LUBE TECHNI-GRAM

FROM:

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THE IMPORTANCE OF HIGH V.I. AND MULTI-GRADED HYDRAULIC OILS

The primary function of petroleum-based hydraulic fluids is to transmit and control power. They also act as lubricants, sealants and heat transfer agents. They must be designed to maximize the efficiency of the hydraulic system. In order to accomplish all this, hydraulic fluids have many requirements. They must be relatively incompressible, flow readily, have sufficient viscosity to provide adequate sealing, possess adequate film strength to reduce friction between moving parts and minimize wear. They should be oxidatively and shear stable; protect component parts against rust and corrosion; and permit rapid settling and separation of insoluble contaminants.

In addition to the aforementioned properties, hydraulic fluids must possess demulsibility and filterability characteristics. Water separability, or demulsibility, is important because most hydraulic systems breathe moisture from the atmosphere, which in turn condenses into the fluid. Water is detrimental to hydraulic systems due to its foaming ability which reduces efficiency, causes rusting, and is also a relatively poor lubricant. Filterability requirements have become increasingly more severe in recent years as the trend to more sophisticated and higher-pressure hydraulic systems continue. Certain sensitive control valves can malfunction due to micron sized particle contamination in the fluid. Hydraulic fluids frequently are required to meet filtration specifications equivalent to the filtration severity of the systems into which they will be charged.

Viscosity, the measure of a fluid's resistance to flow, is one of the most important properties of a hydraulic fluid because it directly affects system efficiency. Within a hydraulic system the pump is generally the most critical component with respect to viscosity. Because of its importance, pump manufacturers specify viscosity limits for operation of their pumps.

Most hydraulic oils in service today are mineral oils fortified with rust and oxidation inhibitors and anti-wear additives. It is important that oil viscosity be controlled in hydraulic systems over the operating range of the equipment. Typically, hydraulic oils become less viscous as temperature increases and more viscous as temperature decreases and pressure increases. The rate of change of viscosity with change in temperature is designated as viscosity index (V.I.). The higher the V.I. of a fluid the smaller is its change in viscosity with temperature. To maintain the viscosity of a hydraulic fluid within limits specified by hydraulic pump manufacturers across a broad operating temperature range, it is desirable to incorporate viscosity index improvers into a hydraulic fluid formulation.

In order to keep pace with equipment changes, and the trend to much higher operating pressures, highest quality V.I. improvers should be utilized because they impart superior viscometric properties to hydraulic fluids at both low and high temperatures compared to lower quality V.I. improver types. In addition to the use of superior V.I. improvers, a hydraulic fluid manufactured from a thermal stable, naturally high viscosity index base stock will further assure superior viscometric performance at both low and high temperatures. And these properties will be maintained throughout the service life of the fluid.

Multi-graded hydraulic oils such as **SWEPCO 703 Multi-Grade Hydraulic Oil** greatly opens up the "operating window" temperature range for acceptable hydraulic equipment performance. This multi-grade formulation constitutes a bona fide multi-season hydraulic oil, with resultant savings in seasonal oil changes and oil disposal costs. Further savings are accrued from improved operating efficiencies both at start-up and during steady-state operation, when compared to lower quality fluids which represent a performance compromise.

Use of superior V.I. improved or multi-grade hydraulic fluids can provide the following advantages:

FEATURES	BENEFITS
• Shear stable	Exhibit very low viscosity loss in service. Provide a high level of performance for extended periods of time.
• Low and high temperature performance.	Enable the hydraulic fluid to operate over a broad temperature range.
• Increased pump discharge flow rate/decreased pump internal leakage flow rate.	Provide increased hydraulic system pumping efficiency. Results in fewer fluid changes and less used fluid disposal.
• Able to meet increased temperatures and pressures determined by industries, along with keeping up with the trend toward increased operating severity.	Reduced maintenance costs and production downtime.

By moderating the change in oil viscosity with temperature, high V.I. and multi-grade hydraulic oil can minimize and, in many cases, prevent the problems listed below:

A viscosity that is TOO HIGH at low temperature can result in:	**A viscosity that is TOO LOW at high temperature can result in:**
• vane breakage	• inadequate sealing between moving parts
• pump cavitation	• increased internal leakage
• sluggish valve action	• reduced system/pump efficiency
• extended warm-up times	• loss of hydrodynamic lubrication
• reduced system/pump efficiency	