

O R G A N I C
C H E M I C A L S D I V I S I O N
R E S E A R C H

Report

REPORT NO. P-1605

JOB NO. 2-21-760.01-1113115

TENTATIVE PROCESS

FOR

PYDRAUL 54QB

DATE - February 17, 1971 WRITTEN BY P. D. Fowlkes

Monsanto

ST. LOUIS, MISSOURI

DSW 620363

STLCOPCB4094390

- 1) Pydraul 540B - low cost fire resistant hydraulic fluid contains no chlorinated biphenyl, tent proc
- 2) Chlorinated-biphenyl - free hydraulic fluid

MONSANTO COMPANY
Organic Chemicals Division
St. Louis Research Department

St. Louis Research Report No. P-1605

TENTATIVE PROCESS

FOR

PYDRAUL 540B

SAFETY REVIEW COMMITTEE	
APPROVED BY	<i>J. D. Gorman</i> 3/2/71
	<i>W. J. Gorman</i> 3/12/71
	<i>J. Gorman</i> 3/15/71

Job. No. 2-21-760.01-1113115

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TECHNICAL INFORMATION GROUP
1700 SOUTH SECOND STREET

REFERENCE BOOK

Not To Be Taken From Library

Written by: P. D. Fowlkes

Work done by: P. D. Fowlkes
P. F. Heimsch
L. F. Smith
L. R. Stark

Date: February 17, 1971

DSW 620364

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OF REPORT NO. P-1605



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13. R. L. Wagner - J. F. Queeny Plant
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DSW 620365

STLCOPCB4094392

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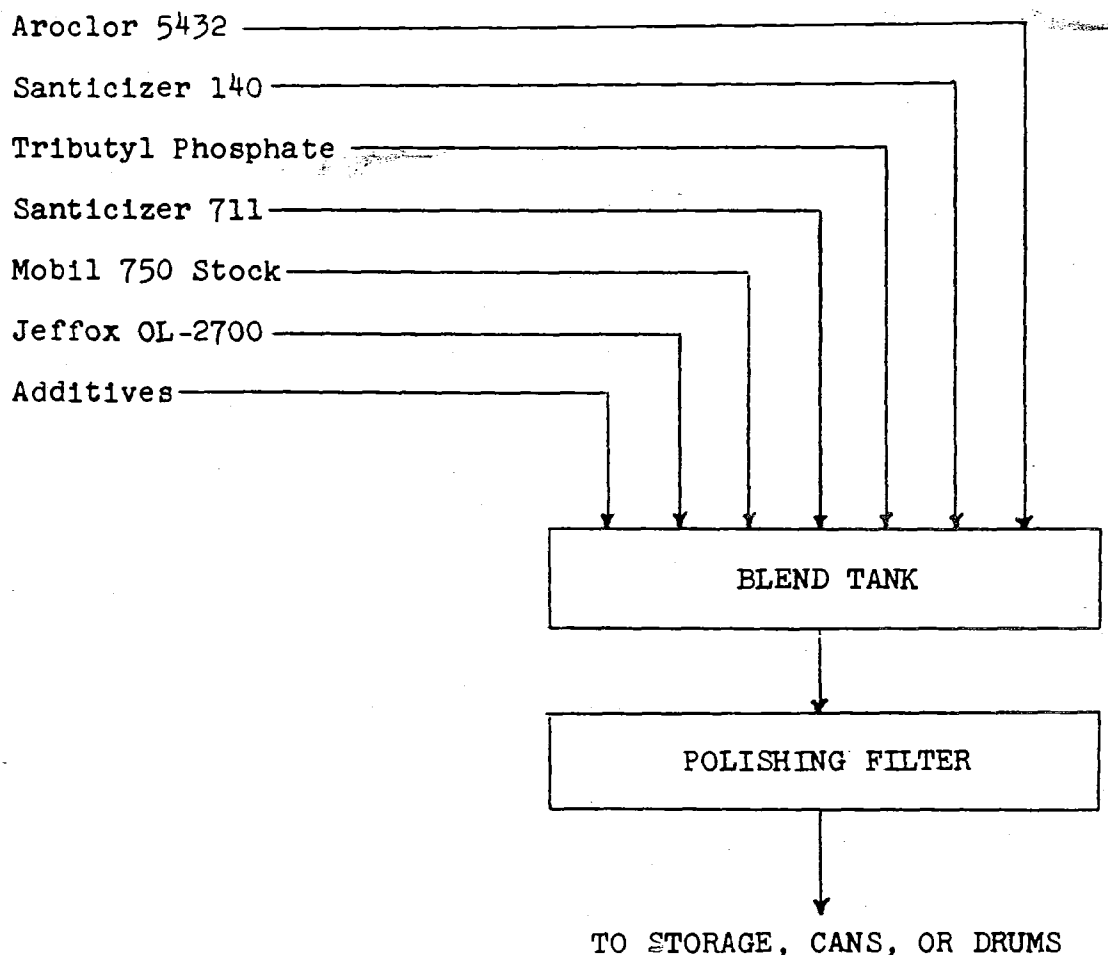
INTRODUCTION

