



BIOSYNTHETIC[®]
TECHNOLOGIES

GREASE

Biosynthetic[®] Technologies' biobased, renewable and biodegradable base oils have proven successful in creating quality grease formulations that deliver excellent performance across many applications. These uniquely patented oils can be used as an additive or as a base oil replacement.

To illustrate the superior functionality of these oils, Biosynthetic Technologies formulated several grease formulations that not only protect bearings and machinery components against wear and corrosion, they are especially suitable in high and low-temperature environments with a superior pour points.

Greases formulated with Biosynthetic Technologies' base oils, reduce friction for smooth performance under the toughest conditions and can match PAO-grease performance in all critical areas. In addition, the base oils superior oxidation and hydrolytic stability provide long lubricant life and excellent equipment protection.

Biosynthetic Technologies base oils are compatible with a wide variety of high-quality thickeners giving formulators a sustainable foundation for high-value products. In addition, they are compatible with conventional additive packages, allowing for formulation of superior industrial greases utilizing the patented Estolides technology.

Biosynthetic Technologies based greases are a perfect choice for environmentally sensitive areas. They are Ecolabel compliant and food grade (HX1) certified and are suitable for demanding U.S. EPA VGP regulations.

Grease Sample Formulation

**USDA Certified Biobased
Superior Oxidative Stability
Excellent Wear Performance
Superior Hydrolytic Stability
HX-1 Certified
Biodegradable and Non-Toxic
Excellent Performance Characteristics**

These sample formulations have been created to assist our partners in formulating Grease. However, they are not intended for commercialization.

Formulation Data

For this Biosynthetic Technologies' grease sample formulation, the BT22 was used. 10% base gel was made using dry technology. Pre-formed lithium 12-hydroxystearate was heated with 40% of the batch mass of BT22 to beyond the point where the soap was melted to 220°C. The remaining 50% of the batch mass of BT22 was added rapidly causing the thickener to gel. The grease was finished by taking the gel and adding BT22 and additives to it. The grease was finished with a homogenizer at 6000 psi.

Applications

Ideal for use in a variety of grease applications that need to meet the EcoLabel or VGP requirements. Suitable for several grease applications in construction, industrial, agricultural, marine, mining and automotive applications where environmental and safety concerns are high. In marine applications, where US VGP 2013 requires environmentally acceptable lubricants, Biosynthetic Technologies Base Oils enable grease formulations to meet performance expectations where other mineral oil replacements fall short.

Biosynthetic Technologies Base Oil Performance Features

- High Oxidative Stability
- Low Volatility
- Excellent Anti-wear Performance
- High Viscosity Index
- Hydrolytic Stability
- Low Pour Point
- Natural Detergency
- Longer Lasting
- High Shear Stability
- Increased Safety
- Fewer Additives Needed
- Increased Stability
- Less Maintenance

Biosynthetic Technologies Base Oil Environmental Benefits

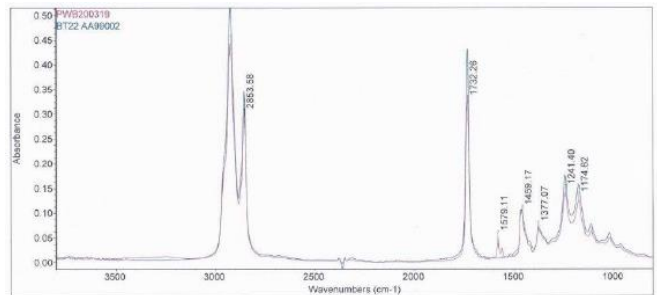
- High Biodegradability
- Low Bioaccumulation
- Low Toxicity
- High Bio-Content
- Low Environmental Risk
- Reduced Risk to Wildlife
- EcoLabel compliant
- VGP compliant
- Renewable Carbon Based

