SINCE 1839 Schaeffer MANUFACTURING COMPANY

ISO 9001 CERTIFIED

TECHNICAL DATA

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#264 PURE SYNTHETIC HYDRAULIC OIL
ISO 32 thru 460

Pure Synthetic Hydraulic Oil is a full synthetic, non-detergent, ashless, non-zinc containing anti-wear, rust and oxidation inhibited, non-detergent, premium quality oil that is specially formulated to satisfy the lubrication needs of hydraulic, steam and hydraulically driven turbine systems, circulating oil, air line, pneumatic, pump, vacuum pumps, lightly loaded gearbox, bearing and general oiling applications that are subjected to wide variations in ambient and system operating temperatures.

Pure Synthetic Hydraulic Oil is blended from the highest quality polyalphaolefin (PAO) synthetic base fluids available. These PAO base fluids provide Pure Synthetic Hydraulic Oil with the following advantages:

1. **Excellent Resistance To Thermal Degradation.**
2. **Superior Oxidative Stability -** Any oil, as it is increasingly exposed to high temperature operations, undergoes the process of oxidation. This results in the oil's thickening and buildup of acidic components. Because of the PAO's uniform molecular structure, the process of oxidation is greatly reduced.
3. **Extended Drain Intervals -** Because of the PAO's excellent resistance to thermal degradation and oxidation, Pure Synthetic Hydraulic Oil's service life is extended up to eight (8) times the normal service life of conventional hydraulic oils.
4. **Low Volatility -** The low volatility of the PAO's results in lower makeup requirements due to evaporation loss.
5. **High Viscosity Index -** This results in a minimum change in viscosity with temperature. The adequate viscosity for proper bearing lubrication is provided regardless of temperature change.
6. **Excellent Cold Temperature Starting and Pumpability**
7. **Greater Hydrolytic Stability And Demulsibility Characteristics -** Since PAO's are non-polar they absorb less water under high humidity conditions. They also separate condensed water much faster and more completely, thus resulting in the water being removed easily from the system. These properties result in extended bearing life, anti-wear protection and improved rust and corrosion protection.
8. **Excellent Operating Temperature Reduction -** PAO's have better specific heat values (less available heat is absorbed) and better thermal conductivity than conventional hydraulic oils. These combined properties help to reduce operating temperatures.
9. **Compatibility with All Types Of Seals And Coatings**

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Combined with these polyalphaolefin synthetic base fluids is highly specialized non-zinc containing multifunctional anti-wear additive package that provides the Pure Synthetic Hydraulic Oil with the following performance benefits:

1. **Exceptional Anti-Wear Protection**
2. **Extended Pump Life**
3. **Extended Bearing Life**
4. **Extended Turbine Life**
5. **Enhanced Thermal and Oxidation Stability**
6. **Superior Hydrolytic Stability**
7. **Excellent Demulsibility Characteristics**
8. **Excellent Rust and Corrosion Protection, Especially in the Presence of Moisture.**
9. **Excellent Antifoaming and Air Release Properties. (Contains a Non-Silicone Antifoam Agent)**
10. **Reduced Sludge, Varnish and Deposit Formation.**
11. **Enhanced Filterability**
12. **Enhanced Seal Life**
13. **Compatibility with zinc based fluids**
14. **Reduced System Maintenance**
15. **Reduced Downtime**
16. **Reduced Power Consumption**

Further blended into these polyalphaolefin synthetic base fluids and the specialized multi-functional anti-wear additive package is a proven frictional modifier, Micron Moly®. Micron Moly® is a liquid soluble type of Moly that plates itself to sliding and rubbing metallic surfaces of the hydraulic, turbine or compressor. Once plated to the metal surfaces the Micron Moly® forms a long lasting solid lubricant film that is capable of withstanding pressures up to 500,000 pounds per square inch. This long lasting solid lubricant film prevents the metal surfaces of the engine from coming into contact with each other. By preventing metal-to-metal contact, damaging frictional wear is eliminated, thus leading to improved system efficiency, reduced energy consumption less downtime and longer equipment life.

Pure Synthetic Hydraulic Oil can also be used as an airline oil for pneunatic systems, as circulating oil for use in all circulating systems of paper machines including wet end systems, dryer bearing and calander stacks, and in bearing and gearbox applications where a non-extreme pressure gear oil is specified.

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Pure Synthetic Hydraulic Oil meets and exceeds the following specifications and manufacturers' requirements: Denison HF-O, Eaton-Vickers I-286-S and M-2950-S, Eaton-Char-Lynn, Haldex, Rexroth, Rexnord, Linde, Commercial Shearing HD 2/900, Commercial Intertech, Cincinnati Machine P38,P-54,P55, P-68, P-69, P-7 specifications; Sauer Danfoss, Sauer Sundstrand, ,Parker Hannifin, DIN- 51524 Part 2 HLP, DIN 51515, DIN 51517 Part 2 (CL), ISO 8068, ISO-L-HM, ISOL-PAB, ISO-L-PAD, ISO-L-TSA, ISO-L-TSE, ISO-L-CKB, AGMA 9005-E02 R&O specification, MIL-L-17331H and MIL-L-17672D, U.S. Steel 120, 126, 127,136, AFNOR E-48-600HL, Alstom Power HTGD 90117, British Standard 849, General Electric GEK 32568F, Brown Boveri HTGD 90117, JIS K2213, Siemens TLV 9016 03/02 and Westinghouse turbine specifications

