

Discrete 9/13/68

T E C H N I C A L B U L L E T I N

PYDRAUL[®] 312

***FIRE-RESISTANT
HYDRAULIC FLUID***

Pydraul[®] 312 Fire-Resistant Hydraulic Fluid . . .
a synthetic fluid that gives you the performance
of premium grade petroleum oils — plus safety —
at the price of water/glycols.

TECHNICAL BULLETIN P-312



file copy
do not remove

DSW 434430

STLCOPCB4087537

PYDRAUL[®] 312

***FIRE-RESISTANT
HYDRAULIC FLUID***

Pydraul[®] 312 Fire-Resistant Hydraulic Fluid . . .
a synthetic fluid that gives you the performance
of premium grade petroleum oils — plus safety —
at the price of water/glycols.

TECHNICAL BULLETIN P-312

DSW 434431

Nothing contained herein shall be construed as a recommendation to use any product in conflict, with existing patents covering any material or its use. The information contained herein is, to our best knowledge, accurate; but all recommendations or suggestions are made without guarantee, since the conditions of use are beyond our control. Monsanto disclaims any liability for loss or damage incurred in connection with the use of the above.

Registered Trademark of Monsanto Company

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

Table of Contents

	Page
INTRODUCTION	3
PROPERTIES OF PYDRAUL® 312	
Chemical.	3
Inspection	3
Corrosion and Stability	5
Fire-Resistance	5
Performance	5
CHANGE-OVER PROCEDURES	7
HANDLING AND STORAGE	8

DSW 434432

Introducing Pydraul 312 Hydraulic Fluid . . .

The newest member of Monsanto's internationally accepted and growing line of fire-resistant hydraulic fluids and lubricants.

In 1951 Pydraul hydraulic fluids first began working to protect hydraulic operations from fire. Now, well over a decade later, the six Pydraul fluids have performed millions of machine hours of service without contributing to a single fire . . . not even when sprayed from ruptured high-pressure hydraulic lines onto white-hot metal. And besides fire-resistant, the Pydraul fluids have always offered . . .

- . . . lubrication as good as premium grade oils
- . . . freedom from corrosive action and foam
- . . . ease of maintenance
- . . . and permanence — they don't "wear out"

Where does new Pydraul 312 fit into this well established picture?

Pydraul 312 hydraulic fluid is a unique marriage of synthetic fluids with specially chosen petroleum fractions . . . and the result is a fire-resistant hydraulic fluid that matches or excels the properties of existing hydraulic fluids — including synthetics, premium grade petroleum oils, and water-containing fluids — *but sells in the same price range as water/glycol fluids — a much lower price than other water-free, fire-resistant hydraulic fluids!*

Chemically Speaking . . .

