ORGANIC CHEMICALS DIVISION RESEARCH Report

REPORT NO. P-1604 JOB NO. 2-21-760.01-1113115

TENTATIVE PROCESS

FOR

PYDRAUL 230A

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

Monsanto

ST. LOUIS, MISSOURI

DSW 620343

STLCOPCB4094370

1) Pydraul 230 A low cost fire resistant hydraulic fluid

2) Chlorinated-biphenyl-free hydraulic fluid

3) Aroclor 5432 - starting material for Pydraul 230 A

4) Santicizer 140 - starting material for Pydraul 230 A

5) Santicizer 711 - starting material for Pydraul 230 A

SAFETY [illegible]
APPROVED [illegible] 3/5/71
[illegible] 3/5/71
[illegible] 3/9/71

MONSANTO COMPANY
Organic Chemicals Division
St. Louis Research Department

St. Louis Research Report No. P-1604

TENTATIVE PROCESS

FOR

PYDRAUL 230A

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

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STLCOPCB4094373

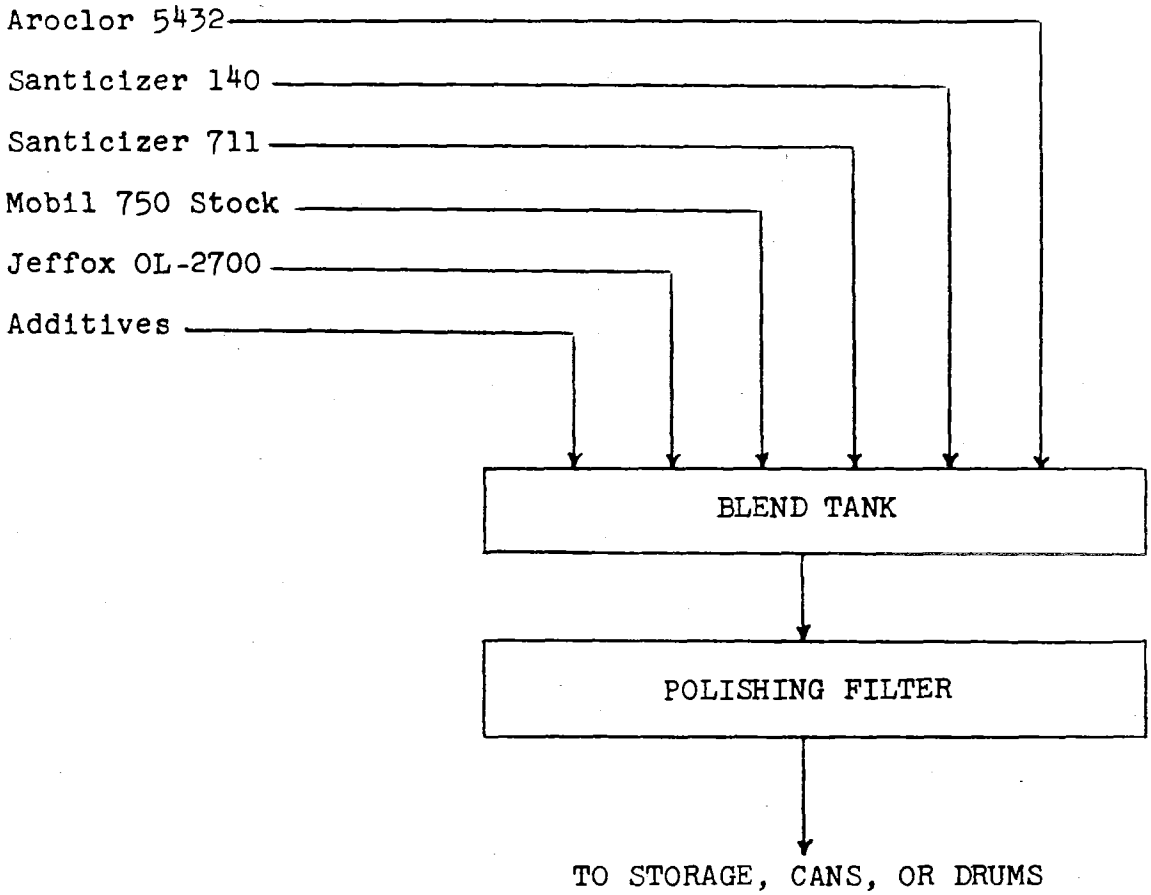
INTRODUCTION

Pydraul 230A is a low cost fire resistant hydraulic fluid which does not contain chlorinated biphenyl. This blend was developed to replace Pydraul 230.

