SINCE 1839 Schaeffer MANUFACTURING COMPANY

ISO 9001 CERTIFIED

TECHNICAL DATA

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#112 HTC OIL

ISO GRADES 22 THROUGH 220

HTC Oil is a premium quality non-detergent, anti-wear, rust and oxidation inhibited oil that is specially formulated for use in those critical high precision industrial and mobile type low pressure and high pressure hydraulic systems, rotary vane, rotary screw, reciprocating, axial and centrifugal type air compressor systems and vacuum pumps and blower applications. HTC Oil is particularly suited for those hydraulic applications such as plastic injection molding machines, glass transfer systems, heavy presses, numerically controlled machine tools and mobile equipment where excessive operating temperatures are seen and protection against the formation of varnish deposits on close clearance servo-valves and other system components is critical.

HTC Oil is formulated from the finest high viscosity index severely solvent refined, severely hydro-finished 100% pure paraffin base stocks available. These high viscosity index 100% pure paraffin base stocks provide HTC Oil with:

1. Excellent thermal stability.
2. Excellent resistance to oxidation and thermal degradation.
3. A naturally high viscosity index. This results in a minimum change in viscosity that helps prevent excessive leakage, sluggish operation and lower overall efficiency and other deficiencies attributed to low viscosity index oils over wide operating temperature ranges.
4. Excellent film strength. This results in increased wear protection.
5. Excellent operating temperature reduction. 100% paraffin base oils have better specific heat values, (less heat is absorbed) and better thermal conductivity that conventional base oils. These combined properties help reduce operating temperatures.
6. Superior chemical stability.
7. Low volatility. This results in lower makeup requirements due to evaporation loss and less deposit formation.
8. Low carbon forming tendencies.

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.

Continued on Next Page

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 antiwear additive package **Varnish Shield™** is blended into these 100% pure paraffin base oils**. Varnish Shield™** 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 **Varnish Shield™** 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 **Varnish Shield™** 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.

In addition to protecting against the formation of varnish deposits and keeping the system clean and operating longer the **Varnish Shield™** additive technology provides 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.

Continued on Next Page

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 Oil 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 Oil can also be used as a slide and way lube, a airline oil for pneumatic systems, as a circulating oil and in those bearing and gearbox applications, where the use of a non extreme pressure oil is specified.

HTC Oil meets and exceeds the following specifications and manufacturer's requirements: : Denison HF-O, Eaton-Vickers I-286-S and M-2950-S; JCMAS HK specification, Eaton-Char-Lynn, Haldex Barnes, Husky, Linde, Rexnord, Bosch Rexroth, Parker Hannifan, Commercial Shearing HD 2/900, Commercial Intertech, Cincinnati Machine P-54, P-68, P-69, P-70, DIN 51 524 Part 2 ; ISO 6743/4 Type HM, Sauer-Sundstrand, Sauer Danfoss U.S. Steel 126,127 and 136, AFNOR E 48-603, Ingersoll Rand, Joy, Kaeser, Gardner Denver, Sullair, Worthington, LeRoi, Quincy and Atlas Copco compressor specifications.

