rack after using.

(2) Keep operating areas clean of all foreign objects.

(3) Return ladders to racks when not in use.

(4) Keep gloves on and hands out of pockets, especially going up and down stairs.

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Cause and Action to Prevent

4. Falls (Contd.)

(5) Place guards around any area that presents a hazard that should be guarded.

c. Poor lighting due to burned out bulbs should be corrected at once. Poor lighting due to inadequate facilities should be reported.

d. Spills must be cleaned up immediately following their occurrence. Report any spill that cannot be cleaned up within the shift to the Chief Operator. Spills are to be reported in the log book.

5. Fires

Fires can occur by:

Biphenyl, Santowax R, or Santowax C ignition.

Chlorine problems in the vaporizer allowing reaction with steam to release hydrogen.

Furnace burner backfire.

Wood, rags, or paper on hot lines.

Sparks from welding apparatus of open flames.

Action to Prevent:

a. Area must be clear of trash or flammable materials. Use trash skips and cans.

b. Smoke only in areas so designated.

c. Use spark producing equipment only with a fire permit and proper inspection.

d. Use care in lighting gas torch or the still furnaces.

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Cause and Action to Prevent

5. Fires (Contd.)

e. Fire fighting equipment includes:

(1) Two wheeled dry powder units.

(2) Hose house with 200 ft. of hose.

(3) Two dry powder hand extinguishers, One CO_2 hand extinguisher.

(4) Two 3/4" water hoses.

(5) Hose connection north of Santowax.

(6) Scott Air Paks.

(7) Fire truck in fire house.

f. Observe visitors in the plant and be sure they observe safety rules.

6. The following is a list of chemicals handled in the Aroclor Plant operations and the precautions to be taken during their handling:

a. Chlorine Gas - This is a corrosive gas which is toxic. Leaks or back pressure can occur and liberate chlorine gas in the area. Operators should have their cartridge type respirators handy at all times while in the area.

If you are caught without a gas mask, and large amount of chlorine gas is liberated, hold your breath and go cross wind until you are out of range of the gas. Once out of the area, obtain an emergency gas mask and return to the area and correct the trouble.

A victim of chlorine gas fumes must be removed as quickly as possible from the gaseous area. Place patient on his back with head and back elevated. Milk may be used in mild cases as a relief from throat irritation. If the patient has stopped breathing, start artificial respiration immediately.

b. Biphenyl - Biphenyl is a flammable material which will burn. Burning should not be done in the presence of Biphenyl or Biphenyl vapors. The melting point is 68.7°C., and the auto ignition temperature is 258°C. Inhalation of Biphenyl fumes is not recommended, since it can cause a drugged effect on the person.

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c. Santowax R - Santowax R is a flammable material which will burn. It is relatively non-toxic to human beings. However, the vapors of Santowax R are irritating to the mucous membranes and bronichial tract. Prolonged breathing of the vapors should be avoided. The melting point is 140°C.

d. Santowax C - Same as Santowax R, since it is the crude material prior to distillation.

e. Ferric Chloride- Ferric Chloride is a black-brown solid. It causes only slightly irritating effects on the skin or mucous membranes. When heated it will decompose and release toxic fumes of Chlorine. It will react with water to produce toxic and corrosive HCl fumes.

f. Attapulgus Earth - This material is a dried earth. No danger in handling. Wash off with water to clean.

g. Hydrated Lime - No particular hazard in handling this material. The dust is irritating to the eyes and skin, and should be washed off with water.

h. Crude Aroclors - Crude Aroclors are hot, since all are handled in steam traced or jacketed lines. They can easily cause thermal burns in contact with the skin. Prior to air blowing, the material has HCl fumes entrained in it which are irritating to the skin or mucous membranes.

i. Hydrogen Chlorine Gas - This is a corrosive gas which is toxic. It is irritating to the mucous membranes, to the eyes, and to the respiratory tract. It will react with water to form Hydrochloric Acid.

j. Still Bottoms - or Residue Fumes from still bottoms are toxic. They are extremely irritating to the mucous membranes, to the eyes, and respiratory tract.

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APPENDIX K - BACKGROUND INFORMATION

History of Pyranols (Inerteens) in Monsanto

Registered trademarks for some commercial brands of chlorinated biphenyls in the United States are the following: Aroclor (Monsanto Company), Chlorextol (Allis-Chalmers Manufacturing Co.), Dykanol (Cornell-Dubilier Division, Federal Pacific Electric Co.), Inerteen (Westinghouse Electric Corporation), Noflamol (Wagner Electric Corporation), Pyranol (General Electric Company), and Therminol (Monsanto Company). Some other registered trademarks or trade names for commercial chlorinated biphenyls found throughout the world are the following: Clophen (I. G. Farbenindustrie A.G., Germany), Fenclor (Caffaro, Italy), Kannechlor (Kanegafuchi Chemical Co., Japan), Pyralene (Prodelec, France), and Sovol (Russia).

Aroclor used either alone or in blends with other materials such as trichlorobenzene, meet the need for a fire-resistant dielectric fluid with a high resistivity, a high dielectric strength, a relatively high dielectric constant, and a very low power factor. By replacing hydrocarbon oil with chlorinated biphenyls or mixtures of chlorinated biphenyls with trichlorobenzene, it has been possible to redesign equipment with a great reduction in size for the same capacity and voltage. At the same time, the fire hazards have been eliminated.

The first production of Pyranol by Monsanto was in 1936 when Pyranol 1488 was made for General Electric Co. These blends have grown through the years until there are now (1968) five Pyranol-Inerteen blends made at the Anniston Plant. Table I shows the approximate date when each blend was first made at the Anniston Plant.

