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Hydro Safe® Premium Hydraulic Fluids **(AW ISO 32, 46, 68, 100)**

STABILIZED™
by Renewable Lubricants

"Biobased Lubricants that Perform Like Synthetics"

Hydro Safe® Premium Hydraulic Fluids are ultimately biodegradable¹ biosynthetic formulas that directly replace mineral oil based hydraulic fluids. These patented biobased hydraulic fluids are formulated to perform in high and low pressure hydraulic systems that require Anti-Wear (AW), anti-rust, anti-oxidation, anti-foam, and demulsibility properties. They are highly inhibited against moisture and rusting in both fresh and sea water and pass A and B Sequences of the ASTM D-665 Turbine Oil Rust Test. Incorporating the super high viscosity index (VI) of the Stabilized* High Oleic Base Stocks (HOBS) into the formulas, increases the viscosity index past synthetic levels (Energy Conserving Formulas). The super high viscosity index of the HOBS naturally improves the thermal shear stability of the formula and increases load capacity. They provide additional fluid value at the higher temperatures, which is a performance benefit over lower VI products of the same ISO viscosity. The HOBS's extremely low volatility increases the flash and fire safety features in the formula. They are formulated to provide seal conditioning for longer seal life and to reduce oil leakage from the system. An environmentally friendly, zinc-free additive system has also been developed that meets or exceeds high pressure pump requirements.

Hydro Safe® Premium Hydraulic Fluids have a long-term history of proven performance with over 10 years of successfully being used in a wide variety of stationary and mobile hydraulic equipment. These patented super high VI fluids have performed successfully in hydraulic systems up to 10,000 psi and in systems with ultra-fine filtration. They are designed for use in hydraulic vane, piston, and gear-type pumps that require DIN 51524 Part 2 and 3, Parker-Denison HF-O/T6H20C, HF-1, HF-2, Eaton-Vickers M-2950-S (35VQ-25) and I-286-S (V-104C), Rexroth, Sauer-Sundstrand, Bosch, Commercial Intertech, GM (LS-2), US Steel 126, 136, and 127. They also meet the requirements for ashless API GL-1, GL-2, GL-3, DIN 51517 Part 3, and AGMA Non-EP gear oils for bearings, reduction units, and gear sets where they meet the viscosity ranges. They have shown to have exceptional anti-wear performance in ASTM D-4172 Four Ball Wear Tests. **Very little wear was encountered in the field studies, and in accelerated pump tests using biobased formulations in Denison T-5D, Vickers 20VQ, 35VQ-25 (M-2950-S), and V-104C (ASTM D-2882), Vickers I-286-S pump stand tests at pressures and temperatures ranging from 2000 to 3000 psi and from 150⁰ to 210⁰ F.** Their anti-wear performance exceeds the requirements for US Steel 126, 136 and 127, load stage 10 in the FZG (DIN 51354), and GM (LS-2). Hydro Safe® Premium Hydraulic Fluids meets and exceeds Federal Specifications A-A-59354 Superseding MIL-H-46001D Specification for machine tool hydraulic systems and they can replace specification MIL-PRF-17672E for ground support equipment.

Hydro Safe® Premium Hydraulic Fluids meet the Environmental Protection Agency (EPA) 2013 Vessel General Permit (VGP) guidelines for Environmentally Acceptable Lubricants (EALs), and should be used in hydraulic systems where **LOW TOXICITY, BIODEGRADABILITY** and **NON-BIOACCUMULATION** properties are required. They exceed the acute toxicity (LC-50 / EC-50 >1000 ppm) criteria adopted by the US Fish and Wildlife Service and the US EPA. Hydro Safe® Premium Hydraulic Fluids are **ENVIRONMENTALLY ACCEPTED LUBRICANTS (EALs)** that are formulated from renewable agricultural biobased resources. We believe Earth's environmental future rests in the use of renewable materials.

¹Ultimate Biodegradation (Pw1) within 28 days in ASTM D-5864 Aerobic Aquatic Biodegradation of Lubricants

STABILIZED by Renewable Lubricants™* is RLI's trademark on their proprietary and patented anti-oxidant, anti-wear, and cold flow technology. High Oleic Base Stock (HOBS) are agricultural vegetable oils. This Stabilized technology allows the HOBS to perform as a high performance formula in high and low temperature applications, reducing oil thickening and deposits.

Patented Product: US Patent 6,383,992, US Patent 6,534,454 with additional Pending and Foreign Patents
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Availability **F.O.B.: Hartville, Ohio, USA** **1 Gallon** **5 Gallon Pail** **Drum** **Totes** **Bulk**

Hydro Safe® Premium Hydraulic Fluids ISO 32, 46, 68 100

The test data below shows that the Hydro Safe® Premium Hydraulic Fluids provide high performance in a wide variety of stationary and transportation equipment that operate in broad ranges of environmental conditions. In equipment operating outside, wear from poor cold temperature pumpability, surge loads, moisture, and dusty environments are more prominent. Hydro Safe® Premium Hydraulic Fluids are formulated to improve performance in equipment that requires excellent anti-wear, rapid water separation and cold temperature pumpability as low as -35°C. They are compatible with the same seals, filters, materials and components that are designed to operate on petroleum oil based formulations.