Typical Properties on Next Page

Typical Properties

ISO Grade	22	32	46	68	100	150	220
AGMA Grade	----	----	1	2	3	4	5
Specific Gravity 60°F/15°C	.8467	.8626	.8625	.8669	.8862	.8866	.8623
Viscosity SUS 100°F (ASTM D-445)	105-122	155-207	123-250	336-361	479-632	757-811	1036-1077
Viscosity cSt 40°C (ASTM D-445)	20.00-23.5	30-40	41.40-48.50	65.00-70.00	92.00-121.00	144.00-155.00	196-205.00
Viscosity cSt 100°C (ASTM D-445)	4.0-4.5	5.0-6.0	6.2-7.1	8.5-9.5	10.5-13.00	14.00-16.00	17.00-19.50
Viscosity Index (ASTM D-2270)	98	100	100	100	100	105	105
Flash Point °F/°C (ASTM D-92)	400°/204°	410°/210°	410°/210°	430°/221°	450°/232°	470°/243°	485°/252°
Pour Point °F/°C (ASTM D-97)	-25°/-32°	-10°/-23°	0°/-18°	0°/-18°	10°/-12°	20°/-7°	20°/-7°
Aniline Point °F/°C (ASTM D-611)	220°/104°	220°/104°	228°/109°	228°/109°	233°/112°	240°/116°	252°/122°
Total Acid Number (ASTM D-664)	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Copper Strip Corrosion Test 3 hrs. (ASTM D-130)	1A	1A	1A	1A	1A	1A	1A
Rust Test (ASTM D-665)							
Procedure A (Distilled Water)	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Procedure B (St Water)	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Four Ball EP Test (ASTM D-2783)							
Weld Point, kg	126	160	160	160	160	200	200
Four Ball Wear Test (ASTM D-4172) (1hr/40kg/130°)							
Mean Scar Diameter, mm	0.4	0.4	0.4	0.4	0.4	0.35	0.35
Four Ball Wear Test (ASTM D-4172) (1hr/20kg/130°)							
Mean Scar Diameter, mm	----	.27	.27	.27	.27	.33	.33
Falex Continuous Load lbs. (ASTM D-3233)							
Failure Load, lbs.	----	1250	1250	1250	1500	1500	1500
Conradson Carbon Residue (ASTM D-189)							
% Residue	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Foam Tendency (ASTM D-892)							
Sequence I	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Sequence II	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Sequence III	0/0	0/0	0/0	0/0	0/0	0/0	0/0
FZG Test (ASTM D-5182)							
Load Stage Pass	----	12	12	12	12	12	12
Hydrolytic Stability (ASTM D-2619)							
Copper Wt. Loss mg/cm^2	0.0556	0.0566	0.0566	0.0566	0.0566	0.0566	0.0566
Acidity of Water mg/KOH	0	0	0	0	0	0	0
Demulsibility Test (ASTM D-1401)							
O-W-E	40-40-0	40-40-0	40-40-0	40-40-0	40-40-0	40-40-0	40-40-0
Time, min	15	15	15	15	15	15	15

Continued on Next Page

TYPICAL PROPERTIES (Continued)

ISO Grade	22	32	46	68	100	150	220
Denison Filterability Test TP-02100							
Filtration Time, without water (seconds)	----	146	146	146	146	146	146
Filtration Time with 2% water (seconds)	----	163	163	163	163	163	163
Oxidation Stability Test (ASTM D-943)							
Hours to TAN of 2	3500+	3500+	3500+	3500+	3500+	3500+	3500+
Sludge Tendencies (ASTM D-4310)							
Neutralization Number after 1000 hours	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Insoluble Sludge, Total Copper, mg.	39.4	39.4	39.4	39.4	39.4	39.4	39.4
Total Copper, mg	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Thermal Stability Test (ASTM D-2070)							
168 hr/135°C, copper/Steel Catalyst)							
Sludge (mg/100ml)	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Copper weight loss,mg/100ml	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Condition of Copper rod	3	3	3	3	3	3	3
Air Release (ASTM D-3427)							
Time, (Min. @ 122°F)	6.2	6.2	6.2	6.2	6.2	6.2	6.2
Denison T6H20C Hybrid Pump Test							
Phase 1 1700 rpm 230°F/110°C weight loss	---	5.1	5.1	5.1	----	----	----
Phase 2 1700 rpm 176°F/80°C + 1% water	---	5.8	5.8	5.8	----	---	----
Vickers 35VQ25 Pump Test							
Total Wt. Loss Vane, mg	----	5	5	5	5	5	----
Total Wt. Loss Ring, mg	----	11	11	11	11	11	----
Total Wt. Loss, mg		16	16	16	16	16	----