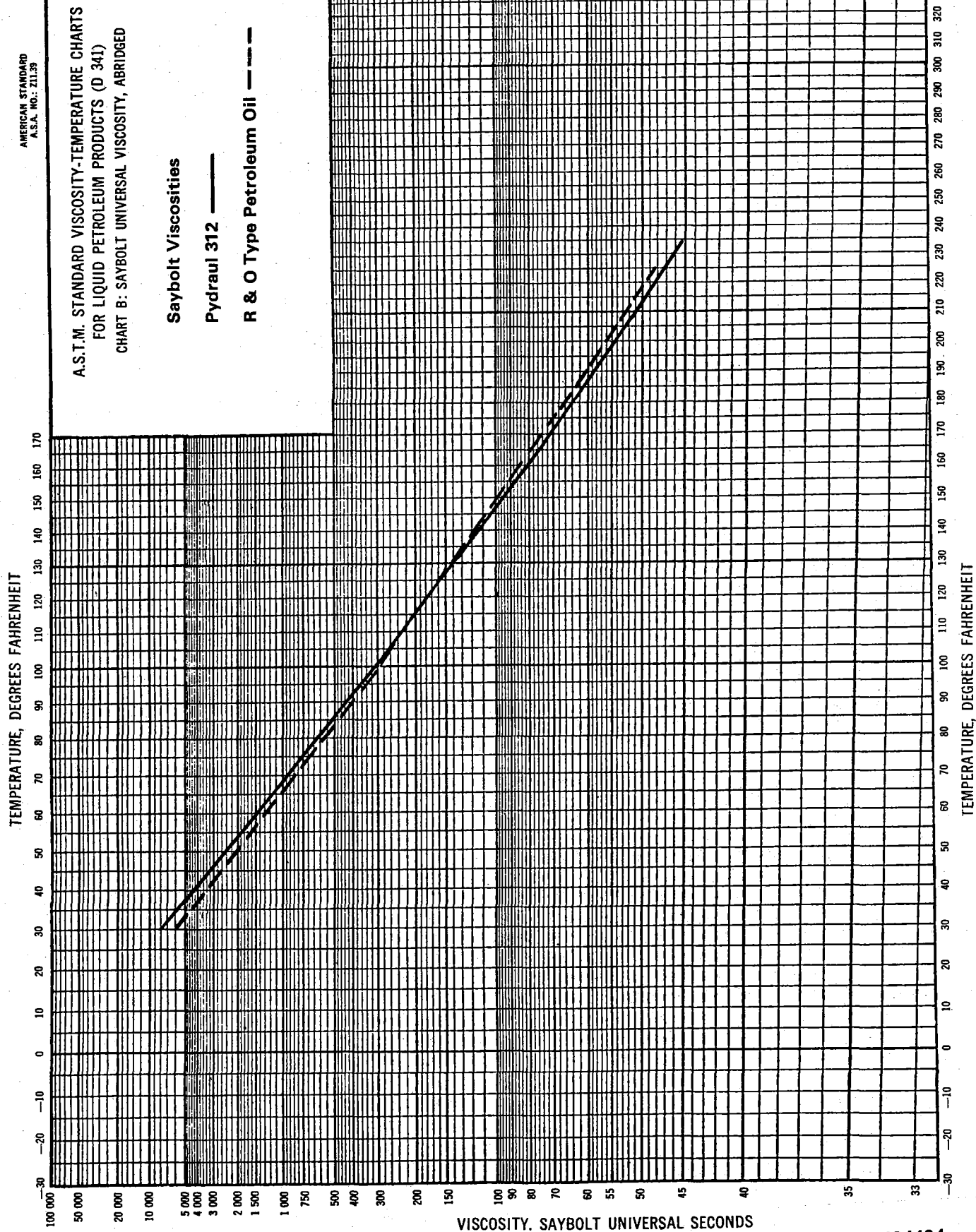
Pydraul 312 fire-resistant hydraulic fluid is a permanent solution of carefully selected petroleum fractions in a synthetic base of halogenated hydrocarbons and phosphate esters. The benefits of this unique hydraulic fluid to you, the user, are fire-resistance, lasting chemical stability, no oxidation or corrosion in normal service, good hydraulic system performance and low maintenance for your machines.

Inspection Properties . . .

Viscosity, SSU @ 40°F	4200
Viscosity, SSU @ 100°F	312.0
Viscosity, SSU @ 210°F	50.9
Viscosity Index	+77
Pour Point, °F	-10
Density 25/25	
Grams/cc	1.095
pounds/gal	9.13
ASTM D-892 Foam Test	
Sequence I	Pass
Sequence II	Pass
Sequence III	Pass

The viscosity and viscosity index of Pydraul 312 are very similar to those of a high quality R&O (rust and oxidation inhibited) type petroleum hydraulic oil as the comparative viscosity curves indicate.

DSW 434433



DSW 434434

Corrosion and Stability . . .

The corrosion and oxidation stability properties of Pydraul 312 are equal to those of the best petroleum hydraulic fluids. Pydraul 312 will not rust or corrode any metal in a hydraulic system even when over-heated to 250°F.

In the *ASTM D-665 Rust Test* Pydraul 312 showed no rust at all, and in use Pydraul 312 does not lose its anti-rust properties.

Good hydrolytic stability is a basic characteristic of Pydraul 312. If water somehow enters your hydraulic system, Pydraul 312 won't hydrolyze to foam acidic or corrosive products.

Beverage Bottle Test (Pydraul 312 plus water aged @ 200°F for 168 hours with a copper strip through both phases).

