FUNCTIONAL PRODUCTS INC.

Innovative Chemistry for Lubricants

Technical Data Sheet

FUNCTIONAL HF-580

Top Tier Ashless Hydraulic Fluid Additive Package for Industrial and Biobased HF

APPLICATION:

FUNCTIONAL HF-580 is a light color, low odor additive package used to formulate ashless antiwear hydraulic fluids using biodegradable esters or vegetable oils. **FUNCTIONAL HF-580** does not contain zinc or heavy metals, provides oxidation/corrosion protection, extreme-pressure/anti-wear activity and demulsibility. **FUNCTIONAL HF-580** is highly compatible in other base oils such as saturated esters, PAOs and Groups I – III petroleum base oils. **FUNCTIONAL HF-580,** when fully formulated to ISO 46 grade in high oleic canola oil, demonstrates excellent performance in a Vickers 104C vane pump test.

COMPOSITION:

FUNCTIONAL HF-580 is a mixture of oxidation, wear, ferrous and non-ferrous corrosion inhibitors and demulsifiers designed to give optimum performance in biodegradable esters and vegetable oils.

Typical Properties	
Appearance	Clear to slightly hazy
Odor	Mild
Color, ASTM D1500	2.0
Phosphorus, %	1.13
Sulfur, %	3.47
Lbs per Gallon	8.2
Flash Point, COC	> 232°C (> 450°F)
Kinematic Viscosity, ASTM D445	50 cSt at 40°C
Vane Pump Test, Total mg wt loss*	24.5 (Pass)

*ISO 46 grade fully formulated in high oleic Canola oil. Eaton Vickers V104C ASTM D7043 (2000 psi, 66°C, 100 hrs).

TREAT LEVEL:

Basic AW HF and R&O fluids can be achieved at rates as low as 1.5wt% (see next page).

FUNCTIONAL HF-580 is most effective at 2.5wt% in a wide range of biodegradable EAL or industrial base fluids to produce antiwear performance on par with industrial zinc and ashless hydraulic fluids and turbine oils.

Additional defoamer and/or demulsifier may be required in certain base oils which must be determined by the formulator. Canola or high oleic soybean oil are recommended for vegetable hydraulic fluid.

HANDLING:

Use normal safe procedures for handling and blending **FUNCTIONAL HF-580**. Heating before blending is not required but temperatures up to 60°C (140°F) may be used to reduce blending time. Review the current Safety Data Sheet before use.

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FORMULATION GUIDE:

Petroleum and PAO Based Hydraulic Fluid:

FUNCTIONAL HF-580 may be used at different treat levels to achieve varying levels of performance at improved economics. Exact treat rates depend on the properties of the base fluid but to start a project:

- **1.5wt%** recommended for basic AW hydraulic fluid (~2000 hour HF) in Group I or II
- **2.0wt%** recommended for mid-tier hydraulic fluid (~4000 hour HF) and R&O oil in Group II
- **2.5wt%** for OEM/industrial performance (~6000 hour HF) and turbine oil in Gr. III or PAO

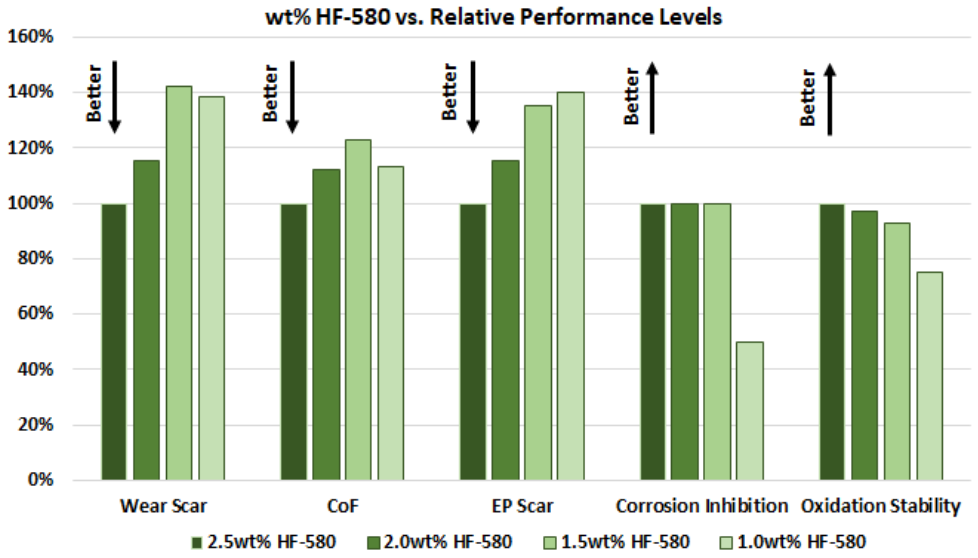
Economic Biobased Hydraulic Fluid:

A series of biodegradable canola/mineral hydraulic fluids with varying wt% of **FUNCTIONAL HF-580** are compared below. Using a high oleic soybean oil in place of canola is recommended for >100 min RPVOT.

Biodegradable ISO 46 HF (by wt%)	
Canola Oil	*52.5 to 54.0%*
6 cSt Group II	30.0%
PAO 4	10.0%
FUNCTIONAL HF-580	*1.0 to 2.5%*
FUNCTIONAL V-521	4.0%
FUNCTIONAL PD-585	1.0%

Basic Properties	
KV40, cSt, D445	47.5
Viscosity Index, D2270	203
Biodegradability, D7373	61.6%, Readily
Pour Point, D97	-42C / -43.6F

	4-Ball Wear (D4172 @ 40kg)		Extreme Pressure (D2783)		Corrosion Inhibition		RPVOT (D2272)
wt% HF-580	Wear Scar, mm	CoF	Weld Load	Scar, mm @ 126 kgf	D665A rust	D130 copper	Time, min
2.5	0.26	0.075	160 kgf	2.50 mm	Pass	1a	69
2.0	0.30	0.084	160 kgf	2.88 mm	Pass	1a	67
1.5	0.37	0.092	160 kgf	3.38 mm	Pass	1a	64
1.0	0.36	0.085	160 kgf	3.50 mm	Fail	1a	52



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