Pydraul 540B is a low cost fire resistant hydraulic fluid which does not contain chlorinated biphenyl. This blend was developed to replace Pydraul 540A.

SYNOPSIS OF PROCESS

Pydraul 540B is prepared by blending Aroclor 5432, Santicizer 140, tributyl phosphate, Santicizer 711, petroleum oil and additives. The finished product is then filtered to remove any stray debris from raw materials or blending, and transferred to containers or storage.

FLOW SHEET



DSW 620367

RAW MATERIAL REQUIREMENTS

Basis, 100 lbs. of product

	<u>Raw Material</u>	<u>Wt., lbs.</u>
45051	Mobil 750 Stock	26.0
86840	Santicizer 711	7.2
80781	Tributyl Phosphate	1.6
83621	Aroclor 5432	42.0
48073	Jefferson Jeffox OL-2700	3.0
46310	Paraplex G-62 <u>or</u>	
10575	Admex 710	0.3
51351	Santolube 70-A	0.3
60015	Tolyltriazole	0.1
31100	DC-200, 350 cs. Fluid	0.003
20640	DuPont Oil Blue A Dye	0.003
80151	Santicizer 140	19.5

PROCESS IN DETAIL

The blending operation may be carried out in any suitable metal or glass lined vessel. The materials are not corrosive and carbon steel equipment is suitable. An agitator should be provided.

Due to the great difference in solubilities of the various ingredients, the order of addition of materials is important. If the suggested blending order is not followed, product cloudiness may result.

To the clean, dry vessel charge the Mobil 750 Stock, tributyl phosphate, Santicizer 711, 5432 and Jeffox OL-2700. Warm to 125-150°F. (50-65°C.) and stir for a minimum of 1/2 hour.

Aroclor 5432 is a resinous, sticky solid at room temperature. It may be handled easily if it is heated to 150-180°F. (65-82°C.). At 150°F. viscosity is 100-400 cs. and at 180°, 40-100 cs.

If convenient, the Santolube 70-A, Paraplex G-62 (or Admex 710), tolyltriazole, DC 200 fluid and dye may be added to the blending tank with the initial charge. The tolyltriazole and dye require 15-30 minutes to dissolve completely.

After the blend has been mixed for at least 30 minutes at 125-150°F. (50-65°C.), add the Santicizer 140 and blend another 15-30 minutes at the same temperature.

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The batch is then circulated through a polishing filter. Samples are taken as required for analytical purposes. The batch may be held for possible viscosity adjustment or be sent to storage. After blending is complete, it is recommended that the temperature be reduced to 80-129°F. (26-49°C.). Prolonged exposure at higher temperatures may cause some product quality deterioration.

DISCUSSION OF IMPORTANT VARIABLES

The most important specification property of Pydraul 540B is viscosity. Adjustments in the blend should be made to keep the 100°F. viscosity within the required specification range.

If the 100°F. viscosity is low, add Aroclor 5432. One pound of 5432 per 100 pounds of blend will increase the viscosity about 1.9 centistokes.

If the 100°F. viscosity is high, add Santicizer 140. One pound of Santicizer 140 per 100 pounds of blend will decrease the viscosity about 3.1 centistokes.

