



Renewable Lubricants™, Inc.

476 Griggy Rd. NE, PO Box 474

Hartville, OH 44632-0474

Voice: 330.877.9982 Fax: 330.877.2266

www.renewablelube.com

Bio-Ultimax™ 1500 Dielectric
Hydraulic Fluids
AW ISO 22, 32, 46, 68



"Biobased Lubricants that Perform Like Synthetics"

Bio-Ultimax™ 1500 Dielectric Hydraulic Fluids are ultimately biodegradable¹ biosynthetic formulas that were designed specifically for use in hydraulic equipment operating over a wide range of temperatures and where an oil with high dielectric (>35 kV) insulating property is required. Applications include power utility aerial buckets, mobile or stationary hydraulic systems, or other equipment where electrical insulating safety is preferred. 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. They are compatible with the same seals, filters, materials and components that are designed to operate on petroleum oil based formulations. 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 15 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 (HLP/HVLP), 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, 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 bearing, 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 GM (LS-2), US Steel 126, 136 127, and load stage 10 in the FZG (DIN 51354). Bio-Ultimax™ Hydraulic Fluids meets and exceeds Federal Specifications A-A-59354 Superseding MIL-H-46001D Specification for machine tool hydraulic systems.

Bio-Ultimax™ 1500 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™ 1500 Dielectric Hydraulic Fluid ISO 22, 32, 46, 68

The test data below show that the Bio-Ultimax™ 1500 Dielectric 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™ 1500 Dielectric Hydraulic Fluids are formulated to improve performance in equipment that requires excellent anti-wear, demulsibility, and cold temperature pumpability as low as -40°C. They meet and exceed ISO 11158 HV and have **Genie-Terex and Altec Equipment OEM approvals.**

TYPICAL SPECIFICATIONS	METHOD	ISO 22	ISO 32	ISO 46	ISO 68	Spec.Requirements
Specific Gravity @ 15.6°C	ASTM D-287	0.87	0.88	0.88	0.89	Report
Viscosity @ 40°C	ASTM D-445	20.7	31.1	44.5	64.2	Note 1
Viscosity @ 100°C	ASTM D-445	5.16	6.9	9.37	12.2	Note 1
Viscosity @ -15°C, Brookfield	ASTM D-2983	350 cP	500 cP	650 cP	1,200 cP	Note 1
Viscosity @ -25°C, Brookfield	ASTM D-2983	850 cP	1,150 cP	1,400 cP	3,400 cP	Note 1
Viscosity @ -30°C MRV TP1	ASTM D-4684	1950 cP	2,600 cP	3,400 cP	7,200 cP	10W= <60,000
Viscosity @ -35°C MRV TP1	ASTM D-4684	3350 cP	4,500 cP	6,200 cP	12,000 cP	5W= <60,000
Viscosity Index	ASTM D-2270	196	192	201	191	90 (min)
Dielectric Strength, KV (Avg)	ASTM D-877	47	54	47	45	35 (min)
Pour Point	ASTM D-97	-50°C	-46°C	-40°C	-36°C	Note 1
Flash Point (COC)	ASTM D-92	211°C	239°C	240°C	245°C	198°C (min)
Fire Point (COC)	ASTM D-92	238°C	261°C	263°C	269°C	218°C (min)
Hydrolytic Stability	ASTM D-2619					
Copper Wt. Loss (mg)		<0.02	<0.02	<0.02	<0.02	0.2
Copper Appearance		1B	1B	1B	1B	Report
Water Layer		3	3	3	3	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	ASTM D-665					
Distilled Water		Pass	Pass	Pass	Pass	Pass
Syn. Sea Water		Pass	Pass	Pass	Pass	Pass
Copper Corrosion Strip 3hr @ 100°C	ASTM D-130	1A	1A	1A	1A	DIN 51524 2(Max)
Rotary Bomb Oxidation, (minutes)	ASTM D-2272	>400	>400	>400	>350	USS 120 (min)
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.)	DIN 53538, Part 1					
Volume Change (%)		9	7	5	5	0 to 12 (ISO 68) 0 to 10)
Shore A Hardness Change (%)		-6	-5	-4	-4	0 to -7
Filterability						
A-No Water (s) (Max)	Denison TP 02100	90	150	270	340	600 (max)
B-2% Water (s) (Max)	HF-0 Requirement	115	175	300	450	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 (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	DIN 51354	11	12	12	12	US.Steel 10 (min)
Biodegradation Classification	ASTM D-5864 OECD 301B	Ultimate PW1 Readily	Ultimate PW1 Readily	Ultimate PW1 Readily	Ultimate PW1 Readily	Ultimate PW1 Readily
Environmentally Friendly	ISO 15380	yes	yes	yes	yes	meets/exceeds
USDA Biobased Tested	New Carbon	yes	yes	yes	yes	meets/exceeds >50%
Environmental Management System	ISO 14001:1996	yes	yes	yes	yes	meets/exceeds

<u>Ecotoxicity LC-50/EC-50</u>	EPA 560/6-82-002, 003	meets/exceeds	meets/exceeds	meets/exceeds	meets/exceeds	meets/exceeds
Product Item #		81090	81050	81060	81070	