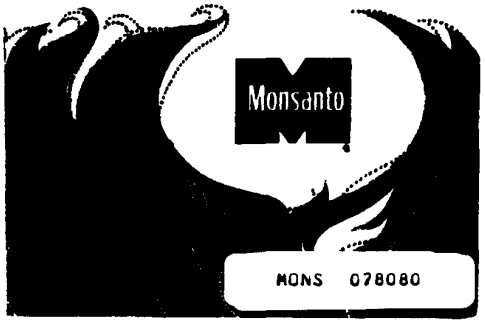
PYDRAUL®

FIRE-RESISTANT HYDRAULIC FLUID

SELECTOR



PYDRAUL

SELECTOR

MONS 078081

THE PYDRAUL SELECTOR

. . . is designed to put literally at your fingertips all the facts about Pydraul fire-resistant hydraulic fluids—to guide you quickly to the Pydraul fluid that will serve your operation best.

Protection from fire for hydraulic operations began with Pydraul. That was in 1951. Pydraul fluids have since served industry with over one billion machine hours of fire-free operation. Never during these billion hours of machine operations has a Pydraul fluid contributed to a fire—not even when sprayed from the broken ends of high pressure hydraulic lines onto white-hot surfaces.

New ways are continuously being explored to improve the excellent performance records of Pydraul fluids. The first Pydraul fluid, general-purpose Pydraul F-9, has grown to a family of six, specially tailored, fire-resistant hydraulic fluids and lubricants. Each answers a major but specific hydraulic fluid need for industrial use. In addition to guarding against fire, each Pydraul fluid lubricates as well as premium grade oil. Pydraul fluids have answered the need of virtually every industrial hydraulic operation, indoors and out—from the sub-zero, outdoor hydraulic lift operations for refineries and blast furnaces to the low-viscosity fluid demands of high-speed, precision machine tools.

MONS 078082

PYDRAUL PERFORMANCE

The six fire-resistant, premium-lubricating Pydraul fluids offer a wide range of viscosities from which you can select the proper level specified by your hydraulic equipment manufacturer. Whichever Pydraul fluid you select, each provides the same protection against fire, premium lubricity, ease of maintenance, and freedom from corrosive action and foam. Pydraul hydraulic fluids also offer several additional benefits—

REDUCED FIRE INSURANCE RATES

Because Pydraul eliminates fire hazards from hydraulic equipment operations, Pydraul reduces the threat of fire to surrounding structure and equipment. Insurance premiums for plants using Pydraul, therefore, are often lower than premiums for operations using petroleum oil.

LONGER PUMP LIFE

Machines that operate on water-based fluids frequently require pump repair or replacement as often as every two or three months. Machines that use Pydraul hydraulic fluids can operate on the same pump for several years. Pydraul hydraulic fluids give the same long pump life as the finest grade petroleum oil.

MCNS 078083

NO CORROSION PROBLEMS

Any metal hydraulic system component in contact with Pydraul will not rust. And Pydraul hydraulic fluids do not lose anti-rust properties with use.

MAXIMUM EQUIPMENT RESPONSE

Pydraul never produces excessive froth or foam during normal operations to interfere with hydraulic equipment response. Because Pydraul hydraulic fluids lubricate as well as premium petroleum oils, Pydraul permits equipment to operate at optimum response capability.

INSPECTION AND REPLACEMENT DOWN-TIME ARE VIRTUALLY ELIMINATED

Pydraul hydraulic fluids are designed to be permanent. Pydraul fluids do not wear out. Except for normal "make-up" requirements, you never have to add new Pydraul to hydraulic systems. Pydraul eliminates "drain and change" periods; it does not have to be inspected in your system from month to month—or even replaced from year to year.

MONS 078084

HYDRAUL SELECTOR

MONS 078085

PYDRAUL 60

Low viscosity Pydraul 60 flows freely at −20° F. It retains its properties and thermal stability at temperatures up to 200° F. In hydraulic operations that require precision flow *instantly*, Pydraul 60 supplies smooth operation from machine start to stop; it offers flow-on-demand operation without hydraulic lag. Pydraul 60 offers excellent, fire-resistant, hydraulic operation with vane, gear and piston pumps in high-speed machine tools.

