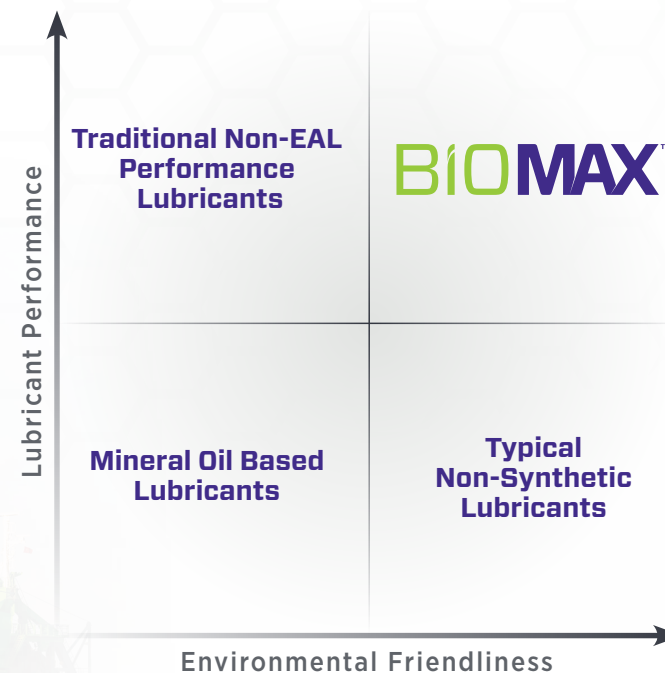


# PERFORMANCE & APPLICATIONS

## UNCOMPROMISED PERFORMANCE

Royal Purple BioMax lubricants meet or exceed all EAL requirements of ready biodegradability, low toxicity / bio-accumulation, and bio-renewability.



## PERFORMANCE ADVANTAGES

- High Film Strength
- Longer Oil Life
- Excellent Corrosion Protection
- Rapidly Separates From Water
- Rapidly Biodegradable
- Renewable Components
- Low Toxicity & Bioaccumulation
- EU ECOLABEL (For EAL Gear Oil)

## APPLICATIONS

### BIOMAX EAL GEAR OIL

- Bow, Azimuth & Stern Thrusters
- Enclosed Gear Drives
- Mining
- Off Shore Oilfield Drilling
- Wind Gears

 For all applications in environmentally sensitive areas.

### BIOMAX EAL HYDRAULIC OIL

- Bow, Azimuth & Stern Thrusters
- Capstan Hydraulic Pumps / Winches
- Controllable Pitch Propellers
- Deck Cranes
- Forestry Equipment
- Mobile Equipment (ROVs)
- Offshore Marine Vessels, Work Boats
- Stern Tubes
- Water parks

**ROYAL PURPLE**  
SYNTHETIC OIL

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### CALUMET BRANDED PRODUCTS, LLC

2780 Waterfront Parkway East Drive | Suite 200 | Indianapolis, IN 46214

PHONE 281-354-8600

FAX 281-354-7335

TOLL FREE 888-382-6300

WEB [www.royalpurple.com](http://www.royalpurple.com)

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**BIO MAX™**

High Performance EAL  
Gear & Hydraulic Oils



# PERFORMANCE THAT OUTPERFORMS

# BIO MAX™

# TYPICAL PROPERTIES

Founded in 1986, Royal Purple is recognized as a leading manufacturer of synthetic lubricants, oils, and greases for consumer and industrial based applications. Royal Purple's development of a unique proprietary additive technology, called Synerlec®, fortifies lubricants with unusually high film strength capable of better protecting bearings, gears and other lubricated components under extreme loads. This specialized technology also provides exceptional oxidation stability for long oil life while providing rust and corrosion protection in both wet and high temperature applications.

## TOUGH JOBS REQUIRE TOUGH SOLUTIONS

EPA 2013 VGP regulations for marine vessels require the use of EAL's (Environmentally Acceptable Lubricants) in all oil-to-sea interfaces. Royal Purple's in house expert R&D team has developed BIOMAX™ EAL GEAR OIL and BIOMAX™ EAL HYDRAULIC OIL to meet these needs.

