

512M VGP-EAL MARINE ECOSHIELD™ BIODEGRADABLE HYDRAULIC FLUID

ISO 32, 46 & 68

VGP-EAL Marine ECOSHIELD™ Biodegradable Hydraulic Fluid is a fully formulated anti-wear, readily biodegradable, environmentally friendly, ecologically responsive, non-toxic fluid that is designed for use in those high pressure marine hydraulic systems, turbines and circulating oil systems that are operated in environmentally sensitive areas. VGP-EAL Marine ECOSHIELD™ Biodegradable Hydraulic Fluid meets the USDA definition EO 13101 for Biobased products and the U.S. EPA's 2013 Vessel General Permit (VGP) specifications and requirements for Environmentally Acceptable Lubricants (EAL) for marine applications where the lubricant may come into contact or interface with fresh or sea water.

VGP-EAL Marine ECOSHIELD™ Biodegradable Hydraulic Fluid is formulated from a blend of renewable hydrocarbons, hydrolytically stable, renewable, synthetic esters, and a highly specialized ashless non-zinc anti-wear, thermally stable multifunctional additive package. This unique combination provides VGP-EAL Marine ECOSHIELD™ Biodegradable Hydraulic Fluid with the following performance advantages:

- Excellent oxidative and thermal stability.
- Very good low temperature properties.
- High natural viscosity index.
- Very good natural lubricity.
- Low volatility characteristics and very low foaming tendencies.
- Excellent anti-wear, rust and corrosion protection
- Extended pump and bearing life
- Excellent demulsibility and filterability.
- Enhanced hydrolytic stability.
- Low free Phenol per EPA 420.1.

VGP-EAL Marine ECOSHIELD™ Biodegradable Hydraulic Fluid meets and exceeds the following specifications and manufacturer's requirements: Denison HF-O, Eaton-Vickers I-286-S, M-2950-S, Eaton Char-Lynn, Eaton, FMC, Rexnord, Commercial Shearing HD 2/900, Commercial Hydraulics, Cincinnati Milicron P-54, P-68, P-69 and P-70; DIN 51524 Part 3, Bosch Rexroth, Saur Sundstrand, Saur Danfoss, US Steel 126, 127 and 136 and AF Nor E 48-603.

APPLICATION NOTES

VGP-EAL Marine ECOSHIELD™ Biodegradable Hydraulic Fluid is miscible with conventional mineral oils, polyalphaolefin synthetic base oils, vegetable base oil (HETG), synthetic ester (HEES) and synthetic hydrocarbon (HEPR) biodegradable base fluids. ***It is not compatible or miscible with polyalkylene glycol base fluids (HEPG).*** 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 system be carefully cleaned and flushed before switching to the VGP-EAL Marine ECOSHIELD™ Biodegradable Hydraulic Fluid by using the following procedure:

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 VGP-EAL Marine ECOSHIELD™ Biodegradable Hydraulic Fluid. Run the equipment for 1 to 4 hours under no load conditions in order to completely circulate the fluid
4. Thoroughly drain the VGP-EAL Marine ECOSHIELD™ Biodegradable Hydraulic Fluid while warm.
5. Change and replace the oil filters.

6. Fill the gear drive with VGP-EAL Marine ECOSHIELD™ Biodegradable Hydraulic Fluid and begin normal operation.
7. Inspect and change filters as required

VGP-EAL Marine ECOSHIELD™ Biodegradable Hydraulic Fluid is compatible with hydrogenated nitrile (HNBR), FPM/FKM and Viton® fluoroelastomers. Depending upon the elastomer grade, the product is also compatible with nitrile (NBR, Buna-N) 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.

