Pydraul 312

Technical Bulletin

MONS 080314

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INTRODUCING PYDRAUL 312 HYDRAULIC FLUID ----------

the newest member of Monsanto's old and growing line of fire-resistant hydraulic fluids.

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 one single fire ... not even when sprayed from the broken ends of high-pressure hydraulic lines onto white-hot metal. And besides fire-resistance, the Pydraul fluids have always offered lubrication as good as premium grade oils ... freedom from corrosive action and foam ... ease of maintenance ... lower fire insurance premiums, in many cases ... and permanence -- they don't "wear out".

So where does new Pydraul 312 fluid fit into this well established picture?

Pydraul 312 hydraulic fluid is a unique marriage of synthetic fluids and a specially chosen petroleum oil ... and the result is a fire-resistant hydraulic fluid that matches or excells the properties of existing hydraulic fluids -- including the other Pydrauls; premium grade petroleum oils, and water-containing fluids -- but sells at a much lower price relative to other water-free, fire-resistant hydraulic fluids!

For the facts on Pydraul 312 fluid read on.

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CHEMICALLY SPEAKING ...

Pydraul 312 hydraulic fluid is true solution of fine and carefully selected petroleum oil in a synthetic base of halogenated hydrocarbons. The benefits of this unique hydraulic fluid to you, the use, are ...

FIRE RESISTANCE ...

Pydraul 312 fluid is fire resistant. It is approved by Underwriters Laboratories. It meets Bureau of Mines Schedule 30 requirements for fire resistant fluids. The specific fire-resistant properties of Pydraul 312 are ...

Flash Point, COC, 395°F.
Fire Point, COC, 545°F.
AIT, 940°F.

In the molten metal test at 1250°F. Pydraul 312 hydraulic fluid does not ignite spontaneously. Without a spark it occasionally flashes after almost all the fluid evaporates. With a spark it flashes and is self-extinguishing until about half the fluid vaporizes; then it flashes and burns to completion.

In the high-pressure spray test, 1000 psi @ 150°F. with the torch two feet from the orifice, flames carry one foot. At three feet from the orifice flames carry 18 inches, and at four feet from the orifice intermittent flashes carry to the hood.

To test fire-resistance under working conditions, Pydraul 312 was sprayed on actual ignition sources in numerous plants. In no case was a fire carried from the immediate source of ignition. Pydraul 312 hydraulic fluid is fire resistant.

EXCELLENT VISCOSITY CHARACTERISTICS ...

Possibly the best way to illustrate the excellent viscosity characteristics of Pydraul 312 hydraulic fluid is to compare them with the characteristics of a typical mineral oil.

