

# **Renewable Lubricants, Inc.**

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### Bio-Ultimax<sup>™</sup> <u>Hydraulic Fluids</u> (ISO 5, 10, 15, 22, 32, 46)



# "Biobased Lubricants that Perform Like Synthetics"

Bio-Ultimax<sup>™</sup> 1200LT (Low Temperature) Hydraulic Fluids are ultimately biodegradable<sup>1</sup>, biosynthetic formulas that were designed specifically to replace and outperform mineral oil based hydraulic fluids for environmentally sensitive and/or cold temperature areas. 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 both A and B Sequences of the ASTM D-665 Turbine Oil Rust Test. Incorporating the super high viscosity index of the Stabilized\* HOBS into the formula, gives multi-grade synthetic base oil performance by boosting the viscosity index (VI) past synthetic levels (energy conserving formulas). This super high viscosity index 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 compared to petroleum formulations with the same viscosity ranges. 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<sup>TM</sup> 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 GL-1, GL-2, GL-3 and AGMA Non-EP gear oils in 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 150<sup>0</sup> to 210<sup>0</sup> F. Their anti-wear performance exceeds the requirements for GM (LS-2), US Steel 126, 136 and 127, load stage 10 in the FZG (DIN 51354), and DIN 51524 Part 2 and 3 requirements for low viscosity hydraulic and turbine oils. They may be used in reduction gears for cold temperature applications, where the OEM recommends a lighter viscosity or SAE 0W for proper channeling.

Bio-Ultimax<sup>TM</sup> 1200 LT Hydraulic Fluids are **recommended** for use with Viton fluorocarbon (FKM 2), fluorosilicone, Teflon (PTFE), Polyurethane (AU), polysulfide, Medium to high nitrile rubber (Buna N, >30% acrylonitrile) and Hydrogenated Nitrile Buna Rubber (HNBR). They are **not recommended** for use where neoprene, natural rubber, and styrene-butadiene rubber (SBR, Buna S) seals are used, and ISO grades 5, and 10 provide high seal swell on Low nitrile rubber NBR-L, NBR1 (Buna N, <30% acrylonitrile).

Bio-Ultimax<sup>TM</sup> 1200 LT 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 <u>LOW TOXICITY</u>, <u>BIODEGRADABILITY</u> and <u>NON-BIOACCUMULATION</u> 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<sup>TM</sup> Hydraulic Fluids are <u>ENVIRONMENTALLY ACCEPTED LUBRICANTS</u> (EALs) that are formulated from renewable biobased resources. We believe Earth's environmental future rests in the use of renewable materials.

#### <sup>1</sup>Ultimate/Readily Biodegradation Pw1 >60% within 28 days in ASTM D-5864 Aerobic Aquatic Biodegradation of Lubricants

STABILIZED by Renewable Lubricants<sup>TM</sup> is RLI's trademark on their proprietary and patented anti-oxidant, anti-wear, and cold flow technology. High Oleic Base Stock (HOBS) are agricultural biobased 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<sup>TM</sup> Trademark of Renewable Lubricants, Inc.

Availability F.O.B.:	Hartville,	Ohio,	USA	1	Gallon	5	Gallon	Pail	<u>Drum</u>	<u>Totes</u>	<u>Bulk</u>
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## Bio-Ultimax<sup>™</sup> 1200LT Hydraulic Fluids ISO 15, 22, 32, 46

The test data below shows that the Bio-Ultimax<sup>™</sup> 1200LT 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<sup>™</sup> 1200LT Hydraulic Fluids are formulated to improve performance in equipment that requires excellent anti-wear, rapid water separation, filterability, and cold temperature pumpability as low as -40<sup>o</sup>C for 0W formulations. ISO grades 15 and 22 meet and exceed SAE 0W, ISO 32 meets and exceeds 0W20, and ISO 46 meets and exceeds SAE 0W30 viscosity requirements.

