**Renewable Lubricants, Inc.**
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# Bio-Ultimax™ 1500 Dielectric Hydraulic Fluids

**AW ISO 22, 32, 46, 68**

STABILIZED™ by Renewable Lubricants

## *"Bio-based Lubricants that Perform Like Synthetics"*

A specially formulated, ultimately biodegradable[1] product 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 lift buckets, mobile and stationary hydraulic systems, or other equipment where electrical insulating safety is preferred. Bio-Ultimax 1500 Hydraulic Fluids are formulated to perform in 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 passes both A and B Sequences of the ASTM D-665 Turbine Oil Rust Test. Incorporating the super high viscosity index of the Stabilized* High Oleic Base Stocks (HOBS) into the formula, increases the viscosity index past synthetic levels (Energy Conserving Formulas). A zinc-free additive system has also been developed that is environmentally friendly and meets or exceeds pump requirements.

Bio-Ultimax™ 1500 Hydraulic Fluids are designed for use in mobile and stationary hydraulic vane, piston, and gear-type pumps and has shown exceptional anti-wear performance. **Very little wear was encountered, 0 to 25mg (Pass), in accelerated bio-based tests using 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 $150^0$ to $210^0$ F.** The anti-wear performance exceeds the load stage 10 in the FZG (DIN 51354) requirements for US Steel 136, DIN 51524, and GM (LS-2). It also meets the requirements for ashless GL-3 gear oils in reduction units and gear sets where it meets the viscosity range.

The super high viscosity index of the HOBS naturally improves the thermal shear stability of the formula and increases load capacity. The HOBS's extremely low volatility increases the flash and fire safety features in the formula. It is formulated to provide seal conditioning for longer seal life and to reduce oil leakage from the system. Bio-Ultimax™ 1500 Hydraulic Fluids should be used in hydraulic systems where low toxicity, and BIODEGRADABILITY properties are required. Base oils and additives in this product pass and exceed the acute toxicity (LC-50) criteria adopted by the US Fish and Wildlife Service and the US EPA. Bio-Ultimax™ Hydraulic Fluids are ENVIRONMENTALLY RESPONSIBLE lubricants that are formulated from renewable agricultural plant resources. We believe Earth's environmental future rests in the use of renewable materials.

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.

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

Patented Product: US Patent 6,383,992, US Patent 6,534,454 with additional Pending and Foreign Patents

* Trademark of Renewable Lubricants™, Inc.



**Availability** **F.O.B. :Bolton, ON, Canada** **5 Gallon Pails** **Drums** **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 $-42^0$C. In addition the products may be used in machine tool hydraulic systems with the above Denison/Vickers pump requirements. They meet and exceed ISO 11158 HV and have **Genie-Terex and Altec Equipment 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** | **>45** | **>45** | **>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 | **0 Foam** | **0 Foam** | **0 Foam** | **0 Foam** | 0 Foam |
| **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 | **417** | **417** | **360** | **360** | 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 | Ultimate PW1 | Ultimate PW1 | Ultimate PW1 | Ultimate PW1 | Ultimate PW1 |
| **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 |
| ***Note 1 Viscosity Sufficient for Application*** | | | | | | |
| ***Note 2 Not Required*** | | | | | | |