The quantity of dye added should be carefully measured on a suitable small balance or scale. This is important to insure uniform color from batch to batch.

Another caution mentioned in the previous section concerned prolonged heating. It is suggested that maximum temperatures of 125-150°F. be limited to 2 or 3 hours. Also, manner of heating the batch should control film temperatures so there are no significant hot spots. Prolonged heating may cause gradual darkening of the product as well as gradual increase in acidity due to decomposition of the CDP.

MATERIAL SPECIFICATIONS

Raw Materials

Refer to raw material specification sheets included in the Appendix.

Finished Pydraul 540B

Typical analyses and suggested specification limits follow:

DSW 620369

<u>Property</u>	<u>Tentative Specification</u>	<u>Typical Value</u>	<u>JFQ Method</u>
Appearance	Clear to slightly hazy green liquid		16-B
Viscosity, cs. at 100°F. at 210°F.	111-118 7.7-8.4	113.0 8.03	126-A
Acidity, mg. KOH/gm.	0.30 max.	0.24	80-B
Specific Gravity 25/25°C.	1.115-1.135	1.125	116-A
Moisture, KF	.15 max.	.05	78-B
Pour Point (each 10th lot)	+15°F. max.	+10°F.	100-A

ANALYTICAL METHODS

No new or special analytical procedures are required for this product. A cross reference table appears in the Appendix listing standard analytical procedures used at J. F. Queeny Plant, W. G. Krummrich Plant, and at the Anniston Plant. These procedures are currently used on similar products.

TOXICITY AND HAZARDS

No unusual toxicity or hazards are expected with the raw materials or finished blend. The process is a simple blending procedure and no hazardous reactions should occur between the various components.

Animal testing indicates that the components used in this blend have a very low order of acute and oral toxicity.

(Note: Current specific toxicity information is being obtained from the Medical Department on these materials and it is suggested these be included in the Appendix of this report.)

General precautions include the following:

1. Goggles should be worn where splashing or spillage may occur.
2. Any material in contact with the skin should be removed by washing with soap and water.
3. Prolonged or repeated exposure to the skin may cause irritation due to removal of skin oils with resulting dryness and chapping.

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4. Material may be irritating to sensitive skin areas and eyes. In case of contact with eye tissue, flush copiously with water and then get medical attention.
5. In case of internal ingestion get immediate medical attention.
6. Avoid inhaling volation material or mists.

POLLUTION CONTROL

No waste by-products are generated by this process. Used filtering material, flushings from the system during cleaning, as well as any spoiled product should be disposed of as dictated by local regulations.

While the materials used in Pydraul 540B have not been identified as environmental contaminants, it is strongly recommended that care be exercised in preventing any tank flushings or other residue from entering the sewers.

Since Pydraul 540B is highly insoluble in water, any material introduced into the sewer would be an easily identifiable oily pollutant.

Used filters and tank flushings should be drummed and disposed of either in the WQK incinerator or sent to the toxic land fill.

APPENDIX

P. D. Fowlkes 3/9/71

P. D. Fowlkes

L. R. Stark 3/9/71

L. R. Stark

File Copy Approved by:

W R Richard

Manager of R&D

3/9/71

(date)

Jim [unclear]

Manager of Manufacturing

3/10/71

(date)

[unclear]

Manager of Process Technology

3/12/71

(date)

/is
2/17/71

DSW 620371

Analytical Procedures

Property	WGK	JFQ	Anniston	ASTM *
Appearance	12809	16-B	G-1	-
Viscosity	12837	126-A	049	D-445
Flash & Fire Point	12803	50-A	114	D-92
Specific Gravity	12804	116-B	052	-
Pour Point	13005	100-A	053	D-97
Cloud Point	-	36-A	-	D-2500
Acidity	12794	80-B	050	D-664/D-974
Moisture	12810	78-B	047	D-1744
Foam	12805	54-A	-	D-892
Refractive Index	13123	104-A	048	D-1218
Distillation Range	10117	-	054	Modified D-20

~~*~~ Approximate equivalent ASTM method.