Certifications and Registrations



Final Formulation

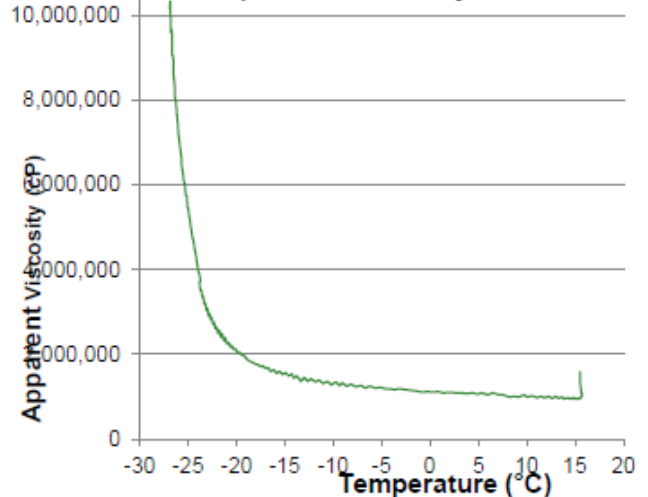
Component	%
BT22	84.8
Lithium 12-Hydroxystearate	6.3
Blachford Complex B	0.9
Vanlube 73 Super Plus	3
Irganox L57	1
NaSul 707	1.5
TPPT	1.5
Vanlube 7723	1



Grease Viscosity Test

Test	Method	BT 22 Grease	GC-LB Specs
Color	Report	Tan	
Appearance	Report	Smooth	
Base Oil Four Ball Wear, 40kg, 75 °C, 1200 rpm, 1h, mm	ASTM D4172	0.62, 0.085 CoF	
Unworked Penetration, 1/10 th mm	ASTM D217	271	
Worked Penetration, 60x, 1/10 th mm	ASTM D217	276	220-340*
NLGI Grade	ASTM D217	2	
Prolonged Worked Penetration, 10,000, 1/10 th m	ASTM D217	342	
Worked Penetration, 10,000x	ASTM D217	321	
Oil Separation, 24h at 100 °C, %	ASTM D6184	0.95	
Evaporation, 24h, 100 °C, %	CTM-1	0.71	
Dropping Point, °C	ASTM D2265	249	150 min
Water Washout, 38 °C, %	ASTM D1264	4.75	
Four Ball Wear, 40kg, 75 °C, 1200 rpm, 1h, mm	ASTM D2266	0.42, 0.072 CoF	0.6 max
Chemistry	FT-IR	See Figure 1	
Low Temperature Apparent Viscosity, T-C	CTM-4	-23	
Spindle, Inception Point, °C	(Brookfield)	See Figure 2	
Oxidation Induction Time, 210 °C, min	ASTM D5483 Modified	80.5	
Four Ball Extreme Pressure, Weld, kg,	ASTM D2596	>250 <315	200 min

Figure 2: PWB200319 Low Temperature Viscosity



Formulation Assistance

Our lubricant specialists are well versed in our patented sustainable base oils as well as a variety of targeted performance additives engineered to provide ideal lubrication properties in countless applications. Our technical support staff is available to help with your formulation needs and assist you in achieving your target viscosity, biodegradability and renewability levels while remaining within your targeted price point.

Protect the environment

Biosynthetic® Technologies is committed to sustainability and clearly focused on the responsible use of natural resources in our daily business. We understand that health, environmental awareness and traceability play just as large a role for consumers as quality and efficacy. Biosynthetic® Technologies is aware of its responsibility in this business and sustainability. As such, our manufacturing facility is operating with a NEGATIVE carbon footprint! Take used oil and grease to an authorized collection point. Comply with local regulations. Do not discharge into drains, soil or water.

Health & Safety

This product is not likely to present any significant health or safety hazards when properly used in the recommended application and good standards of personal hygiene are maintained. Reference is made to the Safety Data Sheet (SDS).

Storage

We recommend storing all packages under cover. In case outside storage is unavoidable, drums should be laid horizontally to avoid the possible ingress of water and damage to drum markings. Products should never be stored above 60°C, exposed to hot sun or freezing conditions.

Legal disclaimer

Typical properties depicted on this document are average values only and do not constitute a specification. Minor variations that do not affect product performance are to be expected during normal manufacture, and at different blending locations. Product formulations are subject to change without notification.

**Pertains to Biosynthetic base oils and not the formulated product.*

Viscosity Blending Chart

	ISO 150	ISO 150	ISO 220	ISO 320	ISO 460	ISO 680
ISO VG 22 products KV @100 C – BT22	100%	-	-	-	-	-
ISO VG 150 products KV @100 C – BT75	-	60%	70%	80%	90%	100%
PAO 4	-	40%	30%	20%	10%	
Biodegradability	79%	73%	74%	75%	75%	76%
Renewable	84%	53%	63%	73%	84%	94%

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