Neutral No. change, mg KOH/mg	0.04
Viscosity change, % @ 100°F	-0.6
% @ 210°F	-1.3
Insolubles	none
Weight loss, Cu strip, mg/cm ²	none

Fire Resistance . . .

Pydraul 312 is an industrial fire-resistant hydraulic fluid.

Miscellaneous Fire-Resistance Tests

ASTM D-286, Auto. Ign. Temp °F ~~440~~ 760

High Pressure Spray Test (AMS-3150C and MIL-F-7100). Test fluid sprayed at 1000 psi through orifice, passing through flame of oxyacetylene torch, 6000°F.

Intermittent flashing but self-extinguishing.

Low Pressure Spray Test (AMS-3150C). Test fluid sprayed at low pressure over ignited, oil-soaked rags to determine degree of increase in flame intensity.

Slight increase in flame intensity.

Hot Manifold Test (MIL-F-7100). Test fluid dripped on tube at 1300°F.

Intermittent flashing but does not propagate to pan below.

Molten Metal Ignition Test. Test fluid exposed to the surface of aluminum alloy at 1200°F to test for spontaneous ignition.

Does not ignite spontaneously. Flashes intermittently with ignition source.

Your Monsanto representatives will be glad to show you color motion pictures of the performance of Pydraul 312 in these tests.

To test fire-resistance under working conditions, Pydraul 312 was sprayed on actual ignition sources in operating plants. In no case was a fire carried from the immediate source of ignition. In one plant, a line rupture on a die-casting machine sprayed Pydraul 312 onto molten aluminum in a holding furnace and over the surrounding area. Flame was confined to the furnace, no plant personnel were injured, and there was no fire damage.

Performance Properties . . .

Pydraul 312 has good viscosity and viscosity-temperature (V.I.) properties. These properties are permanent. Pydraul 312 will not shear mechanically to degrade viscosity.

The following chart shows viscosity of Pydraul 312 *before* a Vickers Hydraulic Pump Test . . . and practically the same viscosity *after* the test.

DSW 434436

TEMPERATURE, DEGREES FAHRENHEIT

100 000
50 000
20 000
10 000
5 000
4 000
3 000
2 000
1 500
1 000
750
500
400
300
200
150
100
90
80
70
60
55
50
45
40
35
33

A.S.T.M. STANDARD VISCOSITY-TEMPERATURE CHARTS
FOR LIQUID PETROLEUM PRODUCTS (D 341)
CHART B: SAYBOLT UNIVERSAL VISCOSITY, ABRIDGED

Pydraul 312 Saybolt Viscosities

— Before Vickers Pump Test

- - - After Vickers Pump Test

VISCOSITY, SAYBOLT UNIVERSAL SECONDS

500
400
300
200
150
100
90
80
70
60
55
50
45
40
35

TEMPERATURE, DEGREES FAHRENHEIT

350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
-20
-30

VISCOSITY, SAYBOLT UNIVERSAL SECONDS

DSW 434435

Vickers Hydraulic Vane Pump Test (V-105E pump, 1000 hours, 140°F, 1000 psi)

% Viscosity change @ 100°F	-4.3
@ 210°F	-1.0
Weight loss of pump parts, gms	
bushings, 2015	nil
bushings, 2016	-0.0057
ring	-0.0013
vane	-0.0021

Pydraul 312 lubricates as well as or better than high-quality R&O type petroleum hydraulic oil.

Four Ball Wear Test (620 rpm, 1 hour, 167°F)

Steel on steel, mm scar diameter	
4 kg load	0.24
10 kg load	0.25
40 kg load	0.44

Steel on bronze	
10 kg load	0.87

Timken Test

Timken OK load, lbs.	55
----------------------	----

Pydraul 312 lubricates under extreme pressure as well as high-quality industrial gear lubricants.

Field Tests

In addition to the laboratory tests, field tests in varied equipment such as automatic multi-welders, die-casting machines and mobile steel mill equipment indicate Pydraul 312 will give years of trouble-free pump service... the same long pump life afforded by high-quality R&O type petroleum hydraulic oils.

