TECHNI/TIPS

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SELECTING HYDRAULIC OILS

Proper selection of hydraulic oils has become much more important in the past few years. Some years ago, almost any good quality hydraulic oil would give satisfactory service. Now, the use of the finest high quality oil available is necessary to get the best service out of today's hydraulic equipment and hold wear to an absolute minimum.

Hydraulic systems have become so much more sophisticated in the past few years. Speed and pressure have increased tremendously. A few years ago, hydraulic pressures of 500 psi, 1000 psi, or even 1500 psi were common. Today, pressures are as high as 10,000 psi in certain applications. In some systems, oil is supplied to the pump at initial pressures of several hundred psi. Because of increased pressures, wear rates have gone up dramatically, particularly in vane-type pumps. Specific anti-wear additives are now required. Higher speeds and pressures have caused considerable increases in the bulk oil temperature. Oxidation of the hydraulic oil cannot be tolerated. The oil, preferably, should have extreme high-temperature oxidation resistance. Protection against foaming, rust and wear is absolutely necessary.

To build a high quality hydraulic oil, a choice crude must be selected. That choice crude must then be refined as carefully as possible by specific methods. The resulting special base oil stocks must then be blended with precisely the amount of selected additives to supplement and improve the qualities being built into the hydraulic oil.

Because of the greater effect of today's higher operating temperatures on viscosity, the viscosity limits are of concern. At higher temperatures, the primary limit is the minimum viscosity of an oil that can be used in the particular system. As the viscosity decreases, leakage can increase. External leakage means loss of fluid through seals; internal leakage means reduced efficiency of the system equipment.

On the low operating temperature end, another set of temperature viscosity limitations must be considered. A simple summary would be that the viscosity can rise until it begins to limit the flow into the pump; or when the viscosity reaches such a consistency that the fluid cannot fill the displacement volume of the pump in the time allowed at normal operating speed, the pump will begin to cavitate. As the viscosity continues to rise, the degree of cavitation increases. Prolonged cavitation can be destructive. The noise level would increase and the efficiency would drop off rapidly. Cavitation can also be caused by restrictions in the inlet line to the pump.

There are two good yardsticks for determining the suitability of any given oil:

Oil Specifications

Performance Data

Specifications are used to pick the right oil with respect to viscosity, VI (Viscosity Index), and other characteristics that can be checked in the laboratory and which have some relation to the ability of the oil to perform satisfactorily. Then rely on performance data as a guide in making the ultimate choice of an oil to give you (1) efficient power transmission, (2) proper lubrication, (3) long oil life, (4) wear protection for long equipment life.

When looking for the "right" oil, remember:

1. Highest consideration must be given to characteristics that have to do with performance. Reduction in wear, viscosity, VI and oxidation, rust and corrosion resistance can be checked to some degree in the laboratory, but actual performance gives a better indication of what the oil can do.

2. Viscosity is an important characteristic. For proper efficiency, the oil selected must have the right viscosity at the operating temperature. Viscosity recommendations are available from the equipment manufacturer.

3. Oxidation occurs in any hydraulic system and can be controlled. Oxidation rates increase with temperature and percentage of contaminants. The greater the oxidation resistance of the oil, the better the protection.

4. Rust can cause serious damage to any hydraulic system. The oil chosen must have sufficient ability to prevent rust under existing conditions. Oil properly inhibited against rust, has a greater ability to prevent rust under existing conditions. Oil properly inhibited against rust, has a greater ability to form a protective film on metal surfaces.

5. Hydraulic oils must possess adequate film strength at all times to minimize wear of the moving parts. As an extra bonus of wear protection, LE's hydraulic oils are blended with the exclusive anti-wear additive MONOLEC®.

It should be pointed out that use of high quality hydraulic oil will more than pay for itself in the long run. Such oils will always have the proper viscosity, VI, pour point, oxidation stability, rust prevention, foam resistance, water separation characteristics and anti-wear properties. Use of such oils results in reduced wear, reduced downtime and reduced labor. In fact, they more than offset the initially higher cost.

After selecting a premium hydraulic oil, the best insurance for long oil and equipment life is cleanliness! There are a number of general maintenance rules regarding hydraulic oils, which should be included in any preventive maintenance program. Some are as follows:

- ***Store drums on their sides. Store inside if possible, but at least sheltered if outside.***
- ***Carefully clean top of drum before opening so no dirt can enter.***
- ***Containers or hoses should be clean before using.***
- ***Oil should be filtered through a 200-mesh screen when filling or adding to a general hydraulic system. In more sensitive hydraulic systems, filtration to five microns is usually adequate.***
- ***Keep dirt off motors, pumps, valves, cylinders, piston rods, etc.***

Preventive maintenance should begin as a new machine is installed. Most hydraulic maintenance problems can be precluded by taking preventive measures at the beginning. Regular and frequent inspections will help prevent break-downs. Leaks, fluid levels and the conditions of the hydraulic oil can be determined by visual inspection. Pump wear is evidenced by an increase in the cycle time. Plugged filters can be spotted by sound. High oil temperatures should always be investigated.

