COPY

FINAL

DATE November 20, 1975

JOB Monsanto Fire Resistant Hydrauli Fluids

(W. D. Lubic, MICC, BlNB; 4-2630)

IC/FF-56

Monsanto (logo)

PYDRAUL®

FIRE RESISTANT FLUIDS AND LUBRICANTS

designed for optimum operating efficiency, greater safety and minimum maintenance.

Monsanto was the pioneer in the development of synthetic fire resistant* lubricants. Over the past quarter century, specialized functional fluids have been developed to meet essentially every required operating condition in a wide variety of specialized hydraulic equipment. A broad choice of viscosity/temperature characteristics is available to give optimum machine response and dependable operation even under severe climatic and operating conditions.

Check over the range and types of hydraulic fluids that are available. Monsanto will provide you with detailed performance information on the ones that interest you.

(Standard Disclaimer Clause Plus *Fire-Resistance Disclaimer)

0165141

Monsanto

2-3259-0372-6

TOWOLDMON0024354

**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."

*"**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."

0165142

TOWOLDMON0024355

## OPERATING ADVANTAGES OF PYDRAUL FLUIDS

Pydraul fire resistant fluids are formulated to give excellent lubrication, long pump life and efficient equipment operation with minimum maintenance. The use of a fire resistant fluid frequently lowers insurance premiums below the costs for operating with petroleum oils. Pydraul fluids are heat- and shear stable, inhibit metal corrosion, eliminate foaming and permit equipment to operate at optimum response capability.

## SERVICE-PROVEN APPLICATIONS OF PYDRAUL FLUIDS

### Steel Industry

Continuous casters
Rolling mills
Furnaces
Scrap chargers
Stripper cranes
Arc welders
Combustion controls
Mobile equipment

### Aluminum Industry

Stripper cranes
Direct chill casters
Furnaces
Rolling mills
Shearers
Combustion controls
mobile equipment

### Forging And Extrusion

Forge presses
Extrusion presses
Billet manipulators

### Diecasting

Diecast machines
Trim presses

### Fabrication

Forming presses
Welders
Furnaces

### Foundries

Furnaces
Molding lines

### Mining Industry

Power shovels & draglines
Blasthole drills
Bulldozers & rippers
Tractors
Scrapers & Graders
Crushers
Ore Feeders
Trucks
Jumbos
Ore Drills
Mechanical Loaders & Scrapers

### Air Compressors

Reciprocating
Rotary Screw

### Offshore Oil And Gas

Drill String Heave Compensators
Guideline tensioners
Riser tensioners

0165143

TOWOLDMON0024356

# PYDRAUL

## Fire Resistant Lubricants for Air Compressors

Pydraul lubricants for air compressors — 30-E, 90-E and 115-E — were developed to eliminate the conditions that cause compressor fires and explosions. Numerous studies, including work by the U.S. Bureau of Mines, The Walter Kidde Company and various individual researchers shows that carbonaceous deposits from petroleum in high pressure lines are the primal cause of compressor explosions and receiver fires. Mist and accumulated petroleum oil film can, under a variety of conditions, break down and ignite.

Pydraul 30-E, 90-E and 115-E air compressor lubricants were especially developed to eliminate the petroleum oil mist and oil's carbonaceous deposits that have been found to be the causes of receiver fires and compressor explosions. ~~The~~ Pydraul synthetic lubricants reduce deposit build-up in pipes, coolers and on exhaust valves -- saving down-time and cleaning. Aside from greater safety many users find the savings in maintenance alone warrants use of Pydraul compressor lubricants.

0165144

TOWOLDMON0024357

# PYDRAUL® "E" SERIES

## All-synthetic Premium Grade Fluids

Pydraul "E" series fluids are straight phosphate-ester lubricants offering superior stability, long service life and excellent lubricity.