History of Therminols in Monsanto

Aroclor 1248 has been used as a heat transfer medium since 1941 and in 1963 the name Therminol FR was assigned to Aroclors used as heat transfer mediums. There are now, in 1968, seven types of Therminol made. Six are made in the Anniston Plant. The seventh (Therminol 77) is made at the J. F. Queeny plant. The various types are as follows:

Therminol FR-1	is Aroclor 1242
Therminol FR-2	is Aroclor 1248
Therminol FR-3	is Aroclor 1254
Therminol FR-0	is an Aroclor blend
Therminol FR-Lo Temp	is an Aroclor blend
Therminol 66	is HB-40
Therminol 77	is an Aroclor blend

Table I shows the approximate date when each blend was first made at the Anniston Plant.

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History of other Aroclor Blends

Various blends are made for specific customer needs other than electrical and heat transfer mediums. The toluene blends were started ten years ago. FMC requires the 1242-1248 blends with viscosity being the critical property. Table I shows the approximate date when each blends was first made at the Anniston plant.

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TABLE I

AROCLOR BLEND STARTING DATES

	BLEND NAME	PRODUCTION STARTED	REMARKS
1.	Pyranol 1467	1957	Changed scavenger to GPE from Tin Tetraphenyl and called Inerteen PPO
2.	Pyranol 1470	1957	Changed scavenger to EP 221 from Tin Tetraphenyl and called Pyranol A13B3B
3.	Pyranol 1481	1957	No longer made at Anniston
4.	Pyranol 1488	1957	No longer made at Anniston
5.	Aroclor 1254 - 10% Secondary Butyl Acetate	1957	No longer made
6.	Aroclor 1254 - 10% Toluene	1958	--
7.	Aroclor 1260 10% Toluene	1958	--
8.	Aroclor 1262 10% Toluene	1958	--
9.	Aroclor 1262 10% Xylene	1958	--
10.	Inerteen PPO	July 1958	--
11.	Pyranol A13B3B	Jan. 1963	--
12.	1254-4465 Blend	Mar. 1965	--
13.	Inerteen 54201-KA	Aug. 1965	--
14.	Therminol FR-0	Mar. 1966	--
15.	Therminol FR-Lo Temp	Feb. 1967	--
16.	Inerteen 54201-A-6	Jan. 1968	--
17.	Inerteen 54201-CH	Jan. 1968	--

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TABLE II

TENTATIVE PROCESSES

1. Therminol FR-Lo Temp

   Research Report P-1441 by C. P. Duncker, dated 13 Feb. '67.

2. Inerteen 54201-KA

   Research Report P-1342 by J. D. Sullivan, dated 11 Nov. '64.

3. Inerteen 54201-A6

   First made in Anniston as lab batch
   (55 gal. drum) 21 Nov. '67 .
   Plant batch made after letter from P. G. Benignus to H. C. Carder
   anticipating first order.
   There is no know Tentative Process for this product.

4. Inerteen 54201-CM

   There is no known Tentative Process for this product.
   Plant batch made after phone call from P. G. Benignus to
   H. L. Williams and resultant sales order from Westinghouse.

5. There are no known Tentative Process descriptions for the remaining Aroclor Blends.

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APPENDIX L - TIME CYCLES

A batch process is used for the production of all Pyranols.

See Table II for time cycles and batch weights of various Pyranol mixes. These are normal size batches, however, a batch size might be increased or decreased depending on need for the material.

There are no bottlenecks in the production of Pyranols at the present time. The time required to load a car, approximately six hours, might become a bottleneck if demand for these products should increase.

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TABLE II

PRODUCT	APPROXIMATE POUNDS PER BATCH	APPROXIMATE TIME REQUIRED TO PRODUCE & PACKAGE A BATCH
1254 - 10% Toluene	20,000 Pounds	24 Hours
1260 - 10% Toluene	20,000 "	24 Hours
1262 - 10% Toluene	20,000 "	24 Hours
1262 - 10% Xylene	20,000 "	24 Hours
A13B3B	100,000 "	24 Hours
Inerteen PPO	100,000 "	24 Hours
Inerteen 54201-KA	100,000 "	48 Hours
Therminol FR-0	20,000 "	24 Hours
Santicizer 794	20,000 "	24 Hours
Aroclor Blend	20,000 "	24 Hours

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APPENDIX M - QUALITY CONSIDERATIONS

Pyranols and Inerteens are used as capaciter and transformer fluids by the electrical industry. The Aroclors used must meet rigid electrical grade specs. The Hooker supplied trichlorobenzenes (TCB) and Tri-tetrachlorobenzenes (TTCB) are analyzed before use. Power factor is measured to determine the need for earth treatment before use in a blend. As the batch is being made samples are analyzed for the electrical properties as well as the physical properties to determine the necessity of further earth treatment.

The other blends are analyzed for physical properties only although all Aroclor 1242, 1254, and 1260 used meet the electrical specs.

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APPENDIX N - MISCELLANEOUS

Specialized Equipment

Iron rust has a deleterious effect on the electrical properties of Pyranols. Every effort is made to prevent rust from coming in contact with the product. The Pyranol mix tank and tank cars are zinc-tin lined to prevent rust. Galvanized, aluminum lines and stainless steel pumps and valves are used.

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WATER_PCB-SD0000050902

Sept. 1984

Monsanto Company

SMP

Anniston

Aroclor Blends

1968

DSW 053441

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