



Renewable Lubricants, Inc.

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Bio-Super High Performance™ Motor Oils **Available in all SAE Grades from SAE 0W10 to 20W70**



"Biobased Lubricants that Perform Like Synthetics"

Since 1993, these unique, first of their kind, High Performance Biobased Motor Oils have proven exceptional performance in the racing world, and they are the lubricants of choice for top performing world and national champions. These high performance racing oils have exceeded the performance of conventional petroleum based products and have shown performance equal to and better than synthetic formulas. Excellent performance has also been experienced from the heavy loads (3000 HP @ >9000 RPM) of IHRA Six Time World Champion alcohol fueled dragster to the high-temperature, long-term endurance, championship, road racing.

HIGH PERFORMANCE BENEFITS OF STABILIZED HOBS:

- Excellent oxidation stability
- Superior viscosity stability
- Excellent mechanical shear stability
- Superior extreme pressure performance
- Superior low volatility performance
- Superior low foam tendency
- Hydrolysis protection
- Protection against excessive seal swell
- Natural corrosion protection
- Gasoline, alcohol, and nitro fuel performance
- Superior flash and fire safety
- Improved biodegradability over mineral oil formulas

CUSTOM DESIGN FORMULAS

These specially formulated racing oils have been designed and tested to run in extreme conditions that would be expected with the motor sport, high performance engines. Most of these formulations can be tweaked to improve performance in a specific type of motor design. When tweaking the formula, Renewable Lubricants, Inc. (RLI) considers the application, loads, RPM's, fuel type, and motor tolerances, etc.

SPECIFICATIONS

In the high performance motor sport world, many conventional lubricant formulations have failed, because the motor sport engines most always exceeds the performance of the standard OEM equipment and require a higher performing lubricant. Although these high performance biobased motor oils have been designed and tested with OEM engine specifications in mind, and meets/exceeds the SAE J300 engine oil requirements, they have not completed the standard engine stand tests for certification. All RLI's biobased motor oils are formulated to exceed API requirements and independent tests and engine tear down studies have show excellent performance in the field. In addition, independent studies have shown that Stabilized HOBS can be incorporated into High Performance formulations to reduce emissions, increase fuel economy, and improve present and future OEM engine requirements. (See Bio-Super High Performance™ Motor Oil Data Sheets for additional information)

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. US Patents: 5,736,493, 5,863,872, 5,990,055, 6,383,992, 6,534,454 and foreign PCT

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

Excellent Oxidation Stability

Independent standardized bench tests and field studies have shown that the Stabilized HOBS will perform as good as or better than mineral and synthetic base stocks. This patented Stabilized technology allows the HOBS to perform as a high performance formula in high-temperature applications, reducing oil thickening and deposits.

Superior Viscosity Stability

Stabilized HOBS produces a super high Viscosity Index (VI) that is higher than conventional mineral and most synthetic based stocks (avg. 220 VI compared to mineral oil at avg. 100 VI). This means the HOBS will have less thermal shear (viscosity breakdown) at high temperature and improved oil pressure.

Excellent Mechanical Shear Stability

Stabilized HOBS also has excellent mechanical shear stability that allows the engine to run for longer intervals at higher RPM with greater fluid protection. This Mechanical Shear Stability and Superior Viscosity Stability combination will provide more power output with reduced blow-by in the ring and cylinder area. In conventional engines, this could transfer into increase fuel economy and/or reduced emissions.

Superior Extreme Pressure Performance

Stabilized HOBS produces an oily, polar effect on the metal surface that enhances pressure absorption at lower temperatures, improving lubricity, and reducing start up friction. The natural oiliness of the base oil is enhanced with the best Extreme Pressure chemistry to produce optimum anti-wear and extreme pressure performance, providing excellent engine durability. Independent, standardized, bench studies have shown that this technology has more than doubled the extreme pressure performance over conventional motor oil formulas.

Superior Low Volatility Performance

According to NOACK (International Standardized test for Volatility), the HOBSs have significantly less volatility over solvent refined petroleum (HOBS <1% compared with petroleum >15%). This means the Stabilized HOBS lubricant will perform at higher temperatures with less evaporation than mineral and synthetic based stocks. This reduces oil consumption and volatile oil pre-detonation in top cylinder areas.