And Pydraul 312 doesn't wear out. Except for normal "make-up",

- ... you don't add water
- ... you don't have "drain and change" periods
- ... you don't have to check it daily
- ... or perform most of the other-time-consuming maintenance necessary with water-containing fluids.

Change-Over Procedures

Converting to Pydraul 312 hydraulic fluid is easy. Virtually every type of equipment that uses fire-resistant hydraulic fluid has been converted to Pydraul fluids. Equipment manufacturers are, therefore, experienced in Pydraul fluid conversions and should be consulted.

If changing seals is necessary, equipment manufacturers can tell you what seals to change, and most even carry a supply of correct seals. Laboratory tests show that Viton® and silicone seals are best for Pydraul 312.

To replace other Pydraul fluids with Pydraul 312 where compatible seals are in the system, it is only necessary to add Pydraul 312 as make-up fluid. It is not necessary to drain or clean. When you convert from petroleum oils, non-Pydraul synthetic fluids, water/glycol fluids, or water-in-oil emulsions, we recommend the following steps. These steps conform to National Fluid Power Association Standards.

Your Monsanto representative will assist you any way he can, or you can telephone our technical specialists in St. Louis directly.

Changing from Phosphate Esters (other than Pydraul)

- (1) Drain the system completely.
- (2) Cleaning is unnecessary.
- (3) Generally, seal changes are unnecessary.

Trademark of E. I. duPont de Nemours & Co., Inc.

DSW 434437

Changing from Petroleum Oil

1. Completely drain and clean the system. Small amounts of oil will not interfere with the performance of Pydraul 312, but resistance to fire is reduced by the amount of oil left in the system.
2. Drain and blow out pipelines. Manually clean valves and reservoirs.
3. Open or remove and drain valves. Replace gaskets, packings, and seals with those compatible with Pydraul 312. It is particularly important to change dynamic seals. Static seals do not necessarily have to be changed if there is no objection to replacing them each time hydraulic components are serviced.
4. Remove pumps, accumulators, and cylinders, if necessary, for draining. Replace packings, seals, gaskets, and bladders with those compatible with Pydraul 312.
5. Check component functions before the system is closed and fluid is added.
6. If your system cannot be completely drained, you may have to flush it with a small amount of Pydraul 312.

Changing from Water/Glycol or Water-in-Oil Emulsion

1. Drain and clean system thoroughly. Remove all traces of water. Empty all lines and low points or dead pockets in components.
2. Clean with steam or warm water. Follow by blowing with dry air.
3. Check sealing materials, hoses, and accumulator bags. Replace if necessary with compatible materials.
4. Install a minimum charge of Pydraul 312 and operate the system from 16 to 24 hours. During this period, inspect the reservoir. If water or other contaminants float to the top, skim them off.
5. Drain the flushing charge immediately after shut-down while the fluid is warm. Drain all isolated points or parts which do not drain back to the reservoir. If water is apparent in fluid clinging to walls, wipe down all accessible parts.

Handling and Storage

As with all specialized industrial fluids, certain precautions are advisable when handling Pydraul 312. No problems will arise when Pydraul 312 is used as recommended.

Avoid repeated or continuous skin contact. Repeated or prolonged contact can lead to drying and skin "chapping". Where prolonged skin contact cannot be avoided, gloves should be worn.

At room temperature there is no significant vapor inhalation hazard from Pydraul 312; however, inhalation of vapors produced when the fluid is at high temperatures should be prevented. Single 6-hour exposures to an atmosphere saturated with vapors at ambient temperatures produced only mild discomfort in experimental animals and they survived the 10-day subsequent observation period without ill effect.

Although eye irritation studies using Pydraul 312 at full strength indicate Pydraul 312 is a mild irritant, there is no evidence to show Pydraul 312 causes permanent damage to eye tissue. If Pydraul 312 is splashed or sprayed into the eyes, eyes should be thoroughly flushed with water and the workman referred to a physician. To relieve irritation, physicians have used 1% tetracaine solutions, as well as ophthalmic cortisone acetate solution.

Pydraul 312 hydraulic fluid can be stored at sub-zero temperatures without fluid damage. Before using, simply allow the fluid to warm to 20 — 30°F. Drums stored outside should be sealed tightly and placed in a horizontal position to keep out moisture.

