MAXIMUM EFFICIENCY mehf HYDRAULIC FLUID

A Guided Tour of a Typical Hydraulic Fluid Data Sheet.

The technical data sheet (TDS) is the fluid user's guide to the physical properties of the fluid. The TDS contains all the information required to understand the performance properties of a fluid and allows comparison of the relative quality of different fluids. It is important for purchasers of hydraulic fluid to understand what the various properties reported in these sheets mean in terms of machinery performance and the resulting impact on operations. By following this guide, you will quickly come to understand that not all hydraulic fluids are created equal and that many important differences in fluid performance can be understood by a careful study of the TDS.

There is no industry standard format for TDSs, nor is there a standard for content. However, most TDS report a basic core of information describing the viscosity, rust and oxidation properties, and anti-wear performance of their fluids. This data is typically laid out in a table format as follows:

Basic Information Found in Most TDSs:

Property	Typical Test Method[1]	Comment
ISO Grade		The higher the number, the higher the viscosity. The most common grades are 32, 46 or 68. Higher and lower grades (viscosities) are available.
Color	D 1500	Varies according to the formulation
Density (lb/gal)	D 4052	Varies according to the formulation
Flash Point (°F)	D 92	Varies according to the formulation
Pour Point (°F)	D 97	Varies according to the formulation
Viscosity: cSt at 40 °C cSt at 100 °C SUS at 100 °C SUS at 210 °C	D 455	This viscosity in cSt at 40 °C (104 °F) defines the ISO grade.
Viscosity Index	D 2270	Typically 95–110 for ordinary hydraulic fluids. Typically 140–149 for premium hydraulic fluids. Greater than 150 for MEHF.
Other Commonly Reported Properties:		
Rust Test	D 665	To Pass
Copper Corrosion	D 130	To Pass
FZG Fail Stage	CEC-L-07-A-95	Report Number
Oxidation Stability	D 943	Report Number
Water Separability (demulsibility)	D 1451	Report Performance
Dielectric Strength	D 877	Report Number
OEM Approvals		Common approvals include: Vickers M-2950-S (Mobile) and I-286-S (Industrial) Cincinnati Machine P-68, P-69 and P-70 Denison HF-0

1. Test Methods are usually standardized test procedures which are developed by independent industry organizations such as ASTM International (formerly the American Society for Testing and Materials). All the methods beginning with a D are ASTM procedures. The CEC method was developed by a European testing organization.

There are additional tests which may be reported in a TDS depending on the special use the fluid is intended for. Other important information regarding product performance, often including OEM approvals, can be found in the text of the TDS instead of in the table.

The MEHF Technical Data Sheet:

What distinguishes an MEHF fluid from other premium hydraulic fluids is how the viscosity of the fluid responds to temperature changes and mechanical stress while in use. Here are some of the factors listed in a TDS that deals with viscosity.

ISO Grade:

The ISO grade tells the user how thick the fluid is. The thickness is measured by the viscosity of the fluid (in units called centistokes, or cSt) at a temperature of 40°C (or 104°F). The reported ISO grade is simply the viscosity of the fluid in cSt at 40°C. The higher the ISO grade, the thicker the fluid.

In principal, fluids could be blended to any desired viscosity. In practice, the industry blends to certain viscosity targets (typically 32, 46 and 68 cSt for hydraulic fluids) that cover the viscosity range of interest for most hydraulic equipment. Keep in mind that the ISO system allows the viscosity to vary by plus/minus 10%; thus an ISO 46 might have a viscosity at 40°C that ranges from a low of 41.4 to a high of 51.2 cSt.

On a practical level, most hydraulic fluids spend little time at 40°C (104°F), but typically experience a wide daily range of temperatures from start-up to operating temperature, and even these can change with the weather, how hard the equipment is working and the season. The property that measures temperature effects on fluid viscosity is the viscosity index.

Viscosity Index:

The viscosity index (VI) is a dimensionless number that is a measure of how much the fluid viscosity changes with temperature. The higher the number, the less the viscosity changes with temperature.