Hydraulic Fluid / Air Compressor Lubricant

| Typical Properties * | PYDRAUL® 10-E | PYDRAUL 29-E/LT | PYDRAUL 30-E | PYDRAUL 50-E | PYDRAUL 65-E | PYDRAUL 90-E | PYDRAUL 115-E |
|---|---|---|---|---|---|---|---|
| Appearance | Clear Blue Liquid | Clear Blue Liquid | Clear Blue Liquid | Clear Blue Liquid | Clear Blue Liquid | Clear Blue Liquid | Clear Blue Liquid |
| Specific Gravity 25°/25°C | 1.085–1.095 | 1.090–1.110 | 1.155–1.175 | 1.145–1.165 | 1.142–1.162 | 1.145–1.165 | 1.145–1.165 |
| Neutralization Number, mg KOH/g max. | 0.25 | 0.25 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| Water Content % | 0.10 | 0.15 | 0.10 | 0.10 | 0.10 | 0.10 | 0.15 |
| VISCOSITY | | | | | | | |
| Centistokes 100°F. | 10.9 cs | 10.9 cs | 32 cs | 49 cs | 67.3 cs | 85–95 cs | 100 cs |
| 40°C. | 2.4 cs | 2.9 cs | 4.9 cs | 5.9 cs | 7.1 cs | 7.7–8.1 cs | 9.1 cs |
| SSU 40°C. | 60 SSU | 145 SSU | 150 SSU | 231 SSU | 312 SSU | 415 SSU | 465 SSU |
| 210°F. | 35 SSU | 50 SSU | 42 SSU | 46 SSU | 58 SSU | 52 SSU | 56 SSU |
| Absolute Viscosity, 100°F. | 66.5 SSU | 150 SSU | 174 SSU | 262 SSU | 349 SSU | 473 SSU | 544 SSU |
| SSU at 210°F. | 35 SSU | 54 SSU | 47 SSU | 50 SSU | 54 SSU | 57 SSU | 61 SSU |
| Pour Point | –70°F. | –45 °F. | –15 °F. | –5 °F. | 0 °F. | +10°F. | +15 °F. |
| Flash Point (Cleveland open cup) | 175°F. | 175 °F. | 225°F. | 225 °F. | 225 °F. | 350°F. | 325 °F. |
| Fire Point, °F. at 760 mm Hg | 207°F. | 500 °F. | 725 °F. | 750 °F. | 780 °F. | 805°F. | 810 °F. |
| Coefficient of Thermal Expansion per °F. | 0.00064 | 0.00060 | 0.00035 | 0.00035 | 0.00035 | 0.00035 | 0.00035 |
| Specific Heat BTU's, °F., 77°F. | 0.42 | 0.39 | 0.36 | 0.37 | 0.38 | 0.38 | 0.38 |
| Thermal Conductivity BTU/hr. ft.²/°F. | 0.067 | 0.0757 | 0.0737 | 0.0730 | 0.0726 | 0.0723 | 0.0721 |
| Vapor Pressure mm Hg., 77°F. | 0.002 | 0.002 | 0.002 | 0.002 | 0.001 | <0.001 | <0.001 |
| Bulk Modulus, Psi Comp. 1000 KGF/cm² | 320,000 | 370,000 | 390,000 | 392,000 | 395,000 | 390,000 | 397,000 |
| Rubber Swell 70 hrs. | Pass | Pass | Pass | Pass | Pass | Pass | Pass |
| Rubber Swell 70 hrs. 350 | Pass | Pass | Pass | Pass | Pass | Pass | Pass |
| Solubility in Water | Negligible | Negligible | Negligible | Negligible | Negligible | Negligible | Negligible |
| FIRE RESISTANCE TESTS | | | | | | | |
| Factory Mutual Spray Test. Test fluid sprayed at 1500 psi through nozzles, directed at flame of propane torch | Fail | Pass | Pass | Pass | Pass | Pass | Pass |
| Factory Mutual Channel Iron Test. Test fluid sprayed at 1000 psi through nozzle directed at flame of propane torch at 1200°F. | Fail | Pass | Pass | Pass | Pass | Pass | Pass |
| Hot Manifold Test (Federal Test Method Std. 791). Test fluid dropped on manifold at 1000°F. | Intermittent flashing but does not propagate to pan below. | Intermittent flashing but does not propagate to pan below. | Intermittent flashing but does not propagate to pan below. | Intermittent flashing but does not propagate to pan below. | Intermittent flashing but does not propagate to pan below. | Intermittent flashing but does not propagate to pan below. | Intermittent flashing but does not propagate to pan below. |
| Factory Mutual Approved. FM | No | Yes | Yes | Yes | Yes | Yes | Yes |

*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.

~~Skidmore-Owings~~ ~~(Pyrodyl)~~

0165145

TOWOLDMON0024358

# Phosphate-ester Base Economy Grade Fluids

Pydraul "C" series fluids have a phosphate ester base formulated with petroleum fractions to produce a fire resistant fluid in a range of viscosities.

Pydraul MC fluid is a waterless, constant composition ~~phosphate-ester~~ "C" series fluid developed specifically for use in mining equipment. Pydraul MC fluid meets the fire resistance requirement of the U.S. Bureau of Mines Schedule #30.