BioMax EAL lubricants provide excellent performance for use in sensitive environments such as thrust gears, steering gears, stern lube and other marine related services. The long life and high film strength of BioMax greatly increases equipment reliability as well as providing excellent protection in highly corrosive environments. It gains its superior performance advantage over competing oils through its powerful blend of base oils plus our proprietary Synerlec additive technology, that is proven to make bearings and equipment run smoother, cooler, quieter, longer and more efficiently.

Royal Purple's Biomax lubricants are readily biodegradable, have low-toxicity / low bioaccumulation, and feature bio-renewable materials, in addition to providing superior lubrication and protection for equipment.

## EAL GEAR OIL & HYDRAULIC OIL

Royal Purple's BioMax EAL Gear Oils & Hydraulic Oils are environmentally acceptable, high performance lubricants formulated for those users of gear oil and hydraulic oil products in marine applications affected by the 2013 Vessel General Permit (VGP).

BioMax EAL Gear Oils & Hydraulic Oils provide excellent performance for use in sensitive environments such as thrust gears, steering gears, stern tube and other marine related services.

The long life and high film strength of BioMax EAL Gear Oils & Hydraulic Oils greatly increases equipment reliability as well as provide excellent protection in highly corrosive environments. It gains its performance advantage over competing oils through its superior blend of base oils plus Royal Purple's proprietary Synerlec additive technology. This unique, synthetic additive technology is proven to make bearings and equipment run smoother, cooler, quieter, longer and more efficiently.

## EAL GEAR OIL

TYPICAL PROPERTIES*	METHOD	ISO GRADE					
		100	150	220	320	460	680
Kinematic Viscosity @ 40°C	D445	100	150	220	320	460	680
Kinematic Viscosity @ 100°C	D445	14.4	19.7	26.3	34.8	46.1	61.6
Viscosity Index	D2270	146	149	152	153	156	159
Density @ 15°C	D4052	0.8798	0.8946	0.9077	0.9174	0.9309	0.9453
Flash Point, °C	D92	224	242	243	254	260	267
Pour Point, °C	D97	-39	-36	-36	-33	-33	-30
TAN mg KOH/g	D664	0.63	0.65	0.66	0.68	0.69	0.71
Foaming Characteristics sequence I,II,III ml	D892	0/0	0/0	0/0	0/0	0/0	0/0
Demulsibility @ 54°C	D1401	NA	NA	NA	NA	NA	NA
Demulsibility @ 82°C	D1401	40/40/0(20)	42/37/1(20)	41/39/0(20)	40/40/0(30)	43/37/0(25)	43/37/0(35)
Corrosiveness to copper, 3h/100°C	D130	1A	1A	1A	1A	1A	1A
Rust-preventing properties Steel, method A & B	D665	Pass	Pass	Pass	Pass	Pass	Pass
Ageing behaviour 312h/95°C,	D2893						
Increase in viscosity @ 100°C,		0.35%	0.813%	0.31%	0.37%	0.49%	0.52%
Increase in viscosity in insoluble content		0	0	0	0	0	0
Timken OK	D2782	100	100	100	100	100	100
Four-Ball EP Load Wear Index	D2783	60.3	60.1	68.8	77.8	85.6	86.4
Four-Ball EP Weld Load	D2783	315	315	315	315	315	315
Four-Ball EP Last Non-Seizure	D2783	126	126	160	200	200	200
Four-Ball Wear	D4172	0.49	0.48	0.50	0.46	0.45	0.45
Four-Ball Wear, (Mod 1800 rpm, 20kgf, 54C, 60 min)	D4172	0.28	0.28	0.28	0.28	0.28	0.28
FZG gear test rig FZG test condition:A/8,3/90	D5182	> 12	> 12	> 12	> 12	> 12	> 12
Roller Bearing FE8 Test: D7,5/80 kN, 80h, 80°C - Roller Wear	DIN 51819-3	< 14	< 14	< 14	< 14	< 14	< 14
Compatibility with SRE-NBR 28/SX after 7 days ± 2 hat (100±1)°C	ISO 1817	PASS	PASS	PASS	PASS	PASS	PASS
Biodegradability	D7373	> 60	> 60	> 60	> 60	> 60	> 60
Rewability	D6866	> 50	> 50	> 50	> 50	> 50	> 50
Algae Toxicity Test, mg/L	OECD 201	> 1000	> 1000	> 1000	> 1000	> 1000	> 1000
Daphnia Toxicity Test, mg/L	OECD 202	> 1000	> 1000	> 1000	> 1000	> 1000	> 1000
Fish Toxicity Test, mg/L	OECD 203	> 1000	> 1000	> 1000	> 1000	> 1000	> 1000
Bacteria Toxicity Test, mg/L	OECD 209	> 1000	> 1000	> 1000	> 1000	> 1000	> 1000