TYPICAL SPECIFICATIONS	METHOD	ISO 32	ISO 46	ISO 68	ISO 100	Spec. Requirements
Specific Gravity @ 15.6°C	ASTM D-287	0.88	0.88	0.88	0.90	Report
Viscosity @ 40°C	ASTM D-445	30.87	43.8	64.1	92.0	Note 1
Viscosity @ 100°C	ASTM D-445	6.9	9.67	12.5	16.7	Note 1
Viscosity @ -15°C, Brookfield	ASTM D-2983	550 cP	1100 cP	3200cP	4200 cP	Note 1
Viscosity @ -25°C, Brookfield	ASTM D-2983	1,200 cP	3,000 cP	4500 cP	5400 cP	Note 1
Viscosity @ -30°C MRV TP1	ASTM D-4684	4,500 cP	8000 cP	15,000 cP	26,000 cP	10W= <60,000
Viscosity @ -35°C MRV TP1	ASTM D-4684	7,500 cP	11,000 cP	24,000 cP		5W= <60,000
Viscosity Index	ASTM D-2270	184	199	198	199	90 (min)
Pour Point	ASTM D-97	-40°C	-40°C	-39°C	-34°C	Note 1
Flash Point (COC)	ASTM D-92	457°F/236°C	469°F/243°C	483°F/251°C	255°C	198°C (min)
Fire Point (COC)	ASTM D-92	500°F/260°C	514°F/288°C	525°F/274°C	280°C	218°C (min)
Hydrolytic Stability, Copper Wt. Loss (mg) Copper Appearance Water Layer	ASTM D-2619	0.0139 1B 3.0	0.0208 1B 3.0	0.0208 1B 3.0	0.0208 1A 3.6	0.2 Report 4
Foam Sequence I, II, III (10 min)	ASTM D-892	<30/0 Foam	<30/0 Foam	<30/0 Foam	<30/0 Foam	150/0, 80/0, 150/0
Rust Prevention Distilled Water Syn. Sea Water	ASTM D-665	Pass Pass	Pass Pass	Pass Pass	Pass Pass	Pass Pass
Copper Corrosion Strip 3hr @ 100°C	ASTM D-130	1A	1A	1A	1 A	DIN 51524 2(max)
RPVOT, (minutes)	ASTM D-2272	>350	>350	>350	>300	USS 120 (min)
Dielectric Strength (KV) (Avg)	ASTM D-877	42	40	40	40	>35
Oxidation Stability (Pressure Differential Scanning Calorimeter) min	ASTM D-5483 Modified	70.0 (165°C)	70.0 (165°C)	70.0 (165°C)	70.0 (165°C)	Note 2
Neutralization Number mg KOH/g	ASTM D-974	<0.4	<0.4	<0.4	<0.4	1.5 (max)
Swell of Synthetic NBR-L Rubber, % (Avg.) Volume Change (%) Shore A Hardness Change (%)	DIN 53538, Part 1	6.0 -4	6.0 -4	6.0 -4	8.0 -4	0 to 12 0 to -7
Filterability A-No Water (s) (Avg) B-2% Water (s) (Avg)	Denison TP 02100 HF-0 Requirement	113 187	268 271	335 449	355 470	600 (max) 2xA (max)
Demulsibility, ML Oil/Water/Emulsion	ASTM D-1401	40/ 40/ 0 (<10 minutes)	40/ 40/ 0 (<10 minutes)	40/ 40/ 0 (<10 minutes)	40/40/0 (<10 minutes)	40/37/3 (max) (30 minutes)
4-Ball Wear, 1h, 167°F, 1200 RPM, 40 kg	ASTM D-4172	0.3 – 0.4	0.3 – 0.4	0.3 – 0.4	0.3 – 0.4	USS 127 0.5 (max)
FZG Test A/8,3/90	DIN 51354 Part 2	12	12	12	12	US.Steel 10 (min)
Biodegradation Classification	ASTM D-5864	Ultimate PW1	Ultimate PW1	Ultimate PW1	Ultimate PW1	Ultimate PW1
Environmentally Friendly	ISO 15380	yes	yes	yes	yes	yes
USDA Biobased Tested	New Carbon	yes	yes	yes	yes	meets/exceeds (Over 50%)
Environmental Management System	ISO 14001	yes	yes	yes	yes	yes
Ecotoxicity LC-50 / EC-50	EPA 560/6-82-002, 003	meets/exceeds	meets/exceeds	meets/exceeds	meets/exceeds	meets/exceeds
Note 1 Viscosity Sufficient for Application Note 2 Not Required						
Product Item #		71000	71010	71020	71030	