DSW 620372

STLCOPCB4094399

MOBIL OIL COMPANY
ORGANIC CHEMICALS DIVISION
J. F. QUERNY PLANT
TENTATIVE
RAW MATERIAL SPECIFICATION

MATERIAL CODE
45051
USED IN
Hydraulic Blends
PROPOSED BY
A. F. Uelner

DISTRIBUTION
R. L. Wagner -2- JFQ
M. J. Smid -1- JFQ
R. A. Geisman -4- JFQ
W. E. Ault/WAULT -1- GO/22
~~W. E. Ault/WAULT -1- GO/22~~
/ ~~GO/Research~~
L. R. Stark/LSTAR -2-
GO/Research
J. D. Leyerle -1- JFQ
H. L. Powell -1- JFQ
Standards Department -4- JFQ

NAME
OIL, MOBIL 750 STOCK (MZY-227N)

CHEMICAL FORMULA

NO. 1.

DATE PROPOSED	EFFECTIVE UNTIL	SUPPLIER	SAMPLE FOR ANALYSIS
2-3-71	2-3-72	Mobil Oil Corporation	1 x 16-ounce NN Bottle

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

TEST	LIMITS	METHODS
<u>On each lot</u>		
Appearance	Brown, mobil liquid	16-B
Color (ASTM D-1500)	3.0 to 4.0	38-I
Fire point	500°F min.	50-A
Flash point	450°F min.	50-A
Neutralization Number	0.04 max.	80-B
Specific gravity @ 15.6/15.6°C	0.916 to 0.929	116-B
Viscosity: @ 100°F @ 210°F	151 to 183 cs. 11.0 to 12.0 cs.	126-A
<u>Upon request</u>		
	<u>Vendor Typical</u>	
Aniline point	198°F	ASTM D611-64
Carbon residue, Conradson, % by weight	0.3	ASTM D189-65
Gravity, API	21 - 23	ASTM D287-64
Pour point	-15°F	100-A
Sulfur: Corrosive Total % by weight	Non-corrosive 0.477	ASTM D1275-64 124-A
Viscosity index	40	126-A

DSW 620373

STLCOPCB4094400

MONSANTO COMPANY ORGANIC CHEMICALS DIVISION EVERETT PLANT FINISHED PRODUCT SPECIFICATION		PRODUCT CODE 86848	DEPT. OR JOB	ISSUED Dec. 26, 1969 STANDARDS DEPARTMENT John F. Queeny Plant By <i>J. H. Bannan</i>	
		USE Sales and internal			
		SALES CODE 3960-300-04-011			
PRODUCT (Trade Name) SANTICIZER 711		TYPE			
PRODUCT (Chemical Name)		TYPE			
CHEMICAL FORMULA					
MOL. WT.					
SUPERSEDES SPECS OF January 9, 1969 (Tentative)		SAMPLE FOR ANALYSIS 1 x 16 ounce NN Bottle			

TEST	UNRESTRICTED SALES LIMITS	INTERNAL CONTROL LIMITS	EVERETT PROCEDURES
<u>On each lot</u>			
Acidity, meq/100 grams	0.12 maximum	----	801-01-03
Appearance	Clear, oily liquid	----	600-01-02
Color	APHA 50 maximum	----	801-01-04
Moisture (By KF in methanol)	0.10% maximum	----	801-01-02
Odor	Slight, characteristic	----	600-15-01
Refractive Index @ 25°C	1.480 to 1.483	----	600-18-01
Specific Gravity @ 25/25°C	0.965 to 0.973	----	801-01-05

Upon request

Composition:		GLC
Low boilers including alcohols	0.8% maximum	
Plasticizers other than Santicizer 711	1.5% maximum	

Sampling procedure

1. Tank Cars or Trucks

- Take one or two 16-ounce dip samples, as per plant practice, after tank or car is filled.
- Submit one bottle to the laboratory for analysis. When a spare is taken, hold in the department for reference.

2. Drums

DSW 620374

- Withdraw a thief sample from every fifth drum and composite to give one or two 16-ounce bottles, as per plant practice.
- Submit one bottle to the laboratory for analysis. When a spare is taken, hold in the department for reference.