TYPICAL PROPERTIES

ISO Grade	32	46	68
Specific Gravity @ 60°F/15°C	0.9259	0.9250	0.9048
Viscosity @ 40°C, cSt (ASTM D445)	30.00 -35.50	41.50 - 50.50	61.00 – 74.70
Viscosity @ 100°C, cSt (ASTM D445)	6.9 – 8.1	8.70 – 10.90	12.50 – 15.90
Viscosity Index (ASTM D2270)	205	206	218
Flash Point °F/°C (ASTM D92)	421°/216°	466°/241°	397°/203°
Pour Point °F/°C (ASTM D97)	-28°/-33.33°	-28°/-33.33°	-20°/-28.89°
Foam Test (ASTM D892), Tendency Stability, ml			
Sequence I	0/0	0/0	0/0
Sequence II	0/0	0/0	0/0
Sequence III	0/0	0/0	0/0
Total Acid Number (ASTM D664)	0.54	0.54	0.54
Demulsibility (ASTM D1401)			
@ 130°F/54.4°C; Oil-Water-Emulsion (min)	40/40/0 (15 min)	40/40/0 (15 min)	40/40/0 (15 min)
Rust Test (ASTM D665)			
Procedure A (Distilled Water)	Pass	Pass	Pass
Procedure B (Salt Water)	Pass	Pass	Pass
Aniline Point °F/°C (ASTM D611)	197°/91.67°	197°/91.67°	197°/91.67°
Hydrolytic Stability (ASTM D2619)			
Copper Wt. Loss (mg/cm ²)	0.01	0.01	0.01
Acidity of Water, mg/KOH	0.21	0.21	0.21
Copper Strip Corrosion Test (ASTM D130)	1a	1a	1a
Oxidative Stability (ASTM D2272) RPVOT, minutes to fail	210	210	210
Oxidation Solubility Test (ASTM D943)			
Hours to TAN of 2	4000	4000	4000
Four Ball Wear (ASTM D4172)			
1hr/40kg/167°, Scar Diameter, mm	0.36	0.36	0.36
FZG (DIN) (5182)			
Load Stage	12	12	12
Vickers 35VQ Pump Wear Test Standard Duration (3000 psi/200°F/2400rpm)			
Total Ring & Vane Wt. Loss, mg. First 50 Hour Test	8	8	8
Total Ring & Vane Wt. Loss, mg. Second 50 Hour (100 hours Total)	11	11	11
Total Ring & Vane Wt. Loss, mg. Third 50 Hour (150 hours Total)	10	10	10
Vickers 35VQ Pump Wear Test Extended Duration			
Total Ring & Vane Wt. Loss, mg. 350hrs on oil; 250 hours on cartridge	33	33	33
Total Ring & Vane Wt. Loss, mg. 550hrs on oil; 450 hours on cartridge	174	174	174

ISO Grade	32	46	68
Vickers V-104C Pump Test (2000 psi, 1200 rpm, 175°F; 100 hours)			
Total Ring & Vane Wt. Loss, mg	3.9	3.9	3.9
Vickers 20VQ5 Pump Test			
Total Ring & Vane Wt. Loss, mg	0.0	0.0	0.0
Denison T-5D Vane Pump Test (2,000 psi, 200°F, 100 hours)			
Total Ring & Vane Wt. Loss, mg	25	25	25
Thermal Stability Test (Cincinnati Milicron Method) (ASTM D2070)			
Sludge mg/100 ml	0.5	0.5	0.5
Condition of Copper Rod	3	3	3
Condition of Iron Rod	2	2	2
Sludging Tendencies (ASTM D4310)			
Total Sludge, mg	78.1	78.1	78.1
Copper Wt. Loss, mg	20.00	20.00	20.00
Iron Wt. Loss, mg	1.10	1.10	1.10
Air Release Properties			
Time @ 50°C/122°F	0.5	0.5	0.5
Biodegradability			
% Biodegradability CEC-L-33-T-93	95%	95%	95%
% Biodegradability Modified Stürm OECD 301B (ASTM D5864)	61%	61%	61%
Environmental Persistence Classification US Military	PW-1	PW-1	PW-1
Ecotoxicity			
Fathead Minnow, 96 hours LC50, ppm	>10,000	>10,000	>10,000
Daphnia Magna 48 hours, EC50, ppm	>10,000 WAF	>10,000 WAF	>10,000 WAF
Sludge Respiration Inhibition, EC50, ppm	>10,000	>10,000	>10,000