American Chemical Technologies, Inc.

EcoSafe® FR

Fire Resistant and Readily Biodegradable Hydraulic Fluids HFDU/HEPG

Formulated for Use in High Performance Hydraulic and Hydrostatic Drive Systems

EcoSafe® FR Hydraulic

A Breakthrough in Performance and Protection for High Performance Hydraulic Systems

EcoSafe® FR fluids represent a significant advancement in fire-resistant hydraulic fluid technology. These fully synthetic formulations deliver performance superior to premium anti-wear mineral oils, and offer significant performance and environmental advantages over other fluid options – including other synthetics. EcoSafe® FR fluids are used in industrial and mobile equipment, including high-pressure systems, hydrostatic drives, systems with servo valves, and all robotics.

EcoSafe® FR fluids are based on a very high VI, polyether polyol base stock combined with a non-metallic additive package. Unlike phosphate and polyol ester-based fluids, they do not break down when exposed to water, minimizing potential for fluid degradation and system damage. As a result, fluid changeout intervals are extended under even the most severe operating conditions.

EcoSafe® FR fluids are classified as FM Approved industrial fluids by Factory Mutual and meet stringent criteria for biodegradability and low toxicity.

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Performance Advantages

Excellent Lubricity – EcoSafe® FR fluids offer excellent lubricity, for outstanding pump life under the most severe conditions. The fluids meet or exceed the pump performance of premium, anti-wear mineral oils, even at 5,500 psi (380 bar) operating pressure. Shear stability is excellent. And all three grades earn a 12-stage rating in the FZG Gear Test, demonstrating high level protection against wear and scuffing.

Hydrolytic Stability – Unlike phosphate esters, polyol esters and vegetable oils, EcoSafe® FR fluids will not break down and react with water, minimizing fluid degradation and acid formation that can damage and eventually destroy hydraulic pumps.

Non-Sludge or Varnish Forming – The fluids are oxidatively stable and will not degrade to form varnish or sludge, contributing to long-term system cleanliness while extending maintenance intervals and overall service life.

High Temperature Stability – EcoSafe® FR fluids are very stable at high temperatures and resistant to thermal degradation up to 120°C (250°F).

All-Weather Service – The high viscosity indices of EcoSafe® FR fluids enable them to handle wide temperature extremes. The fluids also have low pour points necessary for cold weather start up.

Material Compatibility – EcoSafe® FR fluids are completely compatible with commonly used seals, hoses and metals. Detailed compatibility data is available upon request.

Detergency – EcoSafe® FR fluids are natural detergents, so systems remain clean…free of staining or sticky residue.

Fire Resistance – EcoSafe® FR fluids are classified as FM Approved industrial fluids by Factory Mutual.

Biodegradable/Low Toxicity – EcoSafe® FR fluids are classified as "readily biodegradable" and environmental impact is low if the products are spilled. EcoSafe® FR fluids also satisfy stringent criteria for toxicity.

EcoSafe® FR fluids meet or surpass Bosch-Rexroth, Sauer-Danfoss, Denison, Parker, Oilgear, and Eaton (formerly Vickers) specifications.

Unmatched by Other Fluids

EcoSafe® FR fluids do not have the drawbacks of other synthetic fluids, mineral oils and vegetable oils…

- Polyol esters (including vegetable oils, which are naturally occurring polyol esters) hydrolyze in the presence of water to form acid. Fluids with increased acidity attack hose linings and o-rings, and leach the alloy from brass components, resulting in premature component failure. Polyol esters also contain some degree of unsaturation, which reduces their thermal and oxidative stability. The end result is the formation of sludge and varnish from insoluble degradation byproducts.
- Phosphate esters also hydrolyze in the presence of water. This reaction accelerates with increasing temperatures and is catalyzed by the presence of strong acids. Since this hydrolysis forms strong acids the reaction is said to be autocatalytic. Metals such as copper, some copper alloys and lead act as pro-oxidation catalysts which will also accelerate this reaction. Phosphate ester fluids represent a human health hazard because a major decomposition by-product is highly toxic.

Fluids

Typical Performance Properties*

Rexroth 1,100 Hour Endurance Test (2600 rpm, 85°C [185°F], 380 bar)	Pass
Brugger Value (DIN 51347)	>40 N/mm^2
Vickers 104C Vane Pump Test, ASTM D2882	
(2000 psi, 1200 rpm, 100 hours, 65°C [150°F], 7.5 gpm, 3.5 gallon sample)	<5mg total wear
Four Ball Wear, ASTM D2266 (1800 rpm, 1 hour, 75°C (167°F), 40 kg load)	0.35 mm
Four Square Gear Test (FZG) (1760 rpm, 90°C [194°F], 1600 ml sample)	Pass, all 12 stages
Eaton Corporation 35VQ25 (formerly Vickers)	
Industrial (I-286-S), Mobile (M-2950-S)	Pass
Turbine Oil Stability Test, ASTM D943	
(95°C [203°F], iron and copper catalysts, 60 mls water) Time to 2.0 Acid Number Increase	>2,000 hours
Seal Compatibility (1,000 hours @ 100°C [212°F]) Buna-n, Viton, Polyurethane (@60°C), EPR, Butyl, PTFE	Pass
OECD Ready Biodegradability Test Method 301 B, 28 days, Requirement: >60%	70.9%