12

MONSANTO COMPANY
ORGANIC CHEMICALS DIVISION
PURCHASED FOR RESALE*
FINISHED PRODUCT
SPECIFICATION

PRODUCT CODE

80781*

DEPT. OR JOB

USE

Sales - W. F. Waychoff, Manager

SALES CODE

8483-100-04-001

ISSUED MARCH

STANDARDS DEPT.

John F. Queeny, Jr.

By *K. H. Bannan*

PRODUCT (Trade Name)

TRIBUTYL PHOSPHATE

TYPE

PRODUCT (Chemical Name)

TYPE

CHEMICAL FORMULA

$(C_4H_9-O)_3P = O$

MOL WT. 266.32

SUPERSEDES SPECS OF

February 10, 1966

SAMPLE FOR ANALYSIS

1 x 16-ounce NN Bottle

*From Stauffer Chemical Company & FMC

TEST	UNRESTRICTED SALES LIMITS	PROCEDURES
<u>On each lot</u>		
Acidity	0.03% max. as phosphoric acid	4-A
Appearance	Clear, mobile liquid	16-B
Color	APHA 25 max.	38-D
Moisture (By KF in methanol)	0.20% max.	78-B
Odor	Characteristic	84-A
Refractive index @ 25°C	1.420 to 1.425	104-A
Specific gravity @ 20/20°C	0.977 to 0.980	116-B

DSW 620375

STLCOPCB4094402

ORGANIC CHEMICALS DIVISION

APPROX 5432

S2

**TENTATIVE
SPECIFICATION**

APPROVED BY

S. L. Conder

GENERAL DESCRIPTION

PL/BI

Application
DATE OF ACTIVE

7/15/70

SOURCE OF SPECIFICATION

Research

PRODUCT CODE

82621

WALL CODE

USE

Sales

CHEMICAL FORMULA

CHLORINATED TERPENE

HOW
ISSUED

1

EFFECTIVE DATE

1/15/71

SAMPLE FOR ANALYSIS

1 x 1/2 gal. Bottle

ISSUED BY

J. T. Bell

CHARACTERISTIC

LIMITS

METHOD

(R) Color, NPA

2 Max.

G-4

(R) Specific Gravity @ 90°C

1.263-1.290

052

(R) Appearance

Clear Yellow Oil

G-1

GENERAL INFORMATION

Chlorine Content, %

30.5-33.0

093

DSW 620376

(R) 1.0 g. Sample, 10.0 ml. Solvent, analyzed by refract only.

STLCOPCB4094403

MONSANTO CHEMICAL COMPANY

ORGANIC CHEMICALS DIVISION

RAW MATERIAL
SPECIFICATION

MATERIAL CODE

46310

USING DEPTS.

Santicizer Blends

SUPPLIER

Rohm & Haas

ISSUED OCT. 18, 1965

STANDARDS DEPARTMENT

John F. Querry, Jr.
By Paul S. KiserMATERIAL
PARAPLEX G-62

CHEMICAL FORMULA

MOL WT. -----

SUPERSEDES SPECS OF
September 7, 1962

SAMPLE FOR ANALYSIS

1 x 16-ounce NN Bottle

TEST	UNRESTRICTED PURCHASE LIMITS	INTERNAL CONTROL LIMITS	PROCEDURES
<u>On each lot</u>			
Appearance @ 30°C	Sparkling clear	----	16-B
Color	Gardner #1 max.	----	38-N
Neutralization No.	Acid. 1.0 max.	----	80-B
Refractive index @ 25°C	----	1.469 to 1.473	104-A
Specific gravity @ 25/25°C	----	0.988 to 0.998	116-A
<u>Upon request</u>			
Iodine number	About 0.7 to 0.8	----	68-C
Viscosity @ 25°C (Gardner-Holt)	M to Q	----	126-D

Product information - Typical Analysis

Flash point	315°C
Freezing point	+5°C
Oxirane oxygen	6.7 to 6.8 (6.5 min.)
Refractive index @ 25°C	1.471
Saponification number	182
Specific gravity @ 25/25°C	0.993

