

#567 ECOSHIELD™ BIODEGRADABLE EP GEAR OIL

ISO 150, 220, 320

EcoShield™ Biodegradable EP Gear Oil is a readily biodegradable, environmentally friendly, ecologically responsive, synthetic, non-toxic, thermally stable and thermally durable extreme pressure lubricant. It is specially formulated for the lubrication of marine gear drives and thrusters, slide and way systems, bearings and bushings that are subjected to heavy loading or shock loading conditions. EcoShield™ Biodegradable EP Gear Oil is also recommended for use in bearing and gear applications that are operated in environmentally sensitive areas. EcoShield™ Biodegradable EP Gear Oil meets the USDA definition EO 13101 for bio-based products and meets and complies with the U.S. EPA's definition of an Environmentally Acceptable Lubricant as defined in Appendix A of the U.S. EPA's Vessel General Permit.

EcoShield™ Biodegradable EP Gear Oil is formulated from a blend of renewable hydrocarbons, hydrolytically stable, renewable, synthetic esters and a thermally stable, thermally durable multi-functional extreme pressure additive package. This combination provides EcoShield™ Biodegradable EP Gear Oil with the following performance advantages and benefits:

- Readily biodegradable, with low ecotoxicity
- Low aquatic toxicity and non-bioaccumulative
- Very low impact to water and soil during usage in case of a spill
- Wide operating temperature range and low volatility characteristics
- A high viscosity index
- High renewability content
- Excellent lubricity
- Compatibility with mineral oils, PAO and ester synthetic base fluids
- Very good scuffing load capacity
- Excellent protection from micro pitting fatigue wear especially to heavily loaded gear drives with surface-hardened tooth metallurgies even under extreme conditions
- Excellent extreme pressure retention, thermal and oxidative stability and durability
- Excellent clean gear performance under high temperature/oxidation conditions
- Enhanced gear, bearing and seal cleanliness
- Excellent shear stability
- Excellent prevention against the formation of sludge, carbon and varnish deposits that can erode seals and cause premature bearing and gear wear
- Excellent resistance to rust and corrosion
- Excellent demulsibility characteristics and hydrolytic stability
- Excellent filterability, outstanding filter life, even in the presence of water
- Excellent resistance to foaming

APPLICATION NOTES

EcoShield™ Biodegradable EP Gear Oil is miscible with conventional mineral oils and polyalphaolefin synthetic base oils. The product is also miscible with vegetable base oil (HETG), synthetic ester (HTEES) and synthetic hydrocarbon (HEPR) biodegradable base fluids. It is not compatible or miscible with polyalkylene glycol base fluids. If the product is mixed with mineral or PAO synthetic base fluids the product may no longer be readily biodegradable. It is recommended that the gear drive and oil circulation system be carefully cleaned and flushed before switching to the EcoShield™ Biodegradable EP Gear Oil.

The following procedure is recommended when switching over to EcoShield™ Biodegradable EP Gear Oil:

1. Run the equipment until it is warm. Drain the previous lubricant from the gear drive
2. Replace oil filters
3. Fill the gear drive with EcoShield™ Biodegradable EP Gear Oil. Run the equipment for 1 to 4 hours under no load conditions in order to completely circulate the fluid
4. Thoroughly drain the EcoShield™ Biodegradable EP Gear Oil while warm.
5. Change and replace the oil filters.
6. Fill the gear drive with EcoShield™ Biodegradable EP Gear Oil and begin normal operation.
7. Inspect and change filters as required

EcoShield™ Biodegradable EP Gear Oil is compatible with hydrogenated nitrile (HNBR), FPM/FKM and Viton® fluoroelastomers. Depending upon the elastomer grade, the product is also compatible with nitrile (NBR) elastomers. Always check with the OEM to verify if the seal material used is compatible and acceptable for use with fluids that contain synthetic esters. Also, prior to application, Schaeffer Mfg. recommends reviewing compatibility and other influencing factors (e.g. maximum permissible water content in the oil) with the component under conditions that would be encountered in the field.

EcoShield™ Biodegradable EP Gear Oil meets the requirements and is suitable for use in those applications that specify the following gear oil standards and specifications:

- AGMA 9005 E02
- AGMA F-16
- DIN 51517 Part 3
- ISO 12925-1 CKC/CKD
- Cincinnati Machine P-76 (ISO 100), P-77 (ISO 150)
- David Brown S1.53.101
- AIST 224 (Formally U.S. Steel 224)
- FZG Micro pitting

TYPICAL PROPERTIES

ISO Grade	150	220	320
Specific Gravity 60°F (15.6°C)	.8953	.9132	.9256
Viscosity cSt @ 40°C (ASTM D445)	158.65	229.2	316.52
Viscosity cSt @ 100°C (ASTM D445)	20.43	26.24	33.85
Viscosity Index (ASTM D2270)	150	147	150
Flash Point °F (°C), C.O.C (ASTM D92)	428° (220°)	428° (224°)	442° (228°)
Pour Point °F (°C), (ASTM D97)	-40° (-40°)	-30° (-34°)	-30° (-34°)
Rust Test, 24 hours @ 60°C (ASTM D665) Procedure A Procedure B	Pass Pass	Pass Pass	Pass Pass
Copper Strip Corrosion 3 hours @ 100°C (ASTM D130)	1b	1b	1b
Foam Test (ASTM D889) Sequence I Sequence II Sequence III	0/0 0/0 0/0	0/0 0/0 0/0	0/0 0/0 0/0
FAG FE-8 Bearing Test DIN 51819-3 Roller Wear mg	2	2	2
FZG (Four Square Gear Test) (ASTM D5182;A/8.3/90)	13 th	13 th	13 th

ISO Grade	150	220	320
FZG FVA 54/7 Micropitting Test	>10/high	>10/high	>10/high
Four Ball EP Test (ASTM D2783) Weld Point, kgf	400	400	400
Four Ball Wear Test (ASTM D4172), 40kg, 1 hour 167°F Scar diameter, mm	0.3	0.28	0.28
Timken OK Load, (ASTM D2782) Failure Load, lbs.	70	70	70
Water Separation @ 82°C (ASTM D1401)	≤3 ml emulsion at 30 minutes	≤3 ml emulsion at 30 minutes	≤3 ml emulsion at 30 minutes
% Biodegradability OCED 301B	>60%	>60%	>60%
% Bio based Content	>70%	>70%	>70%
Ecotoxicity			
Rainbow Trout, 96 hrs. LC50 mg/l	>100	>100	>100
Daphnia Magna, 48 hours LC50 mg/l	>1000	>1000	>1000
Algae, 72 hours, ErC50	>1000	>1000	>1000
EPA Static Sheen Test	Pass	Pass	Pass
Bioaccumulation	Negative	Negative	Negative