Keep in mind that all fluids will become less viscous (thinner) with increasing temperature. However, the viscosity of a hydraulic fluid with a higher VI will not change as much as that of a fluid with a lower VI. This resistance to temperature changes has important real life consequences as can be seen in the following list:

1. A high VI can allow a fluid to be used year round, eliminating seasonal change-outs between a summer and a winter fluid.

2. A high VI fluid will lead to cooler operating temperatures, avoiding unscheduled shut-downs due to overheating.

3. A high VI fluid will allow efficient and smooth operation at higher temperatures, and permit start-up at lower temperatures. This increases the temperature operating range of hydraulic equipment.

4. An MEHF fluid will provide all the above advantages, but because it has an especially high VI it also offers improved power and efficiency over standard hydraulic fluids which results in fuel cost savings and/or increased power and productivity.

There are many good high VI hydraulic fluids with a VI ranging between 140 and 149 that can provide the first three benefits. However, only MEHF fluids with a VI of 150 or more provide the full energy savings and/or productivity gains characteristic of this fluid. Fluids with a VI of less than 150 will provide only a fraction of the energy savings and/or productivity gains provided by MEHF, and that fraction will decrease the further below 150 the VI is.

Viscosity and Viscosity Index Stability:

Another important factor in fluid performance is viscosity and VI stability under operating conditions. High VI fluids can be make with high VI oils (such as expensive synthetic oils) and/or by adding polymers called Viscosity Index Improvers to the formulation. Viscosity Index Improvers are a common and well-tested technology first used to made multi-grade engine oils in the 1940s. They are still used for this purpose as well as to make high VI oils for a wide range of other applications, including automotive transmission fluids such as Dexron and Mercon, manual transmission gear oils and high VI hydraulic fluids.

Modern hydraulic systems apply great force to the hydraulic fluid. The base oil and most other additives will not be affected by this force, but in some circumstances the viscosity index improver might be. In the worst case, the forces will break (shear) the VI improver into smaller pieces, resulting in a decrease of fluid viscosity and VI. Thus the benefits of a high VI fluid could be lost in operation. With modern technology, VI improvers that are resistant to breaking (shearing) are commercially available, and an MEHF fluid requires that only these shear-resistant VI improvers be used. The specification which addresses this issue is the Denison HF-0. Among many other demanding criteria such as wear resistance, this test requires that the used fluid lose no more than 15% of the starting (fresh fluid) viscosity. An MEHF fluid must have a Denison HF-0 approval, and this is your sign that the fluid viscosity and VI will remain stable in use and continue providing all the MEHF benefits to you.

Locating an MEHF:

Take the short sample Technical Data Sheet below and discuss it with your supplier. It lists the three basic properties to look for when seeking an MEHF. If a fluid satisfies these values, then it is an MEHF. Of course, your particular application might require other performance features such as electrical resistance, or additional approvals for maintaining warranty coverage, etc., which you should also look for when selecting a fluid.

The MEHF concept is a new one, and there are few fluids currently (January 2005) available that have a VI greater than 150. However, premium hydraulic fluids with a VI between 140 and 149 are widely available and will provide some of the MEHF benefits (low-temperature start-up, cooler high temperature operation and elimination of seasonal oil changes). Over time, we expect that MEHF fluids will become more common and easier to find.

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The Basic Technical Data Sheet Properties Defining an MEHF Product:

Property	Value	Comment
ISO Grade	32, 46 or 68	The fluid grades for which MEHF benefits have currently been determined.
Viscosity Index	150 or higher	Indicates a fluid that can provide the full MEHF benefits: energy savings and/or increased power and productivity.
OEM Approvals	Dennison HF-0	Indicates a fluid with stable in-use viscosity as well as excellent anti-wear properties so that the MEHF benefits are retained for the fluid life.

Caution: Your application may require that the fluid meet additional properties and approvals criteria to those listed above.

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