TYPECAL SPECIFICATIONS         METHOD         ISO.15         ISO.15         ISO.22         ISO.32         ISO.46         Reprint Production (Control of the control sector) of UPCA Networks (COC)         ATTN D-445 ASTM D-446 ASTM D-445 ASTM D-445 ASTM D-446 ASTM D-445 ASTM D-446 ASTM D-445 ASTM D-446 ASTM D-445 ASTM D-446 ASTM D-446									Spec.
Vacanity & IOPC, C41 Vacanity & IOPC, C43 Vacanity & IOPC, C43 Vacanity & IOPC, C44 Vacanity & IOPC, C44 Vacani Vacanity & IOPC, C44 Vacanity & IOPC, C44 Vacanity & IOPC, C44	TYPICAL	METHOD	<u>ISO 5</u>	<u>ISO 10</u>	<u>ISO 15</u>	<u>ISO 22</u>	<b>ISO 32</b>	<u>ISO 46</u>	
Viscosity 0 00°C, C8         ASTM D-445 Nearby 0 30°C         1.35 Note 1 Note 1	SPECIFICATIONS								-
Vacanify 3.20°C, eM         ATM D435         86.68         54.8         52.5         425         775         11.09         Name 1           Vacanify 3.20°C, eM         ASTM D-283         500         2200 eP         2200 eP         2200 eP         2200 eP         200 eP         428 P2.20 P         428 P2.20 P <td>Viscosity @ 40°C, cSt</td> <td>ASTM D-445</td> <td>4.48</td> <td>10.65</td> <td>14.0</td> <td>21.3</td> <td></td> <td>44.9</td> <td>Note 1</td>	Viscosity @ 40°C, cSt	ASTM D-445	4.48	10.65	14.0	21.3		44.9	Note 1
Viscoiry 6-30°C BookEdD         ASTM D-2831         500 2200 cP         3200 cP <t< td=""><td>Viscosity @ 100°C, cSt</td><td>ASTM D-445</td><td></td><td>3.08</td><td></td><td></td><td></td><td>9.8</td><td>Note 1</td></t<>	Viscosity @ 100°C, cSt	ASTM D-445		3.08				9.8	Note 1
Viscosity of 40°C MRV TP1         ASTM D-464         2200 cP         2200 cP         2200 cP         3950 cP         6500 cP         1750 cP $0W60,000 cP$ Viscosity index         ASTM D-27         151         160         189         199         204         212         90 (min)           Pour Pour Tesh Tesh Pour (CCC)         ASTM D-27         3297/10°C         33871/10°C         42879/20°C         45175/237C         4277237C         4277237C         4277237C         4007 (SOB)         2001 (SOB)	Viscosity @ -20°C, cSt	ASTM D-445	86.68	154.8	225	425	775	1030	Note 1
Viscotity Index         ASTM D-271         151         164         189         199         204         212         90 (min)           Peur Priat Bash Pour (CCC)         ASTM D-271         ASTM D-271         320°F/10°C         338°F/10°C         56°F/18°C         428°F/20°C         45°F/20°C         45°F/20°C         45°F/20°C         420°F/20°C         175-19°C min) (00 FF N Loss (mg) Copper PV Loss (mg) Copper PV Loss (mg) Copper Avename         ASTM D-271         320°F/10°C         338°F/10°C         338°F/10°C         320°F/10°C         338°F/10°C         320°F/10°C         320°F/10°C         320°F/10°C         338°F/10°C         320°F/10°C         320°F/10°C         320°F/10°C         320°F/10°C         338°F/10°C         320°F/10°C         320°F/10°C         338°F/10°C         338°F/10°C         320°F/10°C         320°F/10°C         338°F/10°C         330°F/10°C         300°F/20°C	Viscosity @ -30°C Brookfield	ASTM D-2983	500	900	900	1300	1750	2250	Note 1