FIRE-RESISTANCE TESTS

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 more than one billion machine hours of use, Pydraul fluids have been accidentally sprayed over molten metal, through electrical arcs, into flames and sparks—without causing fire. Pydraul fluids have never caused or contributed to an hydraulic fire in any type of equipment. They pass all of the important ignition tests for fire-resistance, as shown by these test results:

Physical Properties
Appearance
Spec. Gravity 25°/25°C
Neutralization No. (acidity) (mg KOH/gm) max.
Moisture (max.)
Viscosity As measured: 100° F. 210° F. "Absolute Saybolts" 100° F. (SSU X Density) 210° F.
Pour Point
Compressibility X10⁻⁶ sq. in./lb.
Bulk Temperature Max.
Boiling Point °F at 760mm Hg.
Coefficient of Thermal Expansion per ° F.
Specific Heat (BTU/lb./° F.) (@ 77° F.)
Thermal Conductivity BTU/hr./ft./° F.
Vapor Pressure Hg @ 200° F.
Bulk Modulus (Room Temp. 1000-6000 psi)
Solubility in Water
Test
High Pressure Spray Test (AMS-3150B and MIL-F-7190). Test fluid sprayed at 100 psi through orifice, passing through flame of oxyacetylene torch, 6000° F.
Low Pressure Spray Test (AMS-3150B). Test fluid sprayed at low pressure over ignited, oil-soaked rag to determine degree of increase in flame intensity.
Hot Manifold Test (MIL-F-7190). Test fluid dripped on tube at 1300° F.
Molten Metal Ignition Test. Test fluid exposed to the surface of aluminum alloy at 1200° F., to test for spontaneous ignition.

MONS 078086

PYDRAUL 150

Pydraul 150 is currently used in more than seven hundred G. P. E. (formerly Askania) regulators to control fuel-to-air ratios for blast furnaces, soaking pits, and other similar related equipment. Although developed especially for severe cold-weather, outdoor operations, Pydraul 150 is also used for certain missile-launch projects and in gears of LOX pumps located in oxygen-rich atmospheres at missile-fueling sites. Pydraul 150 also performs as an excellent low-viscosity fluid for high-speed machine tools.

MCNS 078087

[redacted]

Physical Properties
Appearance
Spec. Gravity 25°/25°C
Neutralization No. (acidity) (mg KOH/gm) max.
Moisture (max.)
Viscosity As measured - 100° F. 210° F "Absolute Saybolts" 100° F (SSU X Density) 210° F
Pour Point
Compressibility X10⁻⁶ sq. in./lb.
Bulk Temperature Max.
Boiling Point °F at 760mm Hg.
Coefficient of Thermal Expansion per ° F.
Specific Heat (BTU/lb./° F.) (@ 77° F.)
Thermal Conductivity BTU/hr./ft./° F.
Vapor Pressure Hg @ 200° F.
Bulk Modulus / Room Temp. (1000-6000 psi)
Solubility in Water
Test
High Pressure Spray Test (AMS-3150B and MIL-F-7100). Test fluid sprayed at 100 psi through orifice, passing through flame of oxyacetylene torch, 2000° F.
Low Pressure Spray Test (AMS-3150B). Test fluid sprayed at low pressure over ignition, tri-nozzles rig to determine degree of increase in flame intensity.
Hot Manifold Test (MIL-F-7100). Test fluid dripped on tube at 1300° F.
Molten Metal Ignition Test. Test fluid exposed to the surface of aluminum alloy at 1200° F., to test for spontaneous ignition.

PYDRAUL A-200

Pydraul A-200 is one of the most widely used, general-purpose, fire-resistant hydraulic fluids in industry. Introduced in 1959, it was the first fire-resistant, straight synthetic hydraulic fluid to break the "price/performance barrier." Where protection from fire is the maximum consideration, Pydraul A-200 offers the lowest cost per gallon of straight synthetic, fire-resistant hydraulic fluids.

MONS 078089

Physical Properties
Appearance
Spec. Gravity 25°/25°C
Neutralization No. (acidity) (mg KOH/gm) max.
Moisture (max.)
Viscosity As measured: 100° F. 210° F. "Absolute Saybolt" 100° F. (SSU X Density) 210° F.
Pour Point
Compressibility X10⁴ sq. in./lb.
Bulk Temperature Max.
Boiling Point °F at 760mm Hg.
Coefficient of Thermal Expansion per ° F.
Specific Heat (BTU/lb./° F.)(@ 77° F.)
Thermal Conductivity BTU/hr./ft./° F.
Vapor Pressure Hg @ 200° F.
Bulk Modulus (Room Temp. 1000-6000 psi)
Solubility in Water
Test
High Pressure Spray Test (AMS-3150B and MIL-F-7150). Test fluid sprayed at 100 psi through orifice, passing through flame of oxyacetylene torch. 1000° F.
Low Pressure Spray Test (AMS-3150B). Test fluid sprayed at low pressure over ignited, oil-soaked rag to determine degree of increase in flame intensity.
Hot Manifold Test (MIL-F-7100). Test fluid dripped on tube at 1300° F.
Nichrom Shroud Ignition Test. Test fluid exposed to the surface of chromium alloy at 1200° F., to test for spontaneous ignition.