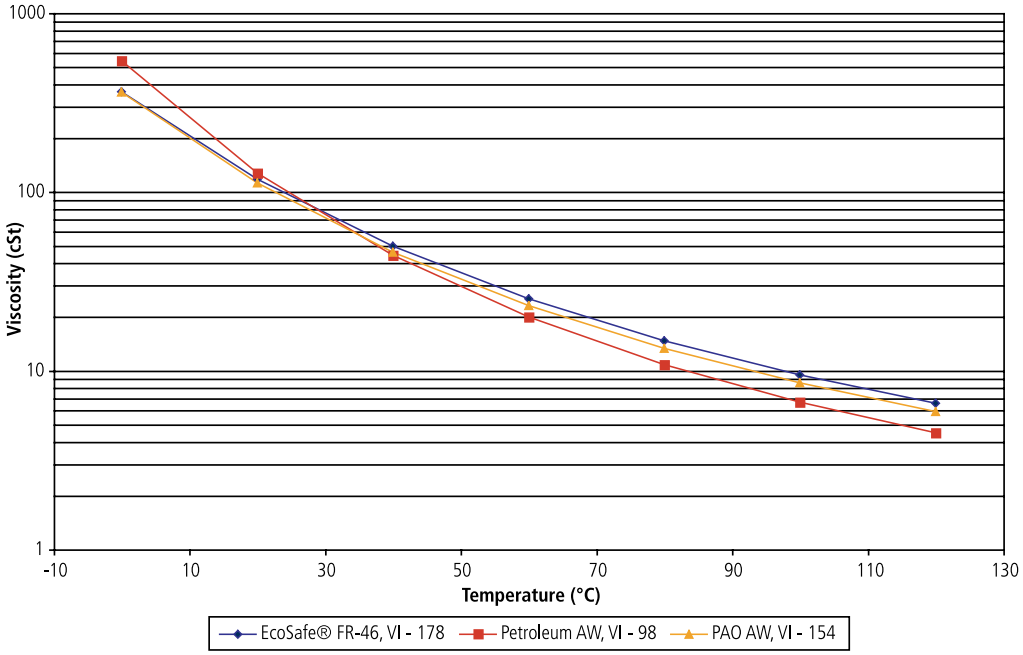
*Typical properties, not to be construed as specifications.

Typical Physical Properties*

	EcoSafe® FR-46	EcoSafe® FR-68	EcoSafe® FR-100
Viscosity @ cSt @ 40°C (100°F, SUS)	48.9 (250)	69 (350)	94.8 (480)
Viscosity @ cSt @ 100°C (210°F, SUS)	9.35 (57.5)	12.6 (69.8)	16.8 (86.6)
Viscosity Index	178	185	192
Pour Point, °C (°F)	-48 (-55)	-45 (-50)	-40 (-40)
Density (lbs/gal) @ 60°C (140°F)	8.19	8.21	8.25
FM Approved	Yes	Yes	Yes

*Typical properties, not to be construed as specifications.

Kinematic Viscosity Comparison



Superior Oxidative Stability

Results of controlled fluid tests show the superior stability of PAG-based fluids such as EcoSafe® FR fluids compared to PAOs (synthetic hydrocarbons). After 2,500 hours at 120°C, the PAO produced significant deposits, which could result in operational problems in hydraulic systems. In contrast, the vial containing the PAG-based fluid was virtually free of deposits.

EcoSafe® FR

Hydraulic Fluids

A Global Source for Premium Fluids and Lubricants

American Chemical Technologies, Inc. (ACT) provides premium industrial lubricants and metalworking fluids to a wide range of industries. Founded more than 30 years ago in the U.S., ACT has grown to become an international supplier of highly specialized products for industry and markets through a global network. Our commitment to advanced technology and personal service continues today as we set new standards for product performance and customer satisfaction.

Call On Us for Total Support

We want your experience with our products to be successful. ACT supports its products with a full range of sales, technical, and customer service support, including information and/or assistance to help you with product selection, handling, maintenance, and disposal. Our Check-Mate hydraulic fluid monitoring program is designed to enable users to maintain fluid quality while monitoring the condition of all system components. Call ACT today for expert fluids and lubricants support.

To Learn More Call: 1-800-938-0101

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- EcoSafe® EHC Hydraulic Fluids for the Power Generation Industry
- EcoSafe® NCLR Hydraulic Fluids for Nuclear Power Stations
- UCON™ Trident™ Water Soluble Anhydrous Hydraulic Fluids
- Neptune® Gear Oils
- EcoGear® Gear Oils

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