DSW 620377

STLCOPCB4094404

ORGANIC CHEMICALS DIVISION		8157-51351	ISSUED MAY 9, 1967
J. F. QUEENY PLANT		USING DEPTS	STANDARD SPECIFICATION
RAW MATERIAL SPECIFICATION		Fluid Blends	J. F. Queeny Plant
		SUPPLIER	Paul H. Briden
		Monsanto - Nitro Plant	
MATERIAL - SANTOLUBE 70-A			
CHEMICAL FORMULA			
Blend of: Santolube 70 98.35%			
Santolene C 1.65%			
MOL. WT.			
SUPERSEDES SPECS OF 6-21-67 for		SAMPLE FOR ANALYSIS	
Santolube 70; Nitro code 81787		1 x 16-ounce WM Bottle	

TEST	RESTRICTED INTER-PLANT LIMITS	PROCEDURES	
		NITRO	JFQ
<u>On each lot</u>			
Appearance	Dark, oily liquid	6-C-01	16-B
Color, ASTM Dilute	5.5 max.	6-C-21	38-I
Neutralization No.	51 to 61	6-A-24	80-A
Solubilities: 5%/vol. in PE	Clear	6-V-15	112-B
Specific gravity @ 25/25°C	0.89 to 0.97*	6-D-07	116-B
<u>Upon request</u>			
Emulsification test	40, 40, 0 (30 min.)	6-S-28	-----
Santolene C presence	Positive phosphorous test	-----	-----
Viscosity @ 210°F	70 to 300 SUS*	6-X-02	126-A

*Typical ranges submitted by Nitro.

Special requirements

This material is shipped upon invoice certification of compliance with specifications. Prior permission will be obtained to ship non-specification grade material.

This specification is the property of Monsanto
and is intended for internal use only.

DSW 620378

IN 27

R2

MONTROVIA COMPANY
ORGANIC CHEMICALS DIVISION

J. F. QUEENY PLANT

TENTATIVE
RAW MATERIAL SPECIFICATION

NAME

TOLYLTRIAZOLE (Cobratec TT-100)

CHEMICAL FORMULA

MATERIAL CODE

60015

USED IN

Hydraulic Blends

PROPOSED BY

P. D. Fowlkes

DISTRIBUTION

R. L. Wagner - 1 - JFQ
P. F. Gatens - 1 - JFQ
R. A. Geisman - 4 - JFQ
J. D. Leyerle - 1 - JFQ
H. L. Powell - 1 - JFQ
N. T. Johnson - 1 - GO/32S
J. R. Savage - 1 - GO/B2N
B. Petty - 1 - GO/B2N
P. D. Fowlkes - 1 - GO/Res
L. R. Stark - 1 - GO/Resear
Standards - 4 -

MOL. WT.

DATE PROPOSED

4/30/70

EFFECTIVE UNTIL

4/30/71

SUPPLIER

Sherwin Williams

SAMPLE FOR ANALYSIS

1 x 8-ounce WM Bottle

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

TESTS

LIMITS

PROCEDURES

Appearance

Light tan granules

16-A

Melting point

81 to 84°C

76-A

Product information

Bulk density

40 - 45 lbs. /ft.³

Screen test:

Retained on 6 mesh

0%

Retained on 60 mesh

99%

Solubility @ 25°C (by wt.)

Benzene

1.7%

Ether

23.0%

Methanol

92.5%

Polyethylene Glycol

53.3%

Water

1.03%

(1.90% @ 60°C)

Water

0.7% maximum

DSW 620379

STLCOPCB4094406

J. F. QUELLENY PLANT
MONSANTO COMPANY
ORGANIC CHEMICALS DIVISION

RAW MATERIAL
SPECIFICATION

MATERIAL CODE
31100

USING DEPTS.
Fluid Blends

SUPPLIER
Dow Corning Corporation

ISSUED FEB. 8, 1968

STANDARD SPECIFICATION

J. B. Gentry
Paul H. Brown

MATERIAL
DOW CORNING 200 FLUID - 350 cs.