- $   -$ <td>Viscosity @ -40°C MRV TP1</td> <td>ASTM D-4684</td> <td>2200 сР</td> <td>2200 сР</td> <td>2200 сР</td> <td>3050 сР</td> <td>6500 cP</td> <td>17500 сР</td> <td>0W= &lt;60,000 cP</td>	Viscosity @ -40°C MRV TP1	ASTM D-4684	2200 сР	2200 сР	2200 сР	3050 сР	6500 cP	17500 сР	0W= <60,000 cP
Flah Pout (COC)         ASTM D-22         329°F/10°C         338°F/17°C         565°F/18°C         428°F/22°C         451°F/23°C         402°F/23°C         175-19°C (m) (INE ISO 23'2)           Hydoxlyfic Sakiliy, Copper VI: Loss (ng) Waer Layer         ASTM D-2019         00.139         00.139         00.139         00.139         00.139         00.208         0.0208         0	Viscosity Index	ASTM D-2270	151	160	189	199	204	212	90 (min)
Hydrolytic Sabality, Copper (Appearance Water Layer     ASTM D-2619     0.0139 18     0.0139 18     0.0139 18     0.0139 18     0.0139 18     0.0139 18     0.0288 18     0.0288									175-195°C (min)
$\begin{array}{c} \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Hydrolytic Stability	ASTM D-2619							
$ \begin{array}{cccccc} Correct Appendix Correct Ap$		101101 2017	0.0139	0.0139	0.0139	0.0208	0.0208	0.0208	
Water Layer         5.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         4           Four Sequence I, II, III (10 min)         ASTM D-892         400 Four $< < < < < < < < < < < < < < < < < < < $									
Found Sequence I, II, III (10 min)         ASTM D-592         4400 Foun         4400 Foun         4300 Foun         4300 Foun         4300 Foun         4300 Foun         1500, 500, 1500 (10 NE NIS)           Rist Prevention         Distilied Water         ASTM D-665         Pass									
Rust Prevention Distilled Water Syn, Sex Water Syn, Syn, Sex Syn, Syn, Sex Syn, Syn, Syn, Sex Syn, Syn, Syn, Syn, Syn, Syn, Syn, Syn,									
Disklid Water Syn. Sea WaterPass PassPass PassPass Pass PassPass Pass Pass PassPass Pass Pass Pass Pass PassPass Pass Pass Pass Pass Pass Pass Pass PassPass Pass Pass Pass Pass Pass Pass Pass Pass PassPass <td>Foam Sequence I, II, III (10 min)</td> <td>ASTM D-892</td> <td>&lt;40/0 Foam</td> <td>&lt;40/0 Foam</td> <td>&lt;30/0 Foam</td> <td>&lt;30/0 Foam</td> <td>&lt;30/0 Foam</td> <td>&lt;30/0 Foam</td> <td></td>	Foam Sequence I, II, III (10 min)	ASTM D-892	<40/0 Foam	<40/0 Foam	<30/0 Foam	<30/0 Foam	<30/0 Foam	<30/0 Foam	
SystemPass <th< td=""><td></td><td>ASTM D-665</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>		ASTM D-665							
Copper Corrosion Strip 3hr @ 100°C         ASTM D-130         IA									
Description         ASTM D-2272         450         450         450         450         450         450         450         450         450         450         USS 120 (min)           Dielectric Strength (KV) (Avg)         ASTM D-547         49         49         49         49         50         45         >35           Oxidation Stability (Pressure Differential Saming Calorimeter) min         ASTM D-5483 Modified         90 (165°C)         90									
Dielectric Strength (KV) (Avg)ASTM D-8774949494949495045>35Oxidation Stability (Pressure Differential Scanning Calorimeter) minASTM D-543390 (165°C)90 (165°C	Copper Corrosion Strip 3hr @ 100°C	ASTM D-130	1A	1A	1A	1A	1A	1A	DIN 51524 2(max)
