



CITGO® Glycol FR-5046HP

OVERVIEW



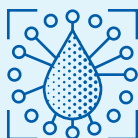
- A high-pressure, polymer-thickened water-glycol fluid which provides superior fire resistance at pressures in excess of 5,000 psi.
- Pump test results (Tables 1, 2, and 3) show low pump wear rates which are equivalent to or significantly better than phosphate esters and polyol esters.
- Long pump life at high pressures and excellent fire safety at lower cost than synthetic fluids.

FEATURES & BENEFITS



- **Fire Protection:** Contains sufficient water to snuff out ignition that can occur in hydraulic systems operating under high pressure when a line suddenly ruptures or fluid contacts an ignition source. Factory Mutual research tests show that thickened glycol-water fluid provides superior fire resistance compared to synthetics such as phosphate ester and polyol ester fluids.
- **Pump Performance:** Imparts the necessary lubricity, corrosion protection, and overall performance demanded of a high-pressure, anti-wear hydraulic fluid.
- **Higher Operating Temperature:** Viscosity will not drop below pump minimum requirements, even at temperatures greater than 180°F, providing greater protection where piping, cylinders, and other components are exposed to high temperatures. Bulk reservoir temperatures should be maintained as low as possible to reduce water evaporation -- preferably 135°F or less. It is important that water content be monitored and sufficient water added to maintain water content, bulk density, viscosity, and fire protection within the required range.
- **Shear Stability:** Exhibits essentially no viscosity loss (temporary or permanent) over a wide range of shear rates (Figure 1).
- Additional features include high viscosity index, low pour point, excellent heat transfer, anti-foam properties, and outstanding rust and corrosion protection.

APPLICATIONS



- Recommended for mobile equipment or stationary hydraulic systems in steel mills, foundries, die casting, power transmission plants, and similar environments and applications.
- Can be used in equipment operating in environmentally sensitive areas; FR-5046HP has been shown to have a lower environmental impact than mineral oil based products. Testing of the fluid has shown that it is relatively harmless to the aquatic species commonly tested. Additional testing has shown that FR-5046HP is relatively harmless to terrestrial species such as earthworms and plant seedlings and is readily biodegradable per OECD 301B

APPLICATIONS

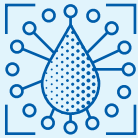


Table 1
ASTM D2882 test results

Fluid	Wear Rate (mg/hr)
Conventional water-glycol	0.65
Phosphate ester	0.05
Polyol ester	0.10
Antiwear oil	0.24
CITGO Glycol FR-5046HP	0.10

Test Conditions: Vickers 104 Vane pump run at 1250 rpm, 2,000 psi, 100 hr. with test pass criteria of 1 mg/hr wear rate max.

Table 3

Sundstrand Series 22 axial-piston pump.

CITGO Glycol FR-5046HP was also evaluated in a Sundstrand Series 22 axial-piston pump using a modified water stability test. The pump was rebuilt according to Sundstrand's Bulletin 9658 specifications. Test conditions were:

Input speed	3,100, 100rpm
Load pressure	5,000 psi
Charge pressure	200, 20 psi
Case pressure	40 psi max.
Stroke	1/2 of full
Reservoir temperature*	120, 10°F
Loop temperature*	170, 10°F
Maximum inlet vacuum	5 psi

Conditions differ from a standard test.

Test duration was 225 hours and followed the sequence: startup at 500 psi for 2 hr; break-in at 3,000 psi for 1 hr; and full load at 5,000 psi for 222 hr.

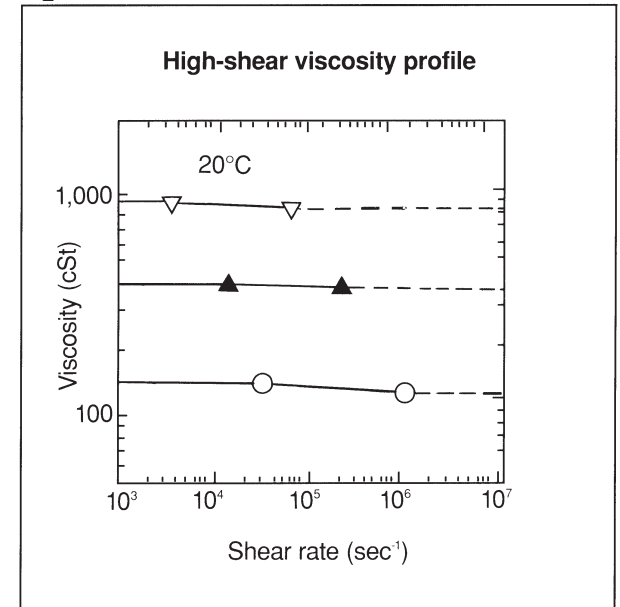
A flow degradation of 10% constitutes failure. Test data show that there was no significant flow degradation (<1%) over the full-load duration of the test. Subsequent examination of the pump components showed no significant wear or distress. These data show that high-pressure, thickened water-glycol hydraulic fluids can be used under conditions where phosphate esters and polyol esters are normally selected.

Table 2
Modified Sperry Vickers 35V25 pump test

Component	Total weight loss (mg)	
	Actual	Recommended
Ring	20	75
Vanes	6	15

*Test Conditions: 12-Vane cartridge substituted for the 10-Vane Cartridge normally used and driven at 1,800 rpm for 49 hr.

Figure 1



PROPERTIES



Typical Properties for CITGO Glycol FR-5046HP:

Material Code	648346001
Specific Gravity, ASTM D1298 (20/20°C)	1.089
Viscosity ASTM D445	
cSt at 0°C	340
cSt at 40°C	46
cSt at 65°C	22
Viscosity Index ASTM D2270	>210
pH	9.9
Pour Point, ASTM D97, °C	-50
Appearance	Red
Biodegradability, Mod. Sturm Test OECD 301B, 28 days	78%

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