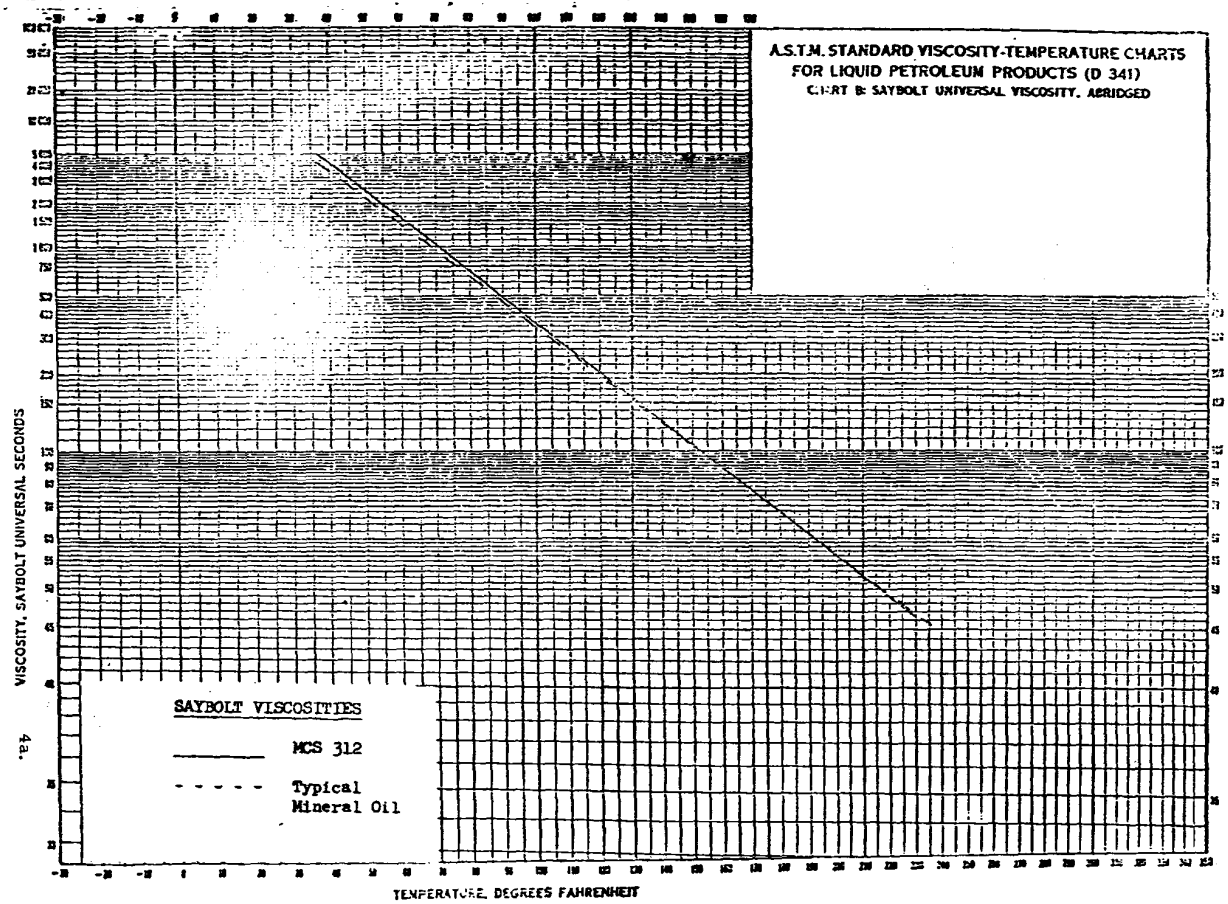
COMPARISON OF TYPICAL HYDRAULIC FLUID VISCOSITIES

	MCS 312	Mineral Oil[a]/
210°F.		
Kinematic, cs	7.80	7.9
Absolute, cp	8.55	6.8
Equiv. Saybolt Universal, seconds	51.78	52.0
100°F.		
Kinematic, cs	70.6	64.9
Absolute, cp	77.3	53.4
Equiv. Saybolt Universal, seconds	327.2	300
40°F.		
Kinematic, cs	930	-
Absolute, cp	1018	-
Equiv. Saybolt Universal, seconds	4290	-
Viscosity Index	81	95
Density 25/25, g/cc	1.095 (9.13 lb./gal.)	0.86
Pour Point, °F.	- 10	-

a/ Values shown for mineral oil were not measured. A 300 SSU viscosity at 100°F. and 95 VI were assumed and all other viscosities calculated. The 0.86 density is typical.

On A. S. T. M. Standard Viscosity-Temperature Charts for Liquid Petroleum Products (D 341), the comparison of Pydraul 312 fluid's viscosity characteristics with those of a typical mineral oil look like this.

