Renewable Lubricants, Inc.
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Bio-SynXtra™ FG Turbine R & O Fluids (Food Grade H1) ISO 22, 32, 46, 68, 100, 150, 220

"Biobased Lubricants that Perform Like Synthetics"

Bio-SynXtra™ FG Turbine R&O Fluids are bio-synthetic Food Grade[2] H1 formulas that contain ingredients, which are "Generally Regarded as Safe" (GRAS) for food possessing equipment. These Biodegradable[1] Food Grade[2] Turbine R&O lubricants are formulated with food grade[2] biosynthetic and PAO base stocks to provide superior oxidation stability, rust prevention, lubricity, and cold temperature performance for longer service life in large capacity steam and non-geared gas turbine oil applications. This superior base oil system and patented additive technology provide improved performance of over 12,000 hours in the ASTMD-943 Turbine Oil Oxidation Test. This allows the products to be used for extended service life in some cases over 3 times that of conventional petroleum-based fluids.

This leads to reduced deposits and cleaner equipment with high resistance to deposit formation and filter plugging. They are highly inhibited against oxidation, foam, moisture and pass both fresh and sea water, A and B Sequences of the ASTM D-665 Turbine Oil Rust Test. They provide long service life in R&O hydraulic systems, and gear cases not requiring high EP Gear lubricant performance, i.e., bearing circulating systems, friction clutches, reduction unit, heat transfer systems, steam turbines, air compressors and other industrial systems not requiring high extreme pressure (EP) performance. The lubricants also exhibit mild anti-wear, excellent water separability, resistance to emulsion formation and anti-foaming characteristics which provides efficient operation, and good air release properties that are critical for hydraulic control mechanisms.

Turbines: Bio-SynXtra™ FG Turbine R&O Fluids meet or exceeds the requirements of Turbine R&O, AW Turbine R&O, Steam Turbine R&O and Gas Turbine R&O Oils. ISO Grades 32 and 46 provide the Class I (SHC) electrical conductivity required in ASTM D-4308 and low volatility for required ASTM-E659 Autoignition Temperature above 310^{O}C for Gas Turbines. In addition, because they are bio-synthetic they provide excellent thermal and oxidation stability exceeding the 2000 hours ASTM D-943 TOST requirement for Solar Gas Turbine. The products are zinc free and may also be used in pump systems with silver lined bearings and reduction units where original equipment manufacturers (OEMs) require Turbine R&O fluids. Meets or Exceeds: Westinghouse, Dresser, ABB, Fiat Aviazione, Siemens TLV901304, AFNOR NFE 48-600 HL & 48-603 HL, DIN 51515 & 51524 Part 1, U.S. Steel 120, British BS 489, GE GEK 32568F, Cincinnati Landis P-38/55/54, Brown Boveri HTGD 90117, Solar ES 9-224, Alstom HTGD 90117, and MIL-H-17672C. The products may be used in reduction units where original equipment manufacturers (OEM) require an R&O lubricant and where they meet the OEM viscosity ranges. (i.e. AFNOR NFE 48-600 HL, DIN 51524 Part 1, and Denison HF-1 fluids). They also meet the requirements for ashless, GL-1, GL-2, GL-3, DIN 51517 Part 3, AGMA No EP, and AGMA Non-EP gear oils for bearings, reduction units, and gear sets and any application not requiring extreme pressure (EP) protection Specifications. Contains no animal byproducts and are manufactured under kosher supervision.
Additional applications include: General Purpose Lubricants, machine oils for shop use, Bio-SynXtra™ FG Fluids ISO 22 through ISO 150 are recommended for electric motor bearings, air equipment, air compressors, gears, hydroelectric turbines, steam turbines, combustion turbine generators (gas), marine turbines, and Hydraulic Systems except heavy duty systems where anti-wear hydraulic fluids are recommended, and for gear lubrication as rust and oxidation inhibited R&O gear oils. ISO 46 through 680 Meet ANSI/AGMA 9005-D94. For higher extreme pressure (EP) Food Grade performance products (see BioSynXtra FG Compressor Fluids).

Maximum oil change intervals can be obtained through proper maintenance and RLI's oil analysis program. Under good operating conditions and monitoring oil analysis program, ISO Grades 32, 46, and 68 could extend service life up to 10,000 hours in rotary screw compressors. Bio-SynXtra™ FG Turbine R&O Fluids ISO Viscosity Grades 32, 46, 68, and 220 meets and exceeds "Military Specifications DOD-L-24651 Lubricating Oils, Food Grade, and Food Processing Equipment". This specification is approved for use by the Departments and Agencies of the U.S. Department of Defense. ISO Viscosity Grades 32, 46 and 68 meets DOD-L-24651 Type I and ISO Viscosity Grade 220 Meet DOD-L-24651 Type II for general purpose and gear oil lubricants. This specification also requires a rating of USDA H-1 for incidental food contact.

