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Bio-MIL-PRF-32073 Hydraulic Fluid

(ISO 15, 22, 32, 46, 68)

"Biobased Lubricants that Perform Like Synthetics"

Bio-MIL-PRF-32073 Hydraulic Fluids are ultimately biodegradable[1] biosynthetic (biobased) formulas that were designed to replace mineral oil based hydraulic fluids for environmentally sensitive areas. They have been specifically formulated to provide additional seal swell (10% to 30%) as required by MIL-PRF-32073 and ISO 15 or ISO 22 can replace obsolete specification (MIL-PRF-5606 for ground support equipment only). Bio-MIL-PRF-32073 Hydraulic Fluids are formulated to perform in hydraulic systems that require anti-wear, anti-foam, anti-rust, anti-oxidation, 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* High Oleic Base Stocks (HOBS) into the formula, gives multi-grade synthetic base oil performance by boosting the viscosity index to synthetic levels. This 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. An environmentally friendly, zinc-free additive system has also been developed that meets or exceeds high pressure pump requirements.

Bio-MIL-PRF-32073 Hydraulic Fluids have been used successfully in a wide variety of stationary and mobile hydraulic equipment. These patented super high VI fluids are designed for use in hydraulic vane, piston, and gear-type pumps. 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.** Their anti-wear performance **exceeds the requirements** for US Steel 126, 136 and 127, load stage 10 in the FZG (DIN 51354).

Bio-MIL-PRF-32073 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-MIL-PRF-32073 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.

[1]Ultimate 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

Availability **F.O.B.: Hartville, Ohio, USA** **1 Gallon** **5 Gallon Pail** **Drum** **Totes** **Bulk**

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The test data below shows that the Bio-MIL-PRF-32073 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-MIL-PRF-32073 Hydraulic Fluids are formulated to improve performance in equipment that requires excellent anti-wear, rapid water separation and cold temperature pumpability as low as -40^{0}C. In addition, the products may be used in machine tool hydraulic systems where higher seal swell fluids are required because of previously used MIL-Spec hydraulic Fluids.

TYPICAL SPECIFICATIONS (MIL-PRF-32073A)	ISO Grade Military Grade	**ISO 15 1**	**ISO 22 2**	**ISO 32 3**	**ISO 46 4**	**ISO 68 5**
Viscosity @ 40°C, cSt	ASTM D-445	**14.18**	**21.1**	**30.87**	**43.8**	**64.1**
Viscosity @ 100°C, cSt	ASTM D-445	**3.81**	**5.0**	**6.9**	**9.67**	**12.5**
Viscosity @ -15°C, cSt	ASTM D-445	**170**	**330**	**479**	**595**	**1160**
Viscosity @ -25°C, Brookfield	ASTM D-2983	**314 cP**	**646 cP**	**970 cP**	**1260 cP**	**2610 cP**
Viscosity @ -30°C Brookfield	ASTM D-2983	**480 cP**	**1020 cP**	**1530 cP**	**2040 cP**	**4800 cP**
Viscosity @ -35°C Brookfield	ASTM D-2983	**750 cP**	**1680 cP**	**2490 cP**		
Viscosity @ -40°C Brookfield	ASTM D-2983	**1250 cP**	**2800 cP**	**4250 cP**		
Viscosity Index	ASTM D-2270	**172**	**175**	**189**	**201**	**198**
Pour Point	ASTM D-97	**-60°C**	**-52°C**	**-48°C**	**-39°C**	**-36°C**
Flash Point (COC)	ASTM D-92	**180°C**	**205°C**	**243°C**	**252°C**	**263°C**
Foam Sequence I, II, III (10 min)	ASTM D-892	**<30/0 Foam**	**<30/0 Foam**	**<30/0 Foam**	**<30/0 Foam**	**<30/0 Foam**
Galvanic Corrosion	FTM 791-5322	**Pass**	**Pass**	**Pass**	**Pass**	**Pass**
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**	**1 A**	**1 A**
Rotary Bomb Oxidation, (minutes)	ASTM D-2272	**400**	**400**	**400**	**400**	**400**
Dielectric Strength (KV) (Avg)	ASTM D-877	**50**	**45**	**45**	**45**	**45**
Oxidation Stability, Pressure Differential Scanning Calorimeter PDSC (minutes)	ASTM D-6186 Modified	**95.0 (155°C) 25.0 (180°C)**	**95.0 (155°C) 25.0 (180°C)**	**90.0 (155°C) 25.0 (180°C)**	**90.0 (155°C) 25.0 (180°C)**	**90.0 (155°C) 25.0 (180°C)**
Neutralization Number mg KOH/g	ASTM D-974	**<0.4**	**<0.4**	**<0.4**	**<0.4**	**<0.4**
Seal Swell NBR-L, % (Avg.)	FTM-791-3603					
Volume Change (%)		**20**	**20**	**13**	**13**	**13**
Filterability	Denison TP 02100					
A-No Water (s) (Avg)	HF-0 Requirement	**113**	**268**	**335**	**355**	**355**
B-2% Water (s) (Avg)		**187**	**271**	**449**	**470**	**470**
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)**	**40/40/0 (<10 minutes)**
4-Ball Wear, 1h, 167°F, 1200 RPM, 40 kg	ASTM D-4172	**.30-.40**	**.30-.40**	**.30-.40**	**.03-.40**	**.30-.40**
FZG Test	DIN 51354	**11**	**11**	**12**	**12**	**12**
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	yes
USDA Biobased Tested	New Carbon	yes	yes	yes	yes	yes
Environmental Management System	ISO 14001	yes	yes	yes	yes	yes
Ecotoxicity LC-50 / EC-50	**EPA 560/6-82-002, 003**	meets/exceeds	meets/exceeds	meets/exceeds	meets/exceeds	meets/exceeds
Product Item #		**81140**	**81150**	**81160**	**81170**	**81180**