MONS 078090

F-9

PYDRAUL F-9

Monsanto introduced Pydraul F-9 as industry's first straight synthetic fire-resistant hydraulic fluid. Pydraul F-9 rapidly became the standard against which all other synthetic hydraulic fluids were judged. Today, it is still considered the basis for comparison. Pydraul F-9 is now used in every major type of die-casting machine and a wide variety of other equipment found in the metal-working, glass, and process industries. No other fire-resistant hydraulic fluid has more on-the-line *proven* performance to offer.

MCNS 078091

Physical Properties
Appearance
Spec. Gravity 25°/25°C
Neutralization No. (acidity) (mg KOH/gm) max.
Moisture (max.)
Viscosity As measured: 100° F. 210° F. "Absolute Saybolts" 100° F. (SSU X Density) 210° F.
Pour Point
Compressibility X10⁶ sq. in./lb.
Bulk Temperature Max.
Boiling Point °F at 760mm Hg.
Coefficient of Thermal Expansion per ° F.
Specific Heat (BTU/lb./° F.) (@ 77° F.)
Thermal Conductivity BTU/hr./ft./° F.
Vapor Pressure Hg @ 200° F.
Bulk Modulus (Room Temp. 1000-4000 psi)
Solubility in Water
Test
High Pressure Spray Test AMS-5100D and MIL-F-7100. Test fluid sprayed at 100 psi through orifice, passing through flame of oxyacetylene torch, 6000° F.
Low Pressure Spray Test (AMS-5100D). Test fluid sprayed at low pressure over ignited, oil-soaked rag to determine degree of increase in flame intensity.
Hot Manifold Test (MIL-F-7100). Test fluid dripped on tube at 1300° F.
Molten Metal Ignition Test. Test fluid exposed to the surface of aluminum alloy at 1200° F., to test for spontaneous ignition.

MONS 078092

625

PYDRAUL 625

High viscosity Pydraul 625 is tailored for ultra-heavy-duty hydraulic operations, such as for large industrial presses and pumps. Pydraul 625 is also used as a fire-and-explosion-resistant air compressor lubricant. Pydraul 625 can be used in any equipment requiring an 800 to 1000 SUS oil.

MONS 078093

Physical Properties
Appearance
Spec. Gravity 25°/25°C
Neutralization No. (acidity) (mg KOH/gm) max.
Moisture (max.)
Viscosity As measured: 100° F. 210° F. "Absolute Saybolts" 100° F. (SSU X Density) 210° F.
Pour Point
Compressibility X10⁻⁶ sq. in./lb.
Bulk Temperature Max.
Boiling Point °F at 760mm Hg.
Coefficient of Thermal Expansion per ° F.
Specific Heat (BTU/lb./° F.) (@ 77° F.)
Thermal Conductivity BTU/hr./ft./° F.
Vapor Pressure Hg @ 200° F.
Bulk Modulus (Room Temp. 1000-5000 psi)
Solubility in Water
Test
High Pressure Spray Test AMS-5100B and MIL-F-7100. Test fluid sprayed at 100 psi through orifice, passing through flame of oxyacetylene torch, 5000° F.
Low Pressure Spray Test (AMS-5100B). Test fluid sprayed at low pressure over ignited, oil-soaked rag to determine degree of increase in flame intensity.
Hot Manifold Test (MIL-F-7100). Test fluid dripped on tube at 1300° F.
Motion Metal Ignition Test. Test fluid exposed to the surface of aluminum alloy at 1200° F., to test for spontaneous ignition.

MONS 078094

PYDRAUL AC

A special safety lubricant *for air compressors*, Pydraul AC offers three important advantages over petroleum oils: safety from flash fires; virtually no valve deposits, and lower *maintenance* costs. By eliminating combustible mists and minimizing carbonaceous residues, Pydraul AC reduces the threat of compressor fires and explosions. Pydraul AC also reduces compressor maintenance costs. By eliminating deposits on exhaust valves, in coolers, and in piping, Pydraul AC greatly reduces the costs of compressor down-time and cleaning. These lower maintenance costs alone usually justify Pydraul AC for air compressors.

