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LVDIC

Fire-Resistant Hydraulic Fluid ...For Mining Equipment

HYDRAULIC FLUID

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0108022

TOWOLDMON0022664
WATER_PCB-00007133

A high-performance hydraulic fluid for safer hydraulic operation with minimum maintenance

Pydraul® MC fire-resistant* hydraulic fluid was developed specifically for use in mining equipment. It is a phosphate-ester based formulation containing no water. It meets the fire resistance requirements of the U.S. Bureau of Mines Schedule #30. Equally important, field experience since 1972 shows that Pydraul MC fluid offers the following operating advantages:

- **Reduced Fluid Maintenance**
  Unlike water-based hydraulic fluids that are oil emulsion or glycol solutions — Pydraul MC does not lose water by evaporation to change composition and viscosity.
- **Eliminates Hazards From Spillage**
  Water-based fluids that evaporate off their water component can leave behind flammable residues in reservoirs, spill pools or crevices.
- **Operates At Higher Temperatures & Pressures**
  Pydraul MC has excellent viscosity characteristics and a high degree of lubricity that permits efficient hydraulic operation at pressures up to 5,000 psi.
- **Gives Equipment Protection From Corrosion**
  Pydraul MC fluid does not create a rust-promoting environment in operating equipment. It is chemically stable to help eliminate corrosion problems.

Monsanto's development of fire protection for industrial hydraulic operations began with the first Pydraul fluid in 1951. Pydraul fluids have since provided industry with millions of machine hours of safe operation.

Pydraul MC was designed to enable ore and coal mine operators meet the current safety legislation that requires a fire-resistant fluid in unattended equipment and either a fire-resistant fluid or suitable fire suppression devices in attended equipment. The initial cost and maintenance of fire suppression devices may show that a stable fluid such as Pydraul MC would be the most economical choice in the long run.

Pydraul MC is a dependable hydraulic fluid for safer operation of above- and below ground equipment with minimized maintenance. It may be considered for use in the hydraulic systems of the following:

- Power Shovels & Draglines
- Blasthole Drills
- Bulldozers & Rippers
- Tractors
- Scrapers & Graders
- Crushers
- Ore Feeders
- Trucks
- Jumbos
- Ore Drills
- Mechanical Loaders & Scrapers

The following pages give data that illustrate the typical properties and performance of Pydraul MC as measured by standard test procedures used to describe hydraulic operation and fire resistance.

Standard Disclaimer Clause
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"Disclaimer on "Fire Resistance" from Pg. 6"

*NOTE: Materials designated "fire resistant" generally are more difficult to ignite, or once ignited, burn at a slower rate than corresponding conventional materials. This term does not mean that fire resistant materials will not burn. However, when properly used, Monsanto's fire resistant "PYDRAUL" HYDRAULIC FLUIDS are useful in helping customers meet their fire safety requirements."

NOTICE: "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 FOR A PARTICULAR PURPOSE OR MERCHANTABILITY OF ANY PRODUCT REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations, and disclaims all liability for any resulting loss or damage."

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Typical Performance Properties**

Foam Test (ASTM D892) Sequence 1, 2, 3	Pass
Rust Test ASTM D-665 (Sequence A)	Pass
Hydrolytic Stability Test (MIL-H-19457)	Pass
Oxidation and Corrosion Test (FS791-3508).	
(168 hr., 250°F., 5 l air per hr.)	
Metal Weight Changes, mg/cm²	
Magnesium	−0.01
Aluminum	+0.05
Cadmium	−0.01
Steel	+0.01
Copper	−0.02
Acidity Increase, NN	2.58
100°F. Viscosity Increase, %	13.1

Compatibility With Materials

Metals	Pydraul MC is compatible with all the commonly used metals of construction.
Paints	Cured epoxy, phenolic, polyurethane and nylon based paints are satisfactory. INTERIOR SURFACES ARE PREFERABLY LEFT UNPAINTED.
Other Fluids	Pydraul MC is miscible in all proportions with the Pydraul E and Pydraul C Series of fluids. It is essentially insoluble in water.
Packings, Seals, Hoses and Bladders	Materials compatible with Pydraul MC are necessary for dynamic or moving seals. For static seals they are preferred but not essential.

Recommended	Marginal**	Unsatisfactory
VITON	BUTYL*	BUNA-N
NYLON	EPR	NEOPRENE
TEFLON		NATURAL RUBBER
FLUOREL*		
SILICONE		

*Trademark of Three-M Company
*Trademark of Enjay Chemical Company

**Although generally classified as marginal with Pydraul fluids, butyl and EPR (ethylene propylene rubber) have proven satisfactory in equipment operating under certain conditions of temperature, fluid cleanliness, maintenance, etc. For best service under general all-around conditions, elastomers of Viton, Nylon, Fluorel, Teflon, and silicone are suggested.

