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Biobased Products That Perform Like Synthetics at a Lower Cost

During early day research and development collaborations, independent tests had been completed by another major chemical company laboratory who requested their name to be kept confidential for this report. (see Assessment of RLI Ultimax Technology Attached) For the purpose of testing the strength of the technology, the tests were run on Renewable Lubricants, Inc. (RLI) patented Bio-Ultimax™ Technology with 28.5% less antiwear and antioxidant chemistry (modified) than the standard commercial Bio-Ultimax™ 1000 and 2000 that is sold in the industry today. In addition, this modified Bio-Ultimax™ Technology was compared to Quaker's polyolester bio-hydraulic fluid and Cargill's vegetable oil bio-hydraulic fluid.

The accelerated bench tests show that RLI's Bio-Ultimax™ Technology, at this lower treat rate, can out-perform the commercial vegetable hydraulic fluid and can perform as good as or better than the polyolester synthetic hydraulic fluid. In comparing the cost, the RLI's commercial biobased hydraulic fluids are priced at $600 to $1,200 per 55 gallon drum and synthetic biodegradable hydraulic fluids are priced at $1,500 to $3,000 per 55 gallon drum.

In the ASTM-D2270 RBOT, the modified Bio-Ultimax™ 1000 ISO 46 and 2000 ISO 46 with 261 and 509 minutes, considerably out-performed the Quaker and Cargill fluids with poorer oxidation of 27 and 177 minutes. In the ASTM D2893 Oxidation Test, the viscosities and total acid number (TAN) are compared. The Quaker synthetic showed a total 14% viscosity change from -5.8 to 8.2 percent with higher TAN of 1.3 to 2.0 (mg KOH/g) compared to RLI's total 16.2% and 15.6% viscosity change with much lower TAN of 0.28 to 0.43 and 0.29 to 0.35. The Cargill fluid shows very poor oxidation stability and was destroyed in this test with a viscosity of molasses and a very high TAN of 0.92 to 7.4.

Contact RLI for additional independent test data and lower cost products.

Respectfully submitted,

William W. Garmier, Vice-President
Renewable Lubricants, Inc.

Comparitive Assessment of RLI Ultimax Technology - September 6, 2005

			RLI Ultimax 1000	RLI Ultimax 2000	Commercial Polyolester bio-hydraulic fluid *Quaker*	Commercial vegetable oil bio-hydraulic fluid *Cargill*
1	Physical Properties					
1.1	Viscosity @ 40°C, cSt	ASTM D445	47	47.9	48.2	37.7
1.2	Viscosity @ 100°C, cSt	ASTM D445	9.62	9.74	10.9	8.65
1.3	Viscosity Index	ASTM D2272	195	194	225	215
1.4	Pour Point, °C	ASTM D97	-40	-31	-32	n/d
1.5	Flash Point, °F	ASTM D92	460	465	500	590
2	Corrosion Testing	ASTM D665A	Pass	Pass	Pass	Pass
		ASTM D665B	Pass	Pass	Pass	Pass
3	Oxidation Testing - RBOT @150°C, mins	ASTM D2272	261	509	177	27
	Oxidation Testing - 121°C for 13 days	ASTM D2893				
	Viscosity change @ 40°C after 13 days, %		10.2	5.6	-5.8	2780
	Viscosity change @ 100°C after 13 days, %		7.3	3.7	-6.6	902
	Viscosity change @ 40°C after 6 weeks, %		16.2	15.6	8.2	not tested
	Total Viscosity Change @ 40°C after 6 weeks, %		16.2	15.6	14	
	TAN change after 13 days, mg KOH/g		0.28 to 0.43	0.29 to 0.35	1.3 to 2.0	0.92 to 7.4
4	Foam Testing					
	Sequence I	ASTM D892	0 Foam (10 min)	0 Foam (10 min)	0 Foam (10 min)	0 Foam (10 min)
	Sequence II	ASTM D893	0 Foam (10 min)	0 Foam (10 min)	0 Foam (10 min)	0 Foam (10 min)
	Sequence III	ASTM D894	0 Foam (10 min)	0 Foam (10 min)	0 Foam (10 min)	0 Foam (10 min)