MCNS 078095

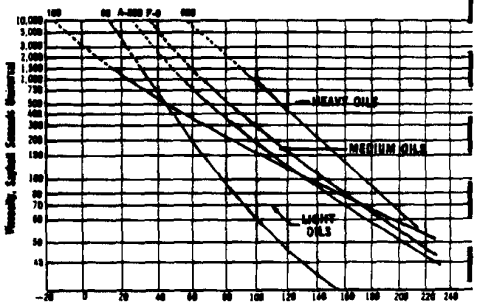
	PYDRAUL AC	PYDRAUL F-9		PYDRAUL 150		
Physical Properties						
Appearance	Clear Blue Liquid	Cloudy Blue Liquid	Cloudy Blue Liquid	Cloudy Blue Liquid	Cloudy Blue Liquid	Cloudy Blue Liquid
Spec. Gravity 25°/23°C	1.340-1.360	1.340-1.370	1.270-1.300	1.415-1.430	1.119-1.135	1.088-1.094
Neutralization No. (acidity) (mg KOH/gm) max.	0.15	0.30	0.30	0.80-1.10	0.17	0.25
Moisture (max.)	0.15%	0.15%	0.20%	0.05%	0.15%	0.10%
Viscosity As measured: 100° F.	400.8 SSU	625.7 SSU	225 SSU	144 SSU	145.9 SSU	90 SSU
210° F.	42.1 SSU	48.9 SSU	43.3 SSU	35.7 SSU	52.5 SSU	35 SSU
"Absolute Saybolt" 100° F.	550 SSU	845 SSU	327 SSU	204 SSU	163 SSU	60.5 SSU
(SSU X Density) 210° F.	50 SSU	58 SSU	52 SSU	48 SSU	56 SSU	38 SSU
Pour Point	+20° F.	+20° F.	−5° F.	+15° F.	−55° F.	−70° F.
Compressibility X10⁻⁶ sq. in./lb.	2.66	2.66	2.58	2.28	3.13	3.05
Bulk Temperature Max.	300° F.	300° F.	300° F.	300° F.	200° F.	200° F.
Boiling Point °F at 760mm Hg.	688° F.	724° F.	644° F.	620° F.	617° F.	707° F.
Coefficient of Thermal Expansion per ° F.	0.00040	0.00040	0.00041	0.00040	0.00042	0.00044
Specific Heat (BTU/lb./° F.) (@ 77° F.)	0.32	0.28	0.32	0.28	0.40	0.42
Thermal Conductivity BTU/hr./ft./° F.	0.066	0.066	0.067	0.068	0.072	0.067
Vapor Pressure Hg @ 200° F.	0.02mm	0.09mm	.5mm	0.2mm	0.1mm	0.01mm
Bulk Modulus (Room Temp. 1000-4000 psi)	375,000	375,000	387,000	438,000	318,000	328,000
Solubility in Water	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Test	**PYDRAUL AC**	**PYDRAUL 65B**	**PYDRAUL F-9**	**PYDRAUL A-200**	**PYDRAUL 150**	**PYDRAUL 65**
High Pressure Spray Test (AMS-3150D and MIL-F-7100. Test fluid sprayed at 100 psi through orifice, passing through flame of oxyacetylene torch, 6000° F.	Does not flash or ignite up to 3½ feet from orifice.	Does not flash or ignite up to 3½ feet from orifice.	Does not flash or ignite up to 3½ feet from orifice.	Does not flash or ignite up to 3½ feet from orifice.	Self-extinguishing.	Self-extinguishing
Low Pressure Spray Test (AMS-3150D). Test fluid sprayed at low pressure over ignited, oil-soaked rag to determine degree of increase in flame intensity.	Very slight increase in flame intensity.	Very slight increase in flame intensity.	No increase in flame intensity.	Slight increase in flame intensity.	Slight increase in flame intensity.	Slight increase in flame intensity.
Hot Manifold Test (MIL-F-7100). Test fluid dripped on tube at 1300° F.	Does not flash or burn.	Does not flash or burn.	Does not flash or burn.	Does not flash or burn.	Intermittent flashing and burning. Little burning in pan below.	Intermittent flashing and burning. Does not burn after leaving tube.
Minimum Manifold Ignition Test. Test fluid exposed to the surface of aluminum alloy at 1200° F., to test for spontaneous ignition.	Does not ignite.	Does not ignite.	Does not ignite; flashes by spark.	Does not ignite.	Does not ignite.	Does not ignite.

