



Renewable Lubricants, Inc.

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Bio-Ultimax™ 1000 Hydraulic Fluids

(AW ISO 32, 46, 68, 100)

STABILIZED™
by Renewable Lubricants



"Biobased Lubricants that Perform Like Synthetics"

Bio-Ultimax™ 1000 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. Because they contain the patented antioxidants (Stabilized*) and they are biosynthetic they provide improved performance in oxidation stability over standard plant/vegetable/HETG and unsaturated HEES type Fluids. 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.

Bio-Ultimax™ Hydraulic Fluids have a long-term history of proven performance with over 30 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. **Very little wear was encountered in the field studies, and in accelerated pump tests using Bio-Ultimax™ bio-based system 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 150° to 210° 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). Bio-Ultimax™ 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.

Bio-Ultimax™ 1000 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. Because they meet the environmental requirements they can also be used where ISO 15380 (HEES/HETG) Hydraulic Fluids are specified. Bio-Ultimax™ Hydraulic Fluids are **ENVIRONMENTALLY ACCEPTED LUBRICANTS (EALs)** that are formulated from renewable biobased resources. We believe Earth's environmental future rests in the use of renewable materials.

¹Ultimate/Readily 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

Bio-Ultimax™ 1000 Hydraulic Fluids ISO 32, 46, 68 100

The test data below shows that the Bio-Ultimax™ 1000 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. Bio-Ultimax™ 1000 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 Viscosity @ 40°C Viscosity @ 100°C Viscosity @ -15°C, Brookfield Viscosity @ -25°C, Brookfield Viscosity @ -30°C MRV TP1 Viscosity @ -35°C MRV TP1	ASTM D-287 ASTM D-445 ASTM D-445 ASTM D-2983 ASTM D-2983 ASTM D-4684 ASTM D-4684	0.88 30.87 6.9 550 cP 1,200 cP 4,500 cP 7,500 cP	0.88 43.8 9.67 1100 cP 3,000 cP 8000 cP 11,000 cP	0.88 64.1 12.5 3200cP 4500 cP 15,000 cP 24,000 cP	0.90 92.0 16.7 4200 cP 5400 cP 26,000 cP	Report Note 1 Note 1 Note 1 Note 1 10W= <60,000 5W= <60,000
Viscosity Index	ASTM D-2270	184	199	198	199	90 (min)
Pour Point Flash Point (COC) Fire Point (COC)	ASTM D-97 ASTM D-92 ASTM D-92	-40°C 457°F/236°C 500°F/260°C	-40°C 469°F/243°C 514°F/268°C	-39°C 483°F/251°C 525°F/274°C	-34°C 255°C 280°C	Note 1 198°C (min) 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	46	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 NBR1 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 OECD 301B ISO 15380	Ultimate PW1 Readily	Ultimate PW1 Readily	Ultimate PW1 Readily	Ultimate PW1 Readily	Ultimate PW1 Readily
Environmentally Friendly		yes	yes	yes	yes	yes
USDA Biobased Tested	New Carbon	yes	yes	yes	yes	meets/exceeds (Over 50%) yes
Environmental Management System	ISO 14001	yes	yes	yes	yes	meets/exceeds
Ecotoxicity LC-50 / EC-50	EPA 560/6-82-002, 003	meets/exceeds	meets/exceeds	meets/exceeds	meets/exceeds	meets/exceeds
<i>Note 1 Viscosity Sufficient for Application</i> <i>Note 2 Not Required</i>						
Product Item #		81000	81010	81020	81030	