\*Properties are typical and may vary

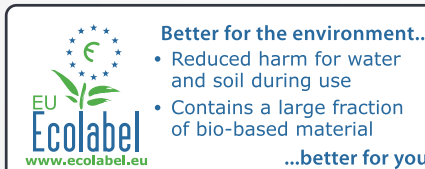
## EAL HYDRAULIC OIL

TYPICAL PROPERTIES*	METHOD	ISO GRADE			
		22	32	46	68
Viscosity	D445				
cSt @ 40°C		22	32	48	68
cSt @ 100°C		4.86	6.19	8.13	10.7
cSt @ 0°C		168.7	284.9	445.7	720.2
cSt @ -20°C		763.7	1449.7	2427.5	4887.9
Viscosity Index	D2270	134	135	141	142
Pour Point, °C	D97	-63	-60	-60	-45
Dielectric Breakdown Voltage	D877	43	48	49	47
Density @ 15 °C	D4052	0.9081	0.8592	0.8691	0.863
Copper Corrosion Test 3 hours @ 100°C	D130	1A	1A	1A	1A
Rust prevention, procedure A, 24h	D665 A & B	Pass	Pass	Pass	Pass
Foam, Seq I, II, III	D892	0/0	0/0	0/0	0/0
Air release, 50 °C	D3427	0	<4	<7	<10
Water separation	D1401	40/40/0	40/40/0	40/40/0	40/40/0
Four-Ball Wear	D4172	0.49	0.47	0.48	0.49
Four-Ball EP Load Wear Index	D2783	37.6	54.2	56.9	57.4
Four-Ball EP Weld Load	D2783	200	200	250	250
Four-Ball EP Last Non-Seizure	D2783	80	126	126	126
Mechanical testing using the	D2783	250		250	
FZG gear test rig FZG test condition: A/8,3/90	D51824	> 12	> 12	> 12	> 12
Flash point COC	D92	246	233	233	231
Elastomer compatibility, FKM, HNBR 1 at 100°C/100 after 1 000 h	ISO 6072	PASS	PASS	PASS	PASS
Load-carrying properties, FZG A/8,3/90	D5182	12	12	12	12
Vane pump, procedure A, Ring wear loss	ISO 20763	2	2	2	2
Vane wear loss		1.5	1.5	1.5	1.5
Renewability	D6866	> 50	> 50	> 50	> 50
Biodegradability, % in 28 days	OECD 301B	> 60	> 60	> 60	> 60
Algae Toxicity Test, mg/L	OECD 201	> 1000	> 1000	> 1000	> 1000
Daphnia Toxicity Test, mg/L	OECD 202	> 1000	> 1000	> 1000	> 1000
Fish Toxicity Test, mg/L	OECD 203	> 1000	> 1000	> 1000	> 1000
Bacteria Toxicity Test, mg/L	OECD 209	> 1000	> 1000	> 1000	> 1000

\*Properties are typical and may vary

**BIO MAX™**  
High Performance EAL  
Gear & Hydraulic Oils

EU Ecolabel : BE/027/004



BioMax EAL Gear Oil Ecolabel Approved