SINCE 1839 Schaeffer MANUFACTURING COMPANY

ISO 9001 CERTIFIED

TECHNICAL DATA

102 Barton Street, St. Louis, Missouri 63104
In-State (314) 865-4100/Out of State 800-325-9962/Fax (314) 865-4107 http://www.schaefferoil.com

#184 HTC OIL MULTIGRADE
ISO 68

HTC Oil Multigrade is a premium quality multi-grade anti-wear non-detergent oil that is specially formulated for use in mobile equipment such as, hydraulic excavators, hydraulic cranes, aerial bucket trucks, forestry equipment, and industrial hydraulic systems that are subjected to wide variations in ambient and system operating temperatures and where protection against the formation of varnish deposits on close clearance servo-valves and other system components is critical

HTC Oil Multigrade is blended from the finest high viscosity index, solvent refined, severely hydro-finished, 100% pure paraffin base stocks available. Blended into these 100% pure paraffin base stocks is a highly specialized performance additive package and an extremely shear stable polymer-type viscosity index improver.

The trend among hydraulic equipment system OEMs is to design hydraulic systems with increased power output and pressures, while minimizing the oil reservoir size in order to make the systems more compact. This trend coupled with higher oil flow rates relative to the amount of hydraulic fluid present in the system has resulted in higher operating temperatures, which increases the rate of oxidation and thermal degradation of the lubricant- all resulting in the potential for the formation of varnish and sludge deposits in the system.

Once varnish deposits are formed they can create a host of problems. Once deposited on the metal surfaces of the system, the sticky nature of these deposits can attract wear particles and contaminants to adhere to the metal surface. This sticky abrasive residue can increase overall friction, especially to servo valves resulting in reduced efficiency and responsiveness. Varnish deposits can also result in sticking servo valves which must be cleaned or replaced, restricted oil flow due to clogged or blocked filters and strainers, and poor heat transfer. All of these factors result in increased maintenance costs, system downtime and lost production.

To combat the formation of varnish deposits a carefully balanced premium anti-wear additive package **VarniShield™** is blended into these 100% pure paraffin base oils and PAO synthetic base fluids**. VarniShield™** is a patented hydraulic fluid additive technology that is designed to prevent the formation and the build-up of varnish deposits, while providing exceptional anti-wear performance, outstanding thermal and oxidation stability, rust and corrosion protection and rapid water separation. The **VarniShield™** additive system provides HTC Oil with a high degree of thermal and oxidative stability thus minimizing the formation of sludge and varnish. If any varnish particles do form, the dispersancy of the **VarniShield™** additive will keep these particles suspended and prevent them from depositing on critical internal components. This helps eliminate the replacement of components such as filters and valves and the costs associated with these activities.

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In addition to protecting against the formation of varnish deposits and keeping the system clean and operating longer the **VarniShield™** additive technology will provide the following performance benefits:

1. Exceptional and long lasting anti-wear protection to protect system components
2. Extended pump life.
3. Extended bearing life.
4. Enhanced thermal and oxidative stability.
5. Superior hydrolytic stability.
6. Excellent demulsibility characteristics so water separates quickly.
7. Excellent rust and corrosion protection that extends component life and protects multi-metallurgy components.
8. Excellent anti-foaming and air release properties.
9. Reduced sludge, varnish and deposit formation.
10. Improved durability of non-ferrous parts.
11. Reduced filter blockage.
12. Excellent filterability.
13. Enhanced compatibility with existing fluids.
14. Excellent fluid quality reserve to maintain its performance features even under severe service conditions and extended drain intervals.
15. Enhanced fluid life.
16. Enhanced seal life.
17. Reduced system maintenance.

The extremely shear stable polymer viscosity index improver provides the HTC Oil Multigrade with a viscosity index of **150**. This extremely high viscosity index allows the HTC Oil Multigrade to provide the proper viscometric properties that are needed for maximum efficiency over a wide range of operating temperatures and pressures. By maintaining its viscometric properties in the optimum viscosity range for the hydraulic pump HTC Oil Multigrade will provide the following performance benefits:

1. **Improved viscometric properties over a wide range of temperatures.**
2. **Less warm-up time during low temperature operation.**
3. **Faster and smoother response of the hydraulic system at low temperatures.**
4. **Improved start-up at lower temperatures**
5. **Reduced risk of pump cavitation and lubricant starvation at low operating temperatures.**
6. **Improved volumetric and hydro-mechanical efficiency.**
7. **Less internal pump leakage.**
8. **Excellent protection from wear during periods of high operating temperatures and high pressures.**
9. **An increased temperature operating window.**
10. **Elimination of seasonal changes.**
11. **Increased hydraulic power.**
12. **Enhanced energy efficiency.**
13. **Improved productivity (more work can be done in the same amount of time).**
14. **Lower energy consumption for the same amount of work.**
15. **Lower operating temperatures.**
16. **Reduced risk of overheating and equipment shutdown.**
17. **Potential fuel savings and reduced emissions.**
18. **Reduced operating and maintenance costs.**

With the trend by hydraulic pump manufacturers to employ higher speeds, higher pressures reduced cycling times and small systems along with the fact that in many applications that the equipment may be operating beyond its design capacity this has resulted in thin film lubrication conditions taking place. These thin film lubrication conditions can result in increased wear conditions and rates taking place. These increased wear conditions and rates can not only result in a loss in system efficiency, reduced equipment life and lead to potentially catastrophic system failure.