CHEMICAL FORMULA

DATE OF

SUBMITTED FOR APPROVAL OF
October 28, 1964

SAMPLE FOR ANALYSIS

1 x 8-ounce Bottle

TEST	UNRESTRICTED PURCHASE LIMITS	METHODS
<u>On each lot</u>		
Appearance	Syrupy liquid	16-B
Refractive index @ 25°C	1.4020 to 1.4040	104-A
Specific gravity @ 25/25°C	0.969 to 0.975	116-A
Viscosity @ 25°C	332.5 - 367.5	126-31100
<u>Upon request</u>		
Color - modified Barrett	1.5 max.	38-H
Flash point	600°F min.	50-A
Neutralization No.	0.01 max.	80-B
Volatility (24 hrs./150°C)	0.5% max.	128-B

DSW 620380

STLCOPCB4094407

MONSANTO COMPANY
ORGANIC CHEMICALS DIVISION
J. F. QUEENY PLANT
FINISHED PRODUCT
SPECIFICATION

PRODUCT CODE	DEPT. OR JOB
80077/80151	
USE Sales - W.F. Waychoff, Manager and Internal for blends	
SALES CODE	
7680-940-04-001	

ISSUED JAN. 23, 1967
STANDARDS DEPARTMENT
J. F. Queeny Plant
Paul H. Bricker

PRODUCT (Trade Name)	TYPE
SANTICIZER 140	A GRADE
PRODUCT (Chemical Name)	TYPE
CRESYL DIPHENYL PHOSPHATE	A GRADE
CHEMICAL FORMULA	

MOL WT.	
SUPERSEDES SPECS OF	SAMPLE FOR ANALYSIS
November 26, 1963	1 x 16-ounce NN Flint Bottle

TEST	UNRESTRICTED SALES LIMITS	CONTROL LIMITS	METHODS
<u>On each lot</u>			
Acidity	0.20 meq/100 g. max. (=0.01% max. as H_3PO_4)	0.15 meq/100 g. max.	4-A
Appearance	Clear, mobile liquid	Clear, mobile liquid	16-B
Color	APHA 40 max.	APHA 15 to 35	38-D
Moisture (By KF in methanol)	0.15% max.	0.12% max.	78-B
Odor	Essentially odorless	Essentially odorless	84-A
Specific gravity @ 25/25°C	1.203 to 1.213	1.205 to 1.208	116-B
Stability to $KMnO_4$	65% transmission, min.	65 to 90% transmission	118-D

Upon request

Refractive index @ 25°C	1.550 to 1.570	1.558 to 1.563	104-A
----------------------------	----------------	----------------	-------

Sampling procedure

1. Circulate storage tank the night before filling shipping containers.
2. While filling drums or tank car, take one 16-ounce bottle from the filling line and submit to the laboratory for analysis.

DSW 620381

STLCOPCB4094408

PHYSICAL CONSTANTS DATA

SUBSTANCE Pydraul 540B		STRUCTURAL FORMULA Blend of: 26.0% Mobil 750 Stock 7.2% Santicizer 711 1.6% Tributyl Phosphate 42.0% Aroclor 5432 3.0% Jeffox OL-2700 19.5% Santicizer 140
COMPILED BY P. D. Fowlkes	DATE 2/17/71	
NAME		SOURCE & DATE
Formula	Blend	
Molecular Weight		
Appearance	Clear to sl. hazy green liquid	
Boiling Point at 760 mm		
Boiling Point at mm		
Boiling Point at mm		
Boiling Point at mm		
Crystallizing Point		
Melting Point		
Solution Point		
Specific Gravity $\pm$ 25/25°C.	1.125	
Specific Gravity $\pm$ 25 °C	9.40	
Pounds per Gal. $\pm$ 25 °C		
Coefficient of Expansion		
Refractive Index $\pm$ n _D		
Infra Red Spectrum (Reference)		
Ultra Violet Spectrum (Reference)		
Viscosity $\pm$ 100°F.	113.0 typ.	
Viscosity $\pm$ 210°F.	8.03 typ.	
Surface Tension		
Solubility in Water	N11	
Solubility in		
Solubility in		
Flash Point °F (Method) COC	440	
Fire Point °F.	540	
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		
Physical Constants		
Other		
Notes		

DSW 620382

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#1

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