DSW 434438

DISTRICT SALES OFFICES ALL DIVISIONS

ATLANTA, GEORGIA 30326

Lenox Towers West,
3390 Peachtree Rd. N.E.
Tel. (404) 231-4320

BOSTON, MASSACHUSETTS 02149

Everett Station
Tel. (617) Dunkirk 7-5010

CHICAGO, ILLINOIS

3158 Des Plaines Ave.
Des Plaines, Illinois 60018
Tel. (312) 296-6688

CINCINNATI, OHIO 45206

1501 Madison Road
Tel. (513) 751-6707

CLEVELAND, OHIO 44122

3645 Warrensville Center Rd.
Tel. (216) 991-5400

DETROIT, MICHIGAN 48235

500 Northland Towers
Tel. (313) 357-0910

HOUSTON, TEXAS 77002

1300 Main Street
Tel. (713) Capitol 3-4011

LOS ANGELES, CALIFORNIA 90022

6670 E. Flotilla St.
Tel. (213) Raymond 3-2492

MINNEAPOLIS, MINNESOTA 55402

912 Northstar Center 110 S. Seventh St.
Tel. (612) Federal 9-4651

NEW YORK, NEW YORK 10017

277 Park Avenue
Tel. (212) 922-4111

PITTSBURGH, PENNSYLVANIA 15222

No. 4 Gateway Center Bldg. Room 1406
Tel. (412) 261-2156

ST. LOUIS, MISSOURI 63166

800 N. Lindbergh Blvd.
Tel. (314) Wydown 3-1000

SAN FRANCISCO BAY AREA

2710 Lafayette, Santa Clara, Calif. 95052
Tel. (408) 243-0414

SEATTLE, WASHINGTON 98104

911 Western Avenue
Tel. (206) Main 2-4203

SPRINGFIELD, MASSACHUSETTS 01101

730 Worcester Ave.
Tel. (413) 788-6911

WILMINGTON, DELAWARE 19803

2005 Concord Pike, Fairfax
Tel. (302) Olympia 8-6531

MONSANTO, 800 N. LINDBERGH BLVD., ST. LOUIS, MISSOURI 63166

Additional District Offices are maintained by:

Agricultural Division

EL DORADO, ARKANSAS 71731

Smackover Highway
P. O. Box 231
Tel. (501) Union 3-3151

LULING, LOUISIANA 70070

P. O. Box 174
Tel. (504) 784-2911

Building Products Department

ST. LOUIS, MISSOURI 63166

800 N. Lindbergh Blvd.
Tel. (314) Wydown 3-1000

LOS ANGELES, CALIFORNIA 90066

814 San Fernando Road
Tel. (213) CA. 2-9111

Chemstrand Company Division

AKRON, OHIO 44313

3030 West Market St.
Tel. (216) Temple 6-7941

CHARLOTTE, NORTH CAROLINA 28202

Wachovia Bank Building
129 West Trade St.
Tel. (704) 376-9871

NEW YORK, NEW YORK 10001

350 Fifth Ave.
Tel. (212) 556-5100

ENGLEWOOD CLIFFS, N. J.

661 Palisades Ave.
Englewood Cliffs, New Jersey 07631
Tel. (201) 568-2151

Hydrocarbons & Polymers Division Lion Oil

EL DORADO, ARKANSAS 71730

Lion Oil Building
Tel. (501) Union 3-3111

JACKSON, MISSISSIPPI 39209

P. O. Box 10937
Westland Station
Tel. (601) Fleetwood 2-3648

LITTLE ROCK, ARKANSAS 72203

1515 West Seventh St.
Tel. (501) Franklin 6-2437

MEMPHIS, TENNESSEE 38101

1023 Riverside Drive
P. O. Box 252
Tel. (901) Whitehall 8-4451

Organic Chemicals Division (Rubber Industry)

AKRON, OHIO 44311

920 Brown Street
P. O. Box 2307
Tel. (216) Hemlock 4-1921

DSW 434440

MONSANTO, 800 N. LINDBERGH BLVD., ST. LOUIS, MISSOURI 63166



STLCOPCB4087547