Fire Resistance Properties*

Flash Point	475°F
Fire Point	525°F.
Autogenous Ignition Temperature (ASTM D2155)	800°F
Factory Mutual High Pressure Spray Test	Pass
(Test fluid sprayed @ 1000 psi through orifice, passing through flame of propane torch.)	Extinguished in less than 5 sec. after torch removed.
Factory Mutual Hot Channel Test	Pass
(Test fluid sprayed @ 1000 psi through orifice, onto hot channel iron @ 1300°F.)	
U.S. Bureau of Mines Approval Schedule 30	Yes, Number 30-6

Fire Resistance Advantages of Pydraul

Pydraul fluids protect hydraulic equipment and personnel with permanent fire protection. Pydraul fluids contain no water to evaporate and leave a flammable residue. During their many millions of machine hours of use, Pydraul fluids have been accidentally sprayed over molten metal, through electrical arcs, into flames and sparks without disaster. They pass all of the important ignition tests for fire resistance.

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1st Proof — SUPERIOR 6973--12-27-74

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Typical Physical Properties*

Appearance	Clear Green Liquid
Specific Gravity 25/25°C.	1.098
Density at	
140°F.	1.075 grams/ml.
77°F.	1.100 grams/ml.
Neutralization No. (mg KOH/g) max.	0.30
Moisture (max.) %	0.15
Viscosity	
Centistokes @ 40°F.	1250 cs
@ 100°F.	69 cs
@ 210°F.	6.9 cs
SSU @ 40°F.	5800 SSU
@ 100°F.	320 SSU
@ 210°F.	48 SSU
Pour Point	−10°F.
Coefficient of Thermal Expansion per °F.	0.00034
Specific Heat BTU/lb./°F. @ 77°F.	0.39
Thermal Conductivity BTU/hr./ft./°F.	0.0728
Solubility in Water	Negligible

*This data is based upon samples tested in the laboratory. It is not guaranteed for all samples. The properties listed above, in addition to varying from sample to sample, are subject to change from time to time due to process modifications and improvements. For complete sales specifications write to Monsanto Company at the address listed in this bulletin.

1st Proof — SUPERIOR 6973—12-27-74

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Converting Mining Equipment Hydraulic Systems to Pydraul MC

Regardless of the type of hydraulic fluid being used, converting a system to Pydraul is easy. Virtually every type of equipment that uses fire-resistant hydraulic fluid has been converted to Pydraul phosphate-ester hydraulic fluids. Most equipment manufacturers are experienced in conversion to Pydraul fluid and should be consulted.

If changing seals is necessary, equipment manufacturers can recommend which to change, and many carry a supply of compatible seals. Laboratory tests and operational experience show Viton*, Teflon*, and silicone to be the preferred elastomers.

To replace other fluids which are compatible with Pydraul and where compatible seals are already in the system, it is only necessary to add Pydraul MC as make-up fluid. It is not necessary to drain or clean. However, when converting from petroleum oils, non-compatible synthetic fluids, water-glycol fluids, or water-in-oil emulsions — the following steps are recommended. These conform to USA Standard B93.5 — 1973.

*Trademark of E. I. Du Pont de Nemours & Co., Inc.

Changing from Petroleum Oil

1. Completely drain and clean the system. Small amounts of oil will not interfere with the performance of Pydraul, 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 all valves. Replace gaskets; packings, and seals with compatible materials. It is particularly important to change dynamic seals. Static seals do not necessarily have to be changed if they are not leaking. Non-compatible static seals can be replaced when the component is disassembled for maintenance.

4. Remove pumps, accumulators, and cylinders, if necessary, for draining. Replace packings, seals, gaskets, and bladders with materials compatible with Pydraul.

5. Check component functions before the system is closed and fluid is added.

6. If the system cannot be completely drained, it may have to be flushed out with a small amount of Pydraul.

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 hydraulic 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, remove by skimming.

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.

Ask the Monsanto fluids specialist for suggestions and assistance. He may be reached by phoning the nearest sales office listed on the back cover.

Toxicity and Safe Handling

Animal studies indicate that Pydraul MC can be classed as practically non-toxic when considered as an industrial fluid. It is non-irritating when the skin is exposed to the fluid.

In case of skin contact wash off with soap and water as a hygienic procedure. In the case of eye contact flush with copious amounts of water.

Due to its low order of toxicity, Pydraul MC requires no special handling precautions.

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7 8 9 10 11 12

2 3609 0175 Litho in U.S.A.

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KINEMATIC VISCOSITY, CENTISTOKES

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TEMPERATURE, DEGREES FAHRENHEIT

VISCOSITY, SAYBOLT UNIVERSAL SECONDS

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Viscosity of Pydraul® MC
In Centistokes

Pump manufacturers recommended operating range between 13 cs. and 1800 cs

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