Typical Properties

ISO Grade	**32**	**46**	**68**	**100**	**150**	**220**
Specific Gravity	.825	.83	.87	.835	.835	.8441
Viscosity 100°F SUS (ASTM D-445)	149-171.6	235.2-255.7	350.9-376.6	490.9-540.3	748.7-827.2	1121.4-1268.1
Viscosity 40°C cSt (ASTM D-445)	29.00-33.50	46.00-50.00	68.50-73.50	95.50-105.00	145.00-160.00	217-245
Viscosity 100°C cSt (ASTM D-445)	5.52-6.09	7.69-8.15	10.38-10.98	13.26-14.22	18.17-19.52	27.00-29.50
Viscosity Index	130	135	138	138	140	159
Flash Point °F/°C (ASTM D-92)	455°/235°	460°/237.7°	495°/257.22°	530°/276.67°	530°/276.67°	453°/234°
Fire Point °F/°C (ASTM D-92)	529°/276°	535°/279.4°	530°/276.67°	560°/293.33°	560°/293.33°	485°/252°
Auto Ignition Temp. °F/°C (ASTM D-2155)	730°/389°	750°/399°	750°/399°	750°/399°	750°/399°	750°/399°
Pour Point °F/°C (ASTM D-97)	-65°/-54°	-65°/-54°	-65°/-54°	-40°/-40°	-35°/-37°	-15°/-26°
Total Acid Number (ASTM D-664)	0.69	0.69	0.69	0.69	0.69	0.69
Rotary Pressure Vessel Oxidation Test (ASTM D-2272)						
Minutes to failure	1320	1330	1330	1330	1330	1330
Foam Test (ASTM D-892)						
Sequence I	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
Sequence III	0/0	0/0	0/0	0/0	0/0	0/0
% Evaporation Loss 22 hr. @ 300°F (ASTM D-972)	0.2	0.2	0.2	0.2	0.2	0.25
% Evaporation Loss @ 700°F/371.11°C (ASTM D-2889)	2.6	2.6	2.6	3	3.5	3.5

ISO Grade	**32**	**46**	**68**	**100**	**150**	**220**
Four Ball EP (ASTM D-2783)						
Weld Point, kg	250	250	250	250	250	250
LWI, kg	77.1	77.1	78.2	78.2	78.2	78.2
Aniline Point °F/°C (ASTM D-611)	265°/129°	270° /132°	270° /132°	285° /140°	287° /142°	287° /142°
Rust Test (ASTM D-665)						
Procedure A (Distilled Water)	Pass	Pass	Pass	Pass	Pass	Pass
Procedure B (Salt Water)	Pass	Pass	Pass	Pass	Pass	Pass
Four Ball Wear Test (ASTM D-4172) (1hr/54°C, 1800 rpm, 40 kg)						
Scar diameter, mm	0.27	0.27	0.27	0.27	0.27	0.27
Falex Continuous Load (ASTM D-3233 Procedure A)						
Failure Load, lbs-f	1250	1250	1250	1500	1500	1500
FZG Gear Test (ASTM D-5182)						
Failure Stage	12^{th}	12^{th}	12^{th}	12^{th}	12^{th}	12^{th}
Demulsibility (ASTM D-1401)						
O-W-E	40-40-0	40-40-0	40-40-0	40-40-0	40-40-0	40-40-0
Time (minutes)	15	15	15	15	15	15
Hydrolytic Stability (ASTM D-2619)						
Copper Wt Loss mg/cm^2	0.1	0.1	0.1	0.1	0.1	0.1
Acidity of Water	0.31	0.31	0.31	0.31	0.31	0.31
Copper Strip Corrosion (ASTM D-130)	1a	1a	1a	1a	1a	1a
Oxidation Stability Test (ASTM D-943)						
Hrs. to Tan of 2	+10,000	+10,000	+10,000	+10,000	+10,000	+10,000
Denison T5D-042 Pump Test						
inches wear, vane	.0094	.0094	.0094	.0094	_-----	------

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Typical Properties Continued

ISO Grade	**32**	**46**	**68**	**100**	**150**	**220**
Sludge Tendencies (ASTM D-4310)						
Total sludge, mg	18	18	18	18	18	18
Total copper, mg	15	15	15	15	15	15
Total iron, mg	0.1	0.1	0.1	0.1	0.1	0.1
Neutralization number	0.2	0.2	0.2	0.2	0.2	0.2
Thermal Stability (Cincinnati Milicron) Method 168 hrs/135°C, copper, steel catalyst (ASTM D-2070)						
Sludge mg/100 ml	2	2	2	2	2	2
Condition of copper rod	1	1	1	1	1	1
Condition of iron rod	1	1	1	1	1	1
Denison T6H20C Hybrid Pump Test						
Vane, mgs weight loss	6	6	6	6	----	----
Pins, mgs weight loss	0.7	0.7	0.7	0.7	----	----
Total mgs weight t loss Vane & Pins	6.7	6.7	6.7	6.7	------	-----
Vickers Vane Pump 35VQ25 Test Run 1						
Ring weight loss, mgs	17	17	17	17	-----	-----
Vane weight loss, mgs	3	3	3	3	-----	-----
Total weight loss, mgs	20	20	20	20	------	------
Vickers Vane Pump 35VQ25 Test Run 2						
Ring weight loss, mgs	15	15	15	15	----	---
Vane weight loss, mgs	3	3	3	3	----	-----
Total weight loss, mgs	18	18	18	18	-----	------