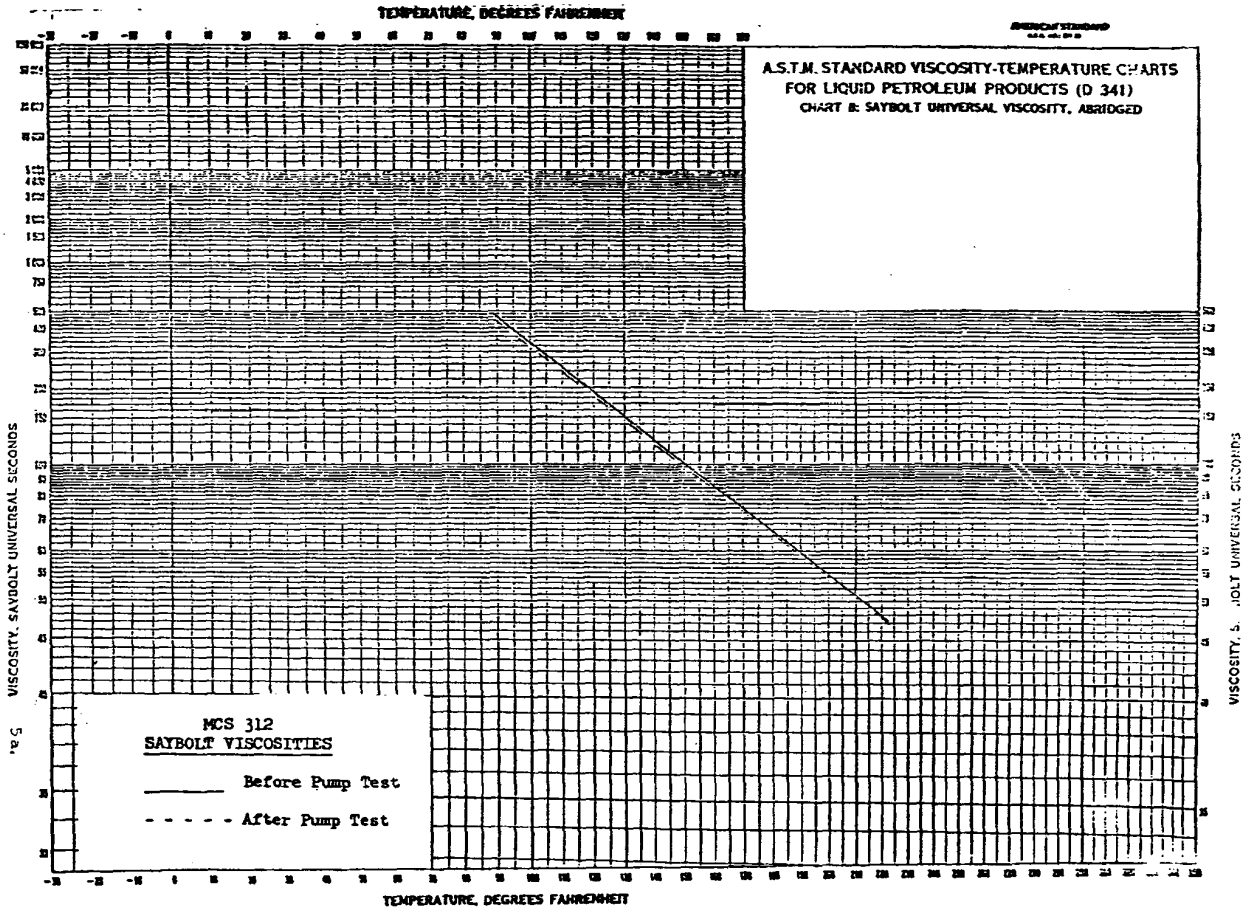
4/



4a.

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And Pydraul 312's viscosity characteristics are inherent ... they're built in ... there are no additives to "wear out" with use. The following chart shows viscosity of Pydraul 312 before a Vickers Hydraulic Pump Test ... and practically the same viscosity after the test.


TEMPERATURE, DEGREES FAHRENHEIT
A.S.T.M. STANDARD VISCOSITY-TEMPERATURE CHARTS
FOR LIQUID PETROLEUM PRODUCTS (D 341)
CHART B: SAYBOLT UNIVERSAL VISCOSITY, ABRIDGED
VISCOSITY, SAYBOLT UNIVERSAL SECONDS
MCS 312
SAYBOLT VISCOSITIES
Before Pump Test
After Pump Test
TEMPERATURE, DEGREES FAHRENHEIT

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SUPERIOR LUBRICITY . . .

Pydraul 312 fluid's lubricity tests out as good or better than the lubricity of fine petroleum oils. Pydraul 312's superior lubricity is substantiated by results of the Vickers Hydraulic Pump Test and the Four Ball Wear Test.

Vickers Hydraulic Pump Test Results
(1000 hrs., 140°F, 100 psi)

Viscosity, SSU	MCS 312
Initial 100°F	327
Initial 210°F	51.8
VI	81
Final 100°F	311
Final 210°F	51.3
VI	79
% Change 100°F	- 4.3
% Change 210°F	- 1.0
Weight Loss, gms	
Bushings 2015	+ 0.0081
Bushings 2016	- 0.0057
Ring	- 0.0013
Vane	- 0.0021

Four Ball Wear Test Results, mm Scar Dia.
(620 rpm, 1 hour, 167°F.)

	MCS 312
Steel/Steel	
4 Kg	0.24
10 Kg	0.25
40 Kg	0.44
Steel/Bronze	
10 Kg	0.87
Timken OK Load, lbs.	55

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HYDROLYTIC STABILITY ...

The Beverage Bottle Test shows practically no chemical reaction when Pydraul 312 hydraulic fluid and water are brought together. In the A. S. T. M. D-1401 Emulsion Test there is partial but not complete separation of water from Pydraul 312 after one hour.

Hydrolytic Stability (Beverage Bottle Test)	MCS 312
Neut. No., mg KOH/g - Initial	0.13
- Final	0.17
Mg NaOH to neutralize water layer	2.0
% Viscosity Change - 100°F.	-0.6
- 210°F.	-1.3
Insolubles	none
Appearance of Cu strip	Sl. dull color, no etching, stain or pitting
Cu strip weight loss, mg/cm^2	0.04

Oxidation and Corrosion Test (250°F, 168 hrs)	
% Viscosity Increase - 100°F.	50.7
- 210°F.	29.2
Metal Weight Change (gms)	
Mg	nil
Al	nil
Cd	-0.0082
Fe	nil
Cu	-0.0014
ASTM D-665 Rust Test (140°F, Dist. Water)	no rust

NORMAL OXIDATION ...

Pydraul 312 hydraulic fluid's oxidation properties are equal to those of the best petroleum hydraulic fluids. After 168 hours at 250°F., Pydraul 312's viscosity increased 50.7% at 100°F., and increased 29.2% at 210°F.