Octored Oxidation Sublify (Pressure Differential Samming Calorimeter) minASTM D-5483 Modified90 (165°C)90 (155°C)90 (165°C)90	Rotary Bomb Oxidation, (minutes)	ASTM D-2272	450	450	450	450	450	450	USS 120 (min)
(Pressure Differential Scanning Calorimetry minASTM D-583 Modified90 (165°C)90 (165°C)90 (165°C)90 (165°C)90 (165°C)90 (165°C)90 (165°C)Note 2Neutralization Number mg KOH'gASTM D-974<0.4	Dielectric Strength (KV) (Avg)	ASTM D-877	49	49	49	49	50	45	>35
Calorimeter) minModifiedModelMarch	Oxidation Stability								
Source 1Normalian Change (%) (Avg.)DIN 53538, Part 112.0 12.012.0 711.0 711.0 711.0 711.0 610.0 68.0 8.00 to 12 0 to 2Filterability A-No Water (s) (Avg) B-2% Water (s) (Avg) B-2% Water (s) (Avg)Denison TP 02100 HF-0 Requirement ASTM D-140172 9872 9872 9872 9885 111 110111260 260 $600$ (max) 2XA (max)Demulsibility, ML Oli/Water/EmulsionASTM D-1401 (<10 min)			90 (165°C)	Note 2					
(Avg.) Shore A Hardness Change (%) Shore A Hardness Change (%)DIN 53538, Part 1 12.012.0 12.012.0 -711.0 -711.0 -710.0 -68.0 -60 to 12 0 to -7Filterability A-No Water (s) B-2% Water (s) (Avg) D-Marter (s) (Avg)Denison TP 02100 HF-0 Requirement 40/40/0 ASTM D-140172 72 9872 	Neutralization Number mg KOH/g	ASTM D-974	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	1.5 (max)
(Avg.) Volume Change (%) Shore A Hardness Change (%)DIN 53538, Part 1 12.012.0 1.2.012.0 1.2.011.0 7.711.0 7.711.0 6.610.0 6.68.0 6.50 to 12 0 to -7Filterability A-No Water (s) (Avg) B-2% Water (s) (Avg) Oil/Water (s) (Avg)Denison TP 02100 HF-0 Requirement 40/40/0 ASTM D-140172 72 9872 	Swell of Synthetic NBR1 Rubber %								
Volume Change (%) Shore A Hardness Change (%)I.1.0I.2.0I.0.0I.0.08.00 to 12 0 to -7Filterability A-No Water (s) (Avg) B-2% Water (s) (Avg)Denison TP 02100 HF-0 Requirement ASTM D-140172 40/40/0 (<10 min)		DIN 53538 Part 1							
Shore A Hardness Change (%)		Dir( 55556, 1 art 1	12.0	12.0	11.0	11.0	10.0	8.0	0 to 12
Filterability A-No Water (s) (Avg) B-2% Water (s) (Avg)Denison TP 02100 HF-0 Requirement72 9872 8072 60070 60040/40/0 6(10 min)40/40/0 (<10 min) <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>									
A-No Water (s) (Avg) B-2% Water (s) (Avg)       02100 HF-0 Requirement       72 98       72 98       72 98       85 98       111 124       260 271       600 (max) 2xA (max)         Demulsibility, ML 0il/Water/Emulsion       ASTM D-1401       40/40/0 (<10 min)	Shore in Hardness Change (10)		,	,	,	Ū	v	5	010 /
A-No Water (s) (Avg) B-2% Water (s) (Avg)       02100 HF-0 Requirement       72 98       72 98       72 98       85 98       111 124       260 271       600 (max) 2xA (max)         Demulsibility, ML 0il/Water/Emulsion       ASTM D-1401       40/40/0 (<10 min)	Filterability	Denison TP							
B-2% Water (s)(Avg)HF-0 Requirement9898981051242712xA (max)Demulsibility, ML Oil/Water/EmulsionASTM D-140140/40/0 (<10 min)	5		72	72	72	85	111	260	600 (max)
Demulsibility, ML Oil/Water/EmulsionRequirement ASTM D-140140/40/0 (<10 min)40/40/0 (<10 min) <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>									