Though HTC Multigrade contains an exceptional anti-wear performance additive system that last longer than most conventional anti-wear hydraulic fluids the products anti-wear capabilities is further enhanced by the addition of Micron Moly®.

Micron Moly® is a liquid soluble type of moly that plates itself to the sliding, rolling and rubbing metal surfaces of the hydraulic and compressor systems. This plating action forms a long lasting solid lubricant film on these rubbing, rolling and sliding surfaces. This moly film will withstand pressures up to 500,000 pounds per square inch. Once plated to the sliding, rolling and rubbing metal surfaces the Micron Moly® not only produces a smooth finish surface, but also reduces friction between the moving parts. This results in less heat being generated, which in turn not only reduces operating temperatures, but also downtime

HTC Multigrade meets and exceeds the following specifications and manufacturers requirements: Denison HF-O, Eaton-Vickers M2950-S, JCMAS HK specification Eaton Char-Lynn, Haldex Barnes, Husky, FMC, Rexnord, Commercial Shearing HD 2/900, Commercial Hydraulics, Cincinnati Machine P-69, DIN 51524 Part 3, ISO 6743/4Type HV, Bosch Rexroth, Saur Sundstrand, Saur Danfoss, US Steel 126, 127 and 136 and AF Nor E 48-603.

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TYPICAL PROPERTIES

ISO Grade	68
API Gravity 60°F	26.7
Specific Gravity 60°F	.849
Viscosity @ 40°C, cSt (ASTM D-445)	65.00-75.50
Viscosity @ 100°C, cSt (ASTM D-445)	10.10-12.00
Viscosity Index (ASTM D-2270)	150
Flash Point °F/°C (ASTM D-92)	410°/210°
Fire Point °F/°C (ASTM D-92)	440°/227°
Pour Point °F/°C (ASTM D-97)	-11° to -17°/-24° to –27°
Rust Test (ASTM D-665)	
Procedure A(Distilled Water)	Pass
Procedure B (Salt Water)	Pass
Copper Strip Corrosion Test 3hrs (ASTM D-130)	1a
Four Ball Wear Test (ASTM D-4172)	
1 hr./40kg/130°F	
Mean Scar Diameter, mm	0.45
Four Ball Wear Test (ASTM D-4172)	
1 hr./20kg/130°F	
Mean Scar Diameter, mm	0.27
Four Ball EP Test (ASTM D-2783)	
Weld Point, kg	160
Falex Continuous Load (ASTM D-3233)	
Failure Load, lbs.	1250
Conradson Carbon Residue (ASTM D-189)	
%Residue	0.3
Foam Test (ASTM D-892)	
Sequence I	0/0
Sequence II	0/0
Sequence III	0/0
FZG Gear Test (ASTM D-5182)	
Load Stage Pass	12
Hydrolytic Stability (ASTM D-2619)	
Copper Wt. Loss mg/cm^2	0.0566
Acidity of Water, mg/KOH	0
Demulsibility (ASTM D-1401)	
Oil-Water-Emulsion	40/40/0
Time, min.	15
Denison Filterability Test:	
Filtration Time, with out water (sec)	146
Filtration Time, with 2% water (sec)	163
Oxidation Stability Test (ASTM D-943)	
Hours to TAN of 2	3500+

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TYPICAL PROPERTIES (continued)

Sonic Shear Test after 40 minutes, (ASTM 5621)	
% Viscosity Loss @ 40ºC	8%
Sludge Tendencies (ASTM D-4310)	
Neutralization Number after 1000 hours	0.34
Insoluble Sludge, mg	39.4
Total Copper, mg	0.1
Thermal Stability Test (ASTM D-2070)	
168 hr/135°C, (copper/steel catalyst)	
Sludge (mg/100ml)	1.8
Copper weight loss, mg/100ml	0.2
Condition of Copper Rod	3
Aniline Point °F/°C (ASTM D-611)	228°/108.8°
Total Acid Number (ASTM D-664)	0.91
Air Release (ASTM D-3427)	
Time (min @ 122°F)	6.2
Denison T6H20C Hybrid Pump Test	
Phase 1 1700 rpm 230°F/110°C weight loss	5.1
Phase 2 1700 rpm 176°F/80°C + 1% water	5.8
Vickers 35Q25 Pump Test	
Total Wt. Loss Vane, mg	5
Total Wt. Loss Ring, mg	11
Total Wt. Loss, mg	16