Equipment will generally give a warning before actual breakdown occurs, and someone must heed the warnings and do something. Here are some suggestions which will help.

- Maintain adequate inventories of spare units and parts.
- Use the best hydraulic fluid available, keep it in good condition and change it as often as necessary.
- Use only trained specialists for hydraulic maintenance work. The maintenance personnel should be thoroughly familiar with specific hydraulic equipment. Use the training facilities made available by the manufacturers.

- ***Filter elements should be cleaned or replaced as indicated by planned periodic inspection.***

- ***Daily checks***
  Fluid level in reservoir
  External leakage (with machine running and not running)
  Unusual noises
  Proper cycle operation
  Temperature of fluid

LE manufactures four different families of products which are ideally suited for hydraulic systems. All four are rust and oxidation inhibited (R&O), anti-foam and anti-wear (AW) hydraulic oils that are designed for long life and best lubrication. They contain unique oxidation inhibitors which actually help reduce deposits. These high temperature inhibitors stand up under considerably higher operating temperatures than most hydraulic oils.

MONOLEC® Hydraulic Oils meet all the needs of all modern equipment where a mineral base oil is required. They contain MONOLEC® , LE's exclusive wear reducing additive which reduces wear and gives longer bearing and parts life.

6520 SAE 5W-20	
6105	**ISO 22**
6110	**ISO 46**
6120 SAE 20	**ISO 68**

MULTILEC® Industrial Oils are truly multi-functional, heavy-duty R&O and AW industrial oils suitable for air compressors, hydraulics, bearings, industrial turbines and R&O gear applications. They contain MONOLEC® , LE's exclusive wear reducing additive which reduces wear and gives longer bearing and parts life.

6801	**ISO 32**
6802	**ISO 46**
6803 SAE 20	**ISO 68**
6804 SAE 30	**ISO 100**
6805 SAE 40	**ISO 150**
6806 SAE 50	**ISO 220**
6807 SAE 60	**ISO 320**

QUINPLEX® White Oils are designed to meet the USDA H1 requirements of the food, bottling, pharmaceutical and textile industries. These excellent non-foaming lubricants can be used where incidental food contact can occur or where a clean, non-staining lubricant is required. Contains QUINPLEX® , LE's exclusive additive.

4010	**ISO 46**
4030 SAE 30	**ISO 100**
4046	**ISO 46**

LOW TOX® Hydraulic Oils are designed with advanced product technology that gives performance equivalent to premium hydraulic fluids, yet afford low eco-toxicity to address environmental concerns. Has a low order of toxicity when compared to the standard commercial hydraulic oils or biodegradable hydraulic oils.

6601	**ISO 32**
6602	**ISO 46**
6603 SAE 20	**ISO 68**
6604 SAE 30	**ISO 100**

TROUBLE SHOOTING TIPS

TROUBLE	CAUSE	ACTION
Noisy Pump	1. Restricted intake. 2. Worn pump. 3. Pump picking up air. a. around shaft or head packing b. at loose or broken intake pipe 4. Cavitation at pump inlet. 5. Excessive speed. 6. Excessive pressure.	Clean intake strainer. Check intake piping for obstruction. Disassemble pump, inspect internal parts for wear. Replace packings, grease pump fitting. Repair or replace pipe. Fluid viscosity too high or partially restricted. Check prime mover speed and operate pump within recommended limits. Check relief valve setting and for line restriction (clogged or undersized lines).
No Pressure Fluctuating Pressure	1. Broken pump shaft. 2. Worn pump. 3. Vanes stuck in rotor (vane pump) 4. Relief valve. a. large piston stuck open b. small hole in large piston plugged* c. piston or valve seat in cover damaged d. dirt between piston and seat in relief valve control head*	} } Disassemble, inspect pump parts. } } } Disassemble valve, Glean, replace damaged parts* } } } }
Relief Valve Chatter	1. Piston or valve seat in cover damaged. 2. Dirt between piston and seat in relief valve control head.*	} } Disassemble valve, clean, replace damaged parts* }
Four-Way Valves not shifting	1. Electrical trouble. (solenoid operated valves) 2. Main valve spool sticking 3. Pilot pressure too low (pilot pressure operated valves).	Shift solenoid by hand. If valve operates, call electrician to check circuit. Disassemble valve, clean spool and bore with crocus cloth. Should be 50 psi minimum.
Machine Feed Slowed Down	1. Slot in throttle valve dirty.* 2. Weak or broken hydrostatic spring.	Remove throttle, clean out valve slot.* Replace spring.
Chatter in Feed	1. Sticky hydrostatic valve. 2. Machine ways lack lubrication or are out-of-line.	Disassemble and clean hydrostatic valve.* Check and correct.

*Wherever difficulties have been caused by dirt in the system, check fluid supply and fluid filter, change if necessary. Fluid must be kept free of water and foreign material. Continuing trouble may indicate a dirty new fluid supply.

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