Oil/Water/EmulsionASTM D-1401(<10 min)(<10 min)(<1	1 2/0 (ang)		70	20	20	100			2
FZG Test A/8,3/90DIN 51354 Part 2101011111212+10 (min)Biodegradation Classification Environmentally FriendlyASTM D-5864 OECD 301B ISO 15380Ultimate PW1 Readily yesUltimate		ASTM D-1401							
FZG Test A/8,3/90DIN 51354 Part 2101011111212+Biodegradation Classification Environmentally FriendlyASTM D-5864 OECD 301B ISO 15380Ultimate PW1 Readily yesUltimate PW1 Readily<	4-Ball Wear, 1h, 167°F, 1200 RPM, 40 kg	ASTM D-4172	0.4	0.4	0.4	0.4	0.4	0.4	USS 127 0.5 (max)
Biodegradation Classification Biodegradation Classification DECD 301B ISO 15380ASTM D-5864 Needaily yesUltimate PW1 Readily yesUltimate PW1 Readily yesUlt		DIN 51354 Part 2	10	10	11	11	12	12+	10 (min)
Environmentally FriendlyOECD 301B ISO 15380Readily yes<	120 1051 A/ 0,3/70	Din 51554 Fait 2	10	10	11	11	12	147	
Environmentally FriendlyOECD 301B ISO 15380Readily yes<							Ĺ.		
OECD 301B ISO 15380Readily yesReadil	<b>Biodegradation Classification</b>	ASTM D-5864	Ultimate PW1						
USDA BiobasedNew Carbon>60%>60%>60%>60%>60%>60%>60%>60%meets/exceedsEnvironmental Management SystemISO 14001:1996yesyesyesyesyesyesyesyesmeets/exceedsEcotoxicity LC-50 / EC-50D02, 003B1460B1470B1310B1320B1330B1330B1340		OECD 301B	Readily						
USDA Biobased     New Carbon     >60%     >60%     >60%     >60%     >60%     >60%     >60%     meets/exceeds       Environmental Management System     ISO 14001:1996     yes     yes     yes     yes     yes     yes     yes     meets/exceeds       Ecotoxicity LC-50 / EC-50     Mote 1	Environmentally Friendly						-		
Environmental Management System     ISO 14001:1996     yes     yes     yes     yes     yes     yes     yes     yes     meets/exceeds     meets/excee	USDA Biobased	New Carbon	-	-	-		-	-	meets/exceeds
System     Job       System     EpA 560/6-82- 002, 003     meets/exceeds	USDA DIUDASCU	INCW CARDON	~0070	~0070	~0070	~0070	~0070	~0070	
Ecotoxicity     LC-50 / EC-50     EPA 560/6-82- 002, 003     meets/exceeds     meets/exceeds     meets/exceeds     meets/exceeds     meets/exceeds     meets/exceeds     meets/exceeds     meets/exceeds       Note 1     Viscosity Sufficient for Application Note 2     Not Required     81460     81470     81310     81320     81330     81340		ISO 14001:1996	yes	yes	yes	yes	yes	yes	meets/exceeds
Ecotoxicity         LC-50 / EC-50         002,003           Note 1         Viscosity         Sufficient for Application         81460         81470         81310         81320         81330         81340		EPA 560/6-82-	meets/exceeds						
Application         81460         81470         81310         81320         81330         81340	Ecotoxicity LC-50 / EC-50								
Application         81460         81470         81310         81320         81330         81340	Note 1 Viscosity Sufficient for								
<u>Note 2 Not Required</u> 81460 81470 81310 81320 81330 81340						01000			
			81760	81470	<b>Q1210</b>	<u>81320</u>	<b>Q1220</b>	01010	
			01400	014/0	01310		01330	<u>81340</u>	
	<u>110uuti ittiii #</u>								