Renewable Lubricants, Inc.
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Bio-HVO™ Hydraulic Fluid

(ISO 46 & 68 FR Fluids)

STABILIZED™ by Renewable Lubricants

"Bio-based Lubricants that Perform Like Synthetics"

Bio-HVO™ Hydraulic Fluids are ultimately biodegradable[1] vegetable based formulas that meet and exceed Vickers M-2950-S, Vickers 1-286-5, U.S. Steel 126, U.S. Steel 127, and U.S. Steel 136. They have been USDA Bio-based tested to show new carbon (vegetable oil) at > 96% and they are **Specially formulated to offer the lowest toxicity in aquatic conditions.** They are an excellent choice for inner plant applications (ie. Steel Mills) as fire resistant (FR) hydraulic fluids, with exceptional oxidation stability (RBOT 350-400 minutes) exceeding US Steel minimum requirement of 120 minutes. **Although they have a pour point of -25°C, care must be taken if used in hydraulic systems setting static below 0°C for extended periods.**

Bio-HVO™ Hydraulic Fluids are formulated to perform in hydraulic systems that require Anti-Wear, Anti-Rust, and Anti-Oxidation properties. There anti-wear performance exceeds the requirements for Vickers 35VQ-25 and V-104C (ASTM D-2882) vane pump stand tests, and DIN 51524 Part 2 load stage 10. They also meet the requirements for ashless GL-3 gear oils in reduction units and gear sets where they meet the viscosity ranges. 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* High Oleic Base Stocks (HOBS) into the formulas, gives multi-grade synthetic base oils performance by boosting the viscosity index to synthetic levels (Energy Conserving Formulas) A zinc-free additive system has also been developed that is environmentally friendly and meets or exceeds pump requirements.

The super high viscosity index of the HOBS naturally improves the thermal shear stability of the formulas and their load capacity. **The HOBS's extremely low volatility increases the flash and fire safety features in these formulas. (Can be listed by Factory Mutual as less hazardous fluids)**

Bio-HVO™ Hydraulic vegetable based fluids should be used where improved oxidation stability, excellent anti-wear performance, low toxicity, and BIODEGRADABILITY properties are required**.**

Bio-HVO™ Hydraulic Fluids are ENVIRONMENTALLY RESPONSIBLE hydraulic fluids that are formulated from renewable agricultural plant resources. We believe Earth's environmental future rests in the use of renewable materials.

Pump Performance

Denison T-5D Vane	Pass
Vickers 35VQ 25 Pump (3000 psi, 2400 rpm, 93.3 ^{O} C)	Pass
Vickers V-104C Pump (2000 psi, 1200 rpm, 79.4 ^{O} C)	Pass
Vickers 20VQ5	Pass

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-HVO™ Hydraulic Fluid

TYPICAL SPECIFICATIONS Page 2 TEST	METHOD	**Bio-HVO 46**	**Bio HVO 68**
Specific Gravity @ 15.6°C	ASTM D-287	**0.92**	**0.92**
API Gravity @ 15.6°C	ASTM D-287	**22.3**	**22.3**
Viscosity @ 40°C	ASTM D-445	**47.5**	**66.5**
Viscosity @ 100°C	ASTM D-445	**10**	**13.5**
Viscosity @ -15°C, Brookfield	ASTM D-2983	**1100 cP**	**1500 cP**
Viscosity Index	ASTM D-2270	**200**	**210**
Pour Point	ASTM D-97	**-25°C**	**-23°C**
Flash Point (COC)	ASTM D-92	**278°C**	**280°C**
Fire Point (COC)	ASTM D-92	**335°C**	**340°C**
Volatility 1 hour @ 250°C	NOACK	**1%**	**1%**
Hydrolytic Stability,	ASTM D-2619		
Copper Wt. Loss (mg)		**0.01**	**0.01**
Copper Appearance		**1B**	**1B**
Water Layer		**0.17**	**0.17**
Foam Sequence I, II, III (10 min)	ASTM D-892	**0 Foam**	**0 Foam**
Rust Prevention	ASTM D-665		
Distilled Water		**Pass/Clean**	**Pass/Clean**
Syn. Sea Water		**Pass/Clean**	**Pass/Clean**
Cincinnati Machine Thermal Stability Procedure A			
Precipitate or sludge, mg/100ml		**0.6**	**0.6**
Steel Rod			
Deposit, mg		**3**	**3**
Metal Removed, mg/200 ml		**Nil**	**Nil**
Copper Rod			
Deposit, mg		**7**	**7**
Accelerated Storage Stability		**Pass**	**Pass**
Copper Corrosion Strip 3hr @ 100°C	ASTM D-130	**1A**	**1A**
Copper Corrosion Strip 3 Days @ 100°C	ASTM D-130	**1B**	**1B**
Rotary Bomb Oxidation, (min)	ASTM D-2272	**350-400**	**350-400**
Acid Number	ASTM D-974	**0.4**	**0.4**
Elastomer Testing BUNA-N Rubber			
Volume Change, %	D-471	**1.6**	**1.6**
Shore A Hardness Change	D-2240	**0.0**	**0.0**
Demulsibility, ML Oil/Water/Emulsion	ASTM D-1401	**40/ 40/ 0**	**40/ 40/ 0**
4-Ball Wear, 1h, 167°F, 1200 RPM, 40 kg	ASTM D-4172	**0.3-0.4**	**0.3-0.4**
FZG Test	DIN 51354	**12**	**12**
Biodegradability	CEC-L33-T-82	**>80%**	**>80%**
	OECD 301B Mod. Sturm	**>60%**	**>60%**
	ASTM D-5864	**>60%**	**>60%**
Ecotoxicity			
Fathead minnow, 96h LC50, ppm		**>10,000 ppm**	**>10,000 ppm**
Daphnis magna, 48 h, EC50, ppm		**>10,000 WAF**	**>10,000 WAF**
Sludge respiration inhibition, EC50, ppm		**>10,000 ppm**	**>10,000 ppm**
Meets EPA requirements 560/6-82-002, 560/6-82-003			
Biodegradation Classification	ASTM D-5864	Ultimate PW1	Ultimate PW1
Environmentally Friendly	ISO 15380	Yes	Yes
USDA Bio-based Tested	New Carbon	yes	yes
Environmental Management System	ISO 14001:1996	yes	yes