SYNOPSIS OF PROCESS

Pydraul 230A is prepared by blending Aroclor 5432, Santicizer 140, 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



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RAW MATERIAL REQUIREMENTS

Basis, 100 lbs. of product

	Raw Material	Wt., lbs.
45051	Mobil 750 Stock	13.5
86840	Santicizer 711	18.0
82621	Aroclor 5432	29.3
48073	Jefferson Jeffox OL-2700	1.5
46310 10575	Paraplex G-62 or 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	37.0

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, 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 230A 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 1.1 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 0.7 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 230A

Typical analyses and suggested specification limits follow:

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Property	Tentative Specification	Typical Value	JFQ Method
Appearance	Clear to slightly hazy green liquid		16-B
Viscosity, cs. at 100°F.	47.0-53.0	50.5	126-A
at 210°F.	5.2-5.8	5.50	
Acidity mg. KOH/gm.	0.30 max.	0.22	80-B
Specific Gravity 25/25°C.	1.122-1.144	1.133	116-A
Moisture, KF	0.15 max.	0.05	78-B
Pour Point (each 10th lot)	-5°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 volatile 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 230A 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 230A 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 WGK incinerator or sent to the toxic land fill.

APPENDIX

P. D. Fowlkes 3/1/71
P. D. Fowlkes

L. R. Stark 3/1/71
L. R. Stark

File Copy Approved by:

W R Richard — 3/2/71
Manager of R&D — (date)

Manager of Manufacturing — 3/3/71 (date)

Manager of Process Technology — 3/3/71 (date)

/ls
2/17/71

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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.

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[illegible] Company
ORGANIC CHEMICALS DIVISION
J. F. QUERY PLANT
TENTATIVE
RAW MATERIAL SPECIFICATION

MATERIAL CODE: 45051

USED IN: Pydraul Blends

PROPOSED BY: A. F. Uelner

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

CHEMICAL FORMULA

DISTRIBUTION:
R. L. Wagner -2- JFQ
M. J. Smid -1- JFQ
R. A. Geisman -4- JFQ
W. E. Ault/WAULT -1- GO/D2
[illegible]/PROWLER -1- GO/Research
L. R. Stark/LSTAR -2- GO/Research
J. D. Leyerle -1- JFQ
H. L. Powell -1- JFQ
Standards Department -4- JFQ

NOTICE:

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
On each lot		
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:		126-A
@ 100°F	151 to 183 cs.	
@ 210°F	11.0 to 12.0 cs.	
Upon request		
	Vendor Typical	
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	Non-corrosive	ASTM D1275-64
Total % by weight	0.477	124-A
Viscosity index	40	126-A

DSW 620353

STLCOPCB4094380

MONSANTO COMPANY
ORGANIC CHEMICALS DIVISION
EVERETT PLANT
FINISHED PRODUCT
SPECIFICATION

PRODUCT CODE: 86848
DEPT. OR JOB:
USE: Sales and internal
SALES CODE: 3960-300-04-011

ISSUED Dec. 26, 1969
STANDARDS DEPARTMENT
John F. Queeny Plant
By W. H. Bauman

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
On each lot			
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

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

2. Drums

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

DSW 620354

IN 84 (REV. 12/68)

STLCOPCB4094381

ORGANIC CHEMICALS DIVISION

TENTATIVE SPECIFICATION

ARCLOR 5432			
PLANT: Anniston	PRODUCT CODE: 82621	USE: Sales	
DATE EFFECTIVE: 7/15/70	SALES CODE:		
AUTHORIZED BY: J. L. Corder	SOURCE OF SPECIFICATION: Research		

GENERAL DESCRIPTION

CHEMICAL FORMULA

CHLORINATED TERPENYL

ISSUE	EFFECTIVE UNTIL	SAMPLE FOR ANALYSIS	ISSUED BY
1	1/15/71	1 x 1/2 gal. Bottle	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

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(R) [illegible] Analyzed by request only.