| Typical Physical Properties* | PYDRAUL® 230-C Hydraulic Fluid | PYDRAUL 312-C Hydraulic Fluid | PYDRAUL 540-C Hydraulic Fluid | PYDRAUL MC** Hydraulic Fluid |
|---|---|---|---|---|
| Appearance | Clear Green Liquid | Clear Green Liquid | Clear Green Liquid | Clear Green Liquid |
| Spec. Gravity 25/25°C. | 1.040–1.060 | 1.030–1.050 | 1.030–1.050 | 1.098 |
| Neutralization No. (mg KOH/g) max. | 0.30 | 0.30 | 0.30 | 0.30 |
| Moisture (max.) % | 0.15 | 0.15 | 0.15 | 0.15 |
| VISCOSITY | | | | |
| Centistokes @ 100°F. | 46.2 cs | 66 cs | 105 cs | 69 cs |
| @ 210°F. | 6.9 cs | 8.4 cs | 10.5 cs | 6.9 cs |
| SSU @ 100°F. | 215 SSU | 309 SSU | 491 SSU | 320 SSU |
| @ 210°F. | 49 SSU | 54 SSU | 61 SSU | 48 SSU |
| Absolute SSU @ 100°F. | 224 SSU | 311 SSU | 498 SSU | |
| (SSU x Density) @ 210°F. | 49 SSU | 52 SSU | 59 SSU | |
| Pour Point | −20 °F. | −10°F. | 0°F. | -10°F. |
| Bulk Temp. Max. (continuous operation) | 200°F. | 200°F. | 200°F. | |
| Boiling Point °F. at 760 mm Hg | 500°F. | 540°F. | 545°F. | |
| Coefficient of Thermal Expansion per °F. | 0.00036 | 0.00036 | 0.00036 | 0.00034 |
| Specific Heat BTU/lb./°F. @ 77°F. | 0.41 | 0.41 | 0.40 | 0.39 |
| Thermal Conductivity BTU/hr./ft./°F. | 0.0755 | 0.0760 | 0.0749 | 0.0728 |
| Vapor Pressure mm Hg @ 200°F. | 0.24 | 0.20 | 0.22 | |
| Bulk Modulus (Room Temp. 1000-6000 psi) | 332,000 | 330,000 | 335,000 | |
| Rust Test ASTM D-665 | Pass | Pass | Pass | Pass |
| Foam Test ASTM D-892 | Pass | Pass | Pass | Pass |
| Solubility in Water | Negligible | Negligible | Negligible | Negligible |
| FIRE RESISTANCE TESTS | | | | |
| Factory Mutual Spray Test. Test fluid sprayed at 1000 psi through orifice, passing through flame of propane torch. | Pass | Pass | Pass | Pass |
| Factory Mutual Channel Iron Test. Test fluid sprayed at 1000 psi through orifice, onto hot channel iron at 1300°F. | Pass | Pass | Pass | Pass |
| Hot Manifold Test (Federal Test Method Std. 791). Test fluid dripped on at 1300°F. | Intermittent flashing but does not propagate to pan below. | Intermittent flashing but does not propagate to pan below. | Intermittent flashing but does not propagate to pan below. | |
| Factory Mutual Approval. FM FM | Yes | Yes | Yes | |
| Meets U. S. Bureau of Mines Schedule #30 | - | -, | - | Yes |

0165146

TOWOLDMON0024359

## CONVERSION TO PYDRAUL FLUIDS

Changing over to a fire resistant Pydraul fluid is quite simple, a matter of selecting the proper material composition of seals and packings. Operating experience shows the preferred materials are Viton*, Teflon* or silicone rubber. Monsanto provides detailed information on change-over and most equipment manufacturers familiar with Pydraul fluids will do the same.

### PYDRATEK®-100

Fire Resistant Preservative Fluid For New And Stand-by Equipment

A corrosion and rust protection fluid whose liquid film preserves metal surfaces for up to 12 months. May be applied by spray, dip, brush, wiped on or as an internal fill-and-drain with no removal necessary before adding the operating fire resistant hydraulic fluid. Protects metal surfaces for up to twelve months.

Pydratek-100 passes High Pressure Spray Tests (sprayed at 1000 psi through oxyacetylene flame @ 6000°F.) without flashing or igniting with torch up to 3 feet from orifice. (AMS-3150 C, 4.9.32 and Federal Test Method Std. 791.) It has good temperature stability in prolonged storage at -30°C. cycled to 70°F. and remains clear.

TYPICAL PHYSICAL PROPERTIES**

| | | Centistokes | SSU |
|---|---|---|---|
| Viscosity @ | 0°F. | 45,000 | 209,000 |
| @ | 20°F. | 4,380 | 20,000 |
| @ | 100°F. | 43.7 | 203 |
| @ | 210°F. | 5.1 | 43 |
| Pour Point, °F. | | -5 | |

*Trademarks of E.I. DuPont de Nemours & Co., Inc.
**Pick up disclaimer

0165147

TOWOLDMON0024360

| | |
|---|---|
| Specific Gravity, 60°/60°F. | 1.154 |
| Acidity, Total Acid No. | 10.3 |
| Flash Point (Cleveland Open Cup) | 465°F. |
| Fire Point (Cleveland Open Cup) | 565°F. |

For more detailed information, check the types of fluid(s) that interest you.

Please send me further data on:

_____ Pydraul Hydraulic Fluids and Lubricants

_____ ~~Pydraul "Series E" Premium Fluids~~

_____ ~~Pydraul "Series C" Economy Fluids~~

_____ ~~Pydraul Air Compressor Lubricants~~

_____ Pydraul MC Fluid for Mining Equipment

_____ Pydratek-100 Preservative Fluid

The type of hydraulic equipment we operate is:_____

_____ with fluid capacity of approx. _____ gallons _____ operating in a temperature range of _____°F.

Name _____ Title_____

Company_____

Address _____

City _____ State _____ Zip _____

Postage Paid Reply Indicia to Dept. BINB

Add MICC Address Line & District Office Listing

Monsanto Logo

0165148

TOWOLDMON0024361