[2] Base oils and additives in these products are listed in 21 CFR 178.3570, Lubricants for incidental food contact HX1 for (USDA H1) formulations. Full compliance with other applicable restrictions of FDA, USDA, oil spill, and oil pollution prevention statutes are recommended.

Elastomer Compatibility: They are compatible with the same seals, filters, materials and components that are designed to operate on petroleum oil-based formulations. They can operate in static, mid-dynamic, and dynamic areas of hydraulic systems that contain plastic nylon composite (Nylatron GS, GSM, NSM), bearing composite (Iglide), fluorocarbon (Viton), polytetrafluoroethylene (Teflon), fluorosilicone, polyurethane, polysulfide, low Nitrile Buna-N, medium Nitrile Buna-N, high Nitrile Buna-N, and Hydrogenated Nitrile Buna Rubber (HNBR).

Benefits:

➢ Safer-Reduced danger of fire/explosions ➢ Low volatility in NOACK Test	➢ Lower maintenance costs
➢ Outstanding oxidation and thermal stability	➢ Extended service and filtration life
➢ Exceptionally low pour point	➢ Low varnish and carbon forming tendencies
➢ Excellent rust protection	➢ High viscosity index
➢ Excellent demulsibility	➢ Low toxicity- food grade
➢ Excellent antiwear properties	➢ Biodegradable

- Meet the Environmental Protection Agency (EPA) 2013 Vessel General Permit (VGP) guidelines for ENVIROMENTALLY ACCEPTED LUBRICANTS (EALs), and should be used 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.
- They are ENVIRONMENTALLY RESPONSIBLE lubricants formulated from renewable agricultural biobased resources.
- Earth's environmental future rests in the use of renewable materials.

[1] Based on previous studies and ASTM D-7373, Bio-SynXtra™ FG Turbine R&O Fluids are Ultimate/Readily Biodegradable >60% within 28 days in ASTM D-5864/OECD 301b Aerobic Aquatic Biodegradation of Lubricants, and German Blue Angel CEC L-33-T-82 and CEC L-33-A-934 tests, for Readily Biodegradable >80% within 21 days.

Pending and Foreign Patents

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Typical Data							
ISO Grade	**22**	**32**	**46**	**68**	**100**	**150**	**220**
VISCOSITIES:							
@100^{O}C., cSt. (D-445)	4.49	5.9	7.9	11	14.9	20.2	26.9
@40^{O}C., cSt. (D-445)	20.8	29.5	43.5	66	97	142	205
Viscosity Index (D-2270)	131	149	155	159	161	165	167
Flash Point, COC, ^{O}C (D-92)	220	232	240	245	255	258	264
Pour Point, ^{O}C (D-97)	-60	-56	-54	-50	-44	-38	-36
Copper Corrosion 3hr @ 100^{O}C (D-130)	1A	1A	1A	1A	1A	1A	1A
Acid Number (D-974)	1.2	1.2	1.2	1.2	1.2	1.2	1.2
4-Ball Wear, mm (D-2266) 20 kg 1800 rpm	.50	.50	.40	.40	.40	.40	.40
FZG Test A/8.3/90 (DIN 51354 Part 2)	10	10	11	11	11	11	11
Demulsibility (D-2711) **(<15 minutes)**	40/40/0	40/40/0	40/40/0	40/40/0	40/40/0	40/40/0	40/40/0
Steam Demulsibility, IP 19 seconds (Avg.)	100-200	100-200	100-200	100-200	100-200	100-200	100-200
Foam Sequence I, II, III (D-892)	**<30/0 Foam**	**<30/0 Foam**	**<30/0 Foam**	**<30/0 Foam**	**<<30/0 Foam**	**<30/0 Foam**	**<30/0 Foam**
Air release (DIN51381, ASTM D 3427 (minutes)	**3**	**3**	**3**	**3**	**4**	**4**	**5**
Rust Prevention (D-665 A & B)	Pass	Pass	Pass	Pass	Pass	Pass	Pass
TOST (ASTM-943 Hrs. 2.0 NNA)	12,000+	12,000+	12,000+	12,000+	12,000+	12,000+	12,000+
Rotary Bomb Oxidation, (minutes ASTM D-2272	1,000+	1,000+	1,000+	1,000+	1,000+	1,000+	1,000+
Dielectric Strength, kV (D-877)	>40	>40	>40	>40	>40	>40	>40
RLI Product Item #	**88600**	**88610**	**88620**	**88630**	**88640**	**88650**	**88660**

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