Typical Properties Continued

ISO Grade	32	46	68	100	150	220
Vickers Vane Pump 35VQ25 Test Run 3						
Ring weight loss, mgs	29	29	29	29	----	-----
Vane weight loss, mgs	7	7	7	7	----	-----
Total weight loss, mgs	36	36	36	36	----	-----
Vickers Vane Pump 35VQ25 Test Average of 3 Runs						
Ring weight loss, Average of 3 Runs mgs	20.3	20.3	20.3	20.3	----	-----
Vane weight loss, Average of 3 Runs mgs	4.3	4.3	4.3	4.3	----	-----
Total weight loss, Average of 3 Runs mgs	24.6	24.6	24.6	24.6	----	-----

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Typical Properties Continued

ISO Grade	32	46	68	100	150	220
Denison Filterability TP-02100-A						
Without Water, seconds	217.5	217.5	217.5	217.5	217.5	217.5
With 2% Water, seconds	381	381	381	381	381	381
AFNOR Filterability NF48-690 and NF 48-691						
Dry phase, minutes	1.1	1.1	1.1	1.1	1.1	1.1
Wet phase, minutes	1.2	1.2	1.2	1.2	1.2	1.2

Typical Properties continued on next page

Typical Properties Continued

ISO Grade	**320**	**460**
Specific Gravity	.83	.84
Viscosity 100°F SUS (ASTM D-445)	1517.5 – 1759.4	2326.6 – 2545.7
Viscosity 40°C cSt (ASTM D-445)	293.86 – 340	448.33 – 490
Viscosity 100°C cSt (ASTM D-445)	34.88 – 38.60	47.79 – 51.01
Viscosity Index	165	166
Flash Point °F/°C (ASTM D-92)	514°/268°	513°/267°
Fire Point °F/°C (ASTM D-92)	555°/290°	550°/288°
Auto Ignition Temp. °F/°C (ASTM D-2155)	750°/399°	750°/399°
Pour Point °F/°C (ASTM D-97)	-15°/-26	-15°/-26
Total Acid Number (ASTM D-664)	0.69	0.69
Rotary Pressure Vessel Oxidation Test (ASTM D-2272) Minutes to failure	1330	1330
Foam Test (ASTM D-892)		
Sequence I	**0/0**	**0/0**
Sequence II	**0/0**	**0/0**
Sequence III	**0/0**	
% Evaporation Loss 22 hr. @ 300°F (ASTM D-972)	0.2	0.2
% Evaporation Loss @ 700°F/371.11°C (ASTM D-2889)	4	4
Four Ball EP (ASTM D-2783)		
Weld Point, kg	315	315
LWI, kg	90	90
Aniline Point °F/°C (ASTM D-611)	287°/142°	287° /142°
Rust Test (ASTM D-665)		
Procedure A (Distilled Water)	Pass	Pass
Procedure B (Salt Water)	Pass	Pass
Four Ball Wear Test (ASTM D-4172) (1hr/54°C, 1800 rpm, 40 kg) Scar diameter, mm	0.27	0.27
Falex Continuous Load (ASTM D-3233 Procedure A)		
Failure Load, lbs-f	1500	1500
FZG Gear Test (ASTM D-5182) Failure Stage	12^{th}	12^{th}
Demulsibility (ASTM D-1401) O-W-E Time (minutes)	 40-40-0 15	 40-40-0 15
Hydrolytic Stability (ASTM D-2619)		
Copper Wt Loss mg/cm^2	0.1	0.1
Acidity of Water	0.31	0.31

Typical Properties Continued

ISO Grade	**320**	**460**
Oxidation Stability Test (ASTM D-943)		
Hrs. to Tan of 2	+10,000	+10,000
Sludge Tendencies (ASTM D-4310)		
Total sludge, mg	18	18
Total copper, mg	15	15
Total iron, mg	0.1	0.1
Neutralization number	0.2	0.2
Thermal Stability (Cincinnati Milicron) Method 168 hrs/135°C, copper, steel catalyst (ASTM D-2070)		
Sludge mg/100 ml	2	2
Condition of copper rod	1	1
Condition of iron rod	1	1
Denison Filterability TP-02100-A		
Without Water, seconds	217.5	217.5
With 2% Water, seconds	381	381
AFNOR Filterability NF48-690 and NF 48-691		
Dry phase, minutes	1.1	1.1
Wet phase, minutes	1.2	1.2