"NO" CORROSION ...

Pydraul 312 fluid essentially will not rust or corrode any metal in a hydraulic system ... nor does it lose its anti-rust properties with use. In a corrosion test of 168 hours at 250°F. manganese, aluminum and iron wafers lost no measurable weight, a cadmium wafer lost .0082 gms., and a copper wafer lost only .0014 gms. In the A. S. T. M. D-665 Rust Test with distilled water at 140°F. there was no rust whatsoever.

MINIMUM MAINTENANCE AND DOWNTIME ...

Lab and field tests in equipment ranging from die-casting machines to automatic multi-welders show that Pydraul 312 hydraulic fluid will give years of trouble-free pump service ... the same long pump life offered by the best petroleum oils. And Pydraul 312 does not wear out. Except for normal "make-up" you don't have to add new Pydraul 312 fluid to your hydraulic systems ... you don't have "drain and change" periods.

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MINIMUM FOAMING . . .

Pydraul 312 never produces excessive froth or foam during normal operations to interfere with your equipment response. In the A. S. T. M. D-892 Foam Test, Pydraul 312 fluid proved its "minimum foam" characteristics.

A. S. T. M. D-892 Foam Test

	MCS 312
75°F. after 5 min blowing, ml	20
collapse time, sec	12
200°F. after 5 min blowing, ml	5
collapse time, sec	8
75°F. after 5 min blowing, ml	0
collapse time, sec	0

AND LOW COST!

Pydraul 312 hydraulic fluid is low in cost compared to other fire resistant fluids. It sells for $1.95 to $2.25 per gallon, depending on quantity. Pydraul 312, then, is a fire-resistant, waterless, good-lubricating hydraulic fluid selling at a price comparable to the price of inferior hydraulic fluids.

CHANGE-OVER PROCEDURES

Converting to Pydraul 312 hydraulic fluid is easy. Virtually every type of equipment using 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 can even supply the correct seals.

To replace other Pydraul fluids with Pydraul 312 fluid, it is only necessary to add Pydraul 312 as make-up fluid. It is not necessary to drain, clean or change seals.

Pydraul 312 fluid can also be added directly to non-Pydraul straight synthetic fluids as make-up, but in isolated instances seals may have to be changed. The following tests show that the best seals for Pydraul 312 are made of Viton and Silicone.

Elastomer Swell, 168 hrs., at 158°F.

		MCS 312
Butyl	%w Increase	57
	%v Increase	63
	Durometer Hardness-Initial	67
	Final	47
Silicone	%w Increase	3.3
	%v Increase	1.9
	Durometer Hardness'- Initial	72
	Final	69
Viton	%w Increase	0.2
	%v Increase	0.0
	Durometer Hardness - Initial	68
	Final	67
EPR	%w Increase	61
	%v Increase	67
	Durometer Hardness - Initial	71
	Final	53

When converting from fluids other than the Pydrauls and non-Pydraul straight synthetics, you should always drain, clean and check the seals in your system for compatibility. * The following steps are recommended in changing from other than other Pydrauls or straight synthetic fluids to Pydraul 312.

*Though Pydraul 312 hydraulic fluid is soluble in all proportions with petroleum oil, a mixture would seriously reduce Pydraul 312 fluid's fire-resistance.

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CHANGING FROM PETROLEUM OIL TO PYDRAUL 312 FLUID

1. Completely drain and clean the system. Small amounts of residual oils 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 fluid. 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. Close system and flush with a small amount of Pydraul 312 fluid. Do not continue to use the flushing fluid.

7. Check system carefully after it is in operation.

CHANGING FROM WATER/GLYCOL OR WATER-IN-OIL EMULSION TO PYDRAUL 312 FLUID.

1. Drain and clean system thoroughly. Remove all traces of water. Empty all lines and low points or dead pockets in components.

2. Steam or warm water cleaning followed by dry air and flushing with the Pydraul 312 fluid is desirable.

3. Check sealing materials, hoses, and accumulator bags. Replace if necessary with compatible materials.

4. Install a minimum charge of Pydraul 312 fluid 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.

6. Install operating charge of Pydraul 312 fluid. If water is still found on top remove it regularly.

HANDLING AND STORAGE

As with all specialized industrial fluids, certain precautions are advisable when handling Pydraul 312 fluid. No problems will arise when Pydraul 312 fluid 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 temperatures, there is no vapor inhalation hazard from Pydraul 312; however, inhalation of vapors at high temperatures should be prevented. In extensive animal experimentation, exposures to vapors for one hour showed local respiratory irritation, although no systemic efforts were produced.

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 tissues. If Pydraul 312 fluid 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 solution, as well as the 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 room temperature. Drums stored outside should be sealed tightly and placed in a horizontal position to keep out moisture.

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