Superior Low Foam Tendency

According to ASTM D-892 sequence I, II, III and ASTM D-6082 High-temp foam tests, the Stabilized HOBS have performed with zero foam and when formulated into the formulation, have performed better than comparative petroleum and synthetic based stocks. This will allow the HOBS to perform better in high performance, oil pump systems under high volume and/or pressure. Less foam means a better lubricating fluid film and steady oil pressure during extensive operation.

Superior Flash and Fire Safety

No matter how professional the racing program, accidents and catastrophic failure can happen. Reports have already come back on the safety features of HOBS formulas showing reduction of oil fire incidents combined with the explosiveness of fuels. The high flash of over 600⁰F (COC 320⁰C) can be an exceptional benefit during serious catastrophic failure due to problems from fuel systems and timing malfunctions, creating engine explosion and/or hot oil fires.

Improved Biodegradability over Mineral Oil Formulas

These are environmentally responsible, high performance, racing oils that are formulated from agricultural renewable resources. We believe Earth's environmental future rests in the use of renewable materials.

Test Data: Fifteen years of supporting test data and testimonials can be supplied upon request.

Early test data (1998) showing performance improvements with only 20% Stabilized HOBS blended in BIO-SAE 5W30 formula

TYPICAL SPECIFICATIONS Page 3	METHOD	<u>Bio-SAE 5W30</u> HOBS	Reference API-SJ 5W30 Mineral Oil	Specifications
TEST				
Specific Gravity @ 15.6°C	ASTM D-287	0.86	0.87	
API Gravity @ 15.6°C	ASTM D-287	33	30.5	
Viscosity @ 40°C	ASTM D-445	51.5	68.54	
Viscosity @ 100°C	ASTM D-445	10.3	11.24	
Viscosity @ -35°C MRV TP1	ASTM D-4684	20,959 cP	26,026 cP	<60,000 cP at °C
Viscosity Index	ASTM D-2270	194	157	
Flash Point (COC)	ASTM D-92	215°C	200°C	200°C
*ALSO AVAILABLE IN DIFFERENT VISCOSITIES				
ACCELERATED BENCH TESTS				
Dispersant Coker LZ #1323	Lubrizol			
Coker rating		9.6	3.7	0-10 (10=best)
% Unit rating		96	30	0-100 (100=best)
ASTM Foam D892A	ASTM D-892			
Sequence 1		0/0	0/0	10.0/0
Sequence 2		0/0	0/0	50.0/0
Sequence 3		0/0	0/0	10.0/0
Sequence 4 D6082		20/0	100/0	200/50 (GF-3 100/0)
L-38 CU-PB Corrosion LZ #1210Y	Lubrizol			
Weight change CU + PB, mg		56.6	59.4	Baseline Avg. 49
Rating CU_D130		3A	3B	(upper limit 65-lower 33)
Weight change CU, mg		26.8	24.7	The lower the # the better the result
Weight change PB, mg		29.8	34.7	
Storage Stability LZ #501B (Weeks 1-2-3-4)*	Lubrizol			
RT with steel		V-V-V-V	V-V-V-V	
65°C with steel		T-T-T-T	T-T-T-T	Typical results are C,L,T,V,Z
0°C at 0°C		C-C-C-C	C-C-C-C	Bad results would be S-Solid,
0°C at RT		C-C-C-C	C-C-C-C	G-Gel and E-Sedimentation
-18°C at -18°C		T-T-T-T	T-T-T-T	
-18°C at RT		C-C-C-C	C-C-C-C	
Ball Rust Test LZ #1319 (GF-3)	Lubrizol			
Rust Rating avg.		137.7	136.8	0-135 (135=cleanest) <100 Fail
% Variability		2	2	Strive for <30% variability between two runs
III E Ring Land Deposits Test LZ #1289	Lubrizol			
Universal No.		99	Not Completed	0-100 (100=cleanest)
NOACK Volatility % max 1h at 250°C	Lubrizol			
		11.8	21	GF-2 22 (max) GF-3 15 (max)
*C=Clear, T=Clear + Trace; Z=Hazy; L=Slightly Hazy; V=Very Slightly Hazy				