MONS 078096

PYDRAUL VISCOSITIES

Laboratory viscosity measurements of SSU (Saybolt Seconds Universal) are affected by fluid density. Because all petroleum oils used for hydraulic operations have similar densities, their measured viscosities can be compared; however, the densities of synthetic fluids differ from one another and from petroleum oils. To compare viscosities, measured viscosities of synthetic fluids must be corrected for density.

On the chart below, each curve for a Pydraul fluid shows the viscosity-temperature relationship modified for the difference in density of the indicated Pydraul fluid. By comparing these curves with viscosity curves of light, medium, and heavy grades of petroleum oils, it can be seen that Pydraul fluids virtually duplicate viscosities of petroleum oils at normal operating temperatures.



Absolute Saybolt Viscosity = Measured SSU × Density of Pydraul

MONS 078097

CONVERTING TO PYDRAUL IS EASY

How to convert existing equipment.

No matter what type of hydraulic fluid you now use in your equipment, you can easily convert to Pydraul. Virtually every type of hydraulic machinery requiring a fire-resistant hydraulic fluid has been converted to Pydraul. Equipment manufacturers are experienced in converting machinery to Pydraul and should be consulted for their specific recommendations. Some manufacturers will tell you exactly what seals to change. Most can supply the correct seals.

Machines operating on a *straight synthetic*, fire-resistant fluid can be converted to Pydraul without interrupting your production. When converting to Pydraul A-200, Pydraul 625, or Pydraul AC, simply add Pydraul as make-up. To convert to other Pydraul fluids, drain the old fluid and refill with the Pydraul fluid. No flush is necessary.

Machines operating on oil or water-based hydraulic fluids require the few simple steps outlined below. These steps are necessary to clean the system of the old fluid and to change to dynamic seals compatible with Pydraul.

Check for leaks.

Check the entire system before the equipment is shut down for conversion. Mark these leaks for later correction.

Drain fluid from the system.

Drain the reservoir, lines, and cylinders as completely as possible to remove all of the old fluid. This can sometimes be done by opening unions at low spots in the system and blowing with clean air.

Clean reservoir and filters.

Remove interior paint from the reservoir (if painted) by scraping or with a commercial paint remover. Wipe clean with lint-free rags. Clean or change the cartridge in the filter.

Check pumps for wear. Replace any part of the pump assembly that shows serious wear.

Install seals and packings compatible with Pydraul.

Dynamic seals should be changed. Reinforced-type hoses are normally satisfactory with Pydraul and need not be replaced if they are in good condition. In operations where severe hose flexing and bending take place, butyl-lined hoses are recommended. Accumulator diaphragms should be made of butyl, Viton, or other materials resistant to Pydraul.

Reconnect lines.

When reconnecting lines, tighten carefully—particularly those joints that leaked previously. Then fill with Pydraul to the proper level.

Start and stop pump.

With the hydraulic controls in neutral, start and stop the pump several times, but do not allow the system to reach working pressure. This will help assure that fluid reaches the pump and lubricates it. The pump can then be left on, and the system can be brought to working pressure.

Run through the cycle.

Run through the cycle several times to use all parts of the hydraulic system. Bleed any trapped air through the petcocks or valves. Check the fluid level and add Pydraul if necessary.

How to equip new machinery with Pydraul.

When ordering new hydraulic equipment, simply specify, "For use with Pydraul hydraulic fluid."

HANDLING AND STORAGE

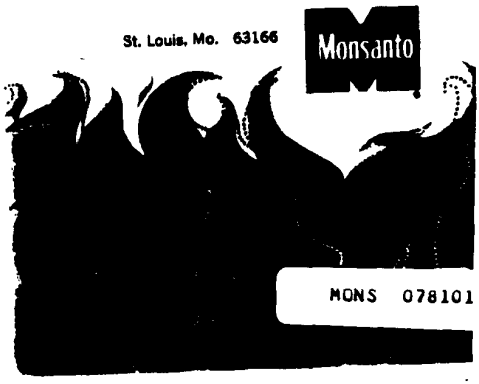
As with all specialized industrial fluids, certain precautions are advisable when handling Pydraul fluids. No problems will arise when Pydraul fluids are used as recommended.

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; 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 effects were produced.

Although eye irritation studies using Pydraul at full strength indicate Pydraul is a mild irritant, there is no evidence to show Pydraul causes permanent damage to eye tissues. If Pydraul 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% pontocaine solution, as well as the ophthalmic cortisone acetate solution.

Pydraul hydraulic fluids can be stored at subzero 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.


St. Louis, Mo. 63166
Monsanto
MONS 078101