STLCOPCB4094382

MONSANTO CHEMICAL COMPANY
ORGANIC CHEMICALS DIVISION

RAW MATERIAL SPECIFICATION

MATERIAL CODE: 46310

USING DEPTS.: Santicizer Blends

SUPPLIER: Rohm & Haas

ISSUED OCT. 18, 1965

STANDARDS DEPT.

John F. [illegible]

By Paul [illegible]

MATERIAL: 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
On each lot			
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
Upon request			
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 620356

J. F. QUEENY PLANT
RAW MATERIAL
SPECIFICATION

USING DEPTS
Fluid Blends

SUPPLIER
Monsanto - Nitro Plant

MAY ... 19..
STANDARDS DEPARTMENT
John F. Queeny Plant
By Paul N. Brown

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 Santolube 70; Nitro code 81787

SAMPLE FOR ANALYSIS
1 x 16-ounce WM Bottle

TEST	RESTRICTED INTER-PLANT LIMITS	PROCEDURES NITRO	PROCEDURES JFQ
On each lot			
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
Upon request			
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 620357

IN-55 REV. 12-67

STLCOPCB4094384

[redacted] COMPANY
ORGANIC CHEMICALS DIVISION
J. F. QUEENY PLANT

TENTATIVE RAW MATERIAL SPECIFICATION

MATERIAL CODE: 60315
USED IN: Pydraul Blends
PROPOSED BY: P. D. Fowlkes

NAME: TOLYLTRIAZOLE (Cobratec TT-100)

CHEMICAL FORMULA

MOL. WT.

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/B2S
J. R. Savage - 1 - GO/B2N
B. Petty - 1 - GO/B2N
P. D. Fowlkes - 1 - GO/Res
L. R. Stark - 1 - GO/Research
Standards - 4 -

DATE PROPOSED	EFFECTIVE UNTIL	SUPPLIER	SAMPLE FOR ANALYSIS
4/30/70	4/30/71	Sherwin Williams	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 620358

STLCOPCB4094385

J. F. QUEENY PLANT
MONSANTO COMPANY
ORGANIC CHEMICALS DIVISION

RAW MATERIAL SPECIFICATION

MATERIAL CODE: 31100

USING DEPTS.: Fluid Blends

SUPPLIER: Dow Corning Corporation

ISSUED FEB. 8, 1968
STANDARDS DEPARTMENT
John B. Cherry
By Paul McPherson

MATERIAL: DOW CORNING 200 FLUID - 350 cs.

CHEMICAL FORMULA:

SUBJECT:

SUPPLIER'S SPECS OF: October 28, 1964

SAMPLE FOR ANALYSIS: 1 x 8-ounce Bottle

TEST	UNRESTRICTED PURCHASE LIMITS	METHODS
On each lot		
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
Upon request		
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 620359

STLCOPCB4094386

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
John F. Queeny Plant
By Paul N. Brien

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
On each lot			
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 620360

STLCOPCB4094387

PHYSICAL CONSTANTS DATA

SUBSTANCE: PYDRAUL 230A

STRUCTURAL FORMULA: Blend of:
29.3 Aroclor 5432
37.0 Santicizer 140
18.0 Santicizer 711
13.5 Mobil 750 Stock
1.5 Jeffox OL-2700

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	None	
Melting Point	None	
Solution Point		
Specific Gravity 25/25°C.	1.133	
Specific Gravity		
Pounds per Gal. 25 °C	9.45	
Coefficient of Expansion		
Refractive Index n_D		
Infra Red Spectrum *(Reference)*		
Ultra Violet Spectrum *(Reference)*		
Viscosity 100°F.	50.5 cs.	
Viscosity 210°F.	5.50 cs.	
Surface Tension		
Solubility in Water	Nil	
Solubility in		
Solubility in		
Flash Point °F *(Method)* COC	450 min	
Fire Point °C	600°	
Heat of Combustion		
Heat of Formation		
Thermal Stability (cal./g.-min.)		
Latent Heat of Fusion		
Latent Heat of Vap.		
Specific Heat		
Critical Temperature		
Critical Pressure		
Dissociation Constant		

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