ORISON

BioTherm Fluids® AF

Non-Glycol Anti-Freeze

BioTherm Fluids® AF (Formerly IceClear AF) is a non-glycol, bio-based glycerin anti-freeze / heat transfer fluid with multi-metal corrosion inhbitor which meets ASTM D1384 as supplied. Designed for industrial anti-freeze / heat transfer appliactions, AF is made from highly refined and/or food-grade glycerin. It is specifically formulated as a drop in alternative to petroleum derived propylene glycol (PG) based fluids in low temperature, non-engine applications such as:

- Hydrostatic Pressure Testing
- Ballast Fluid
- Directional Drilling Fluid
- Chillers
- Secondary Refrigerant
- All Season Dust Supressant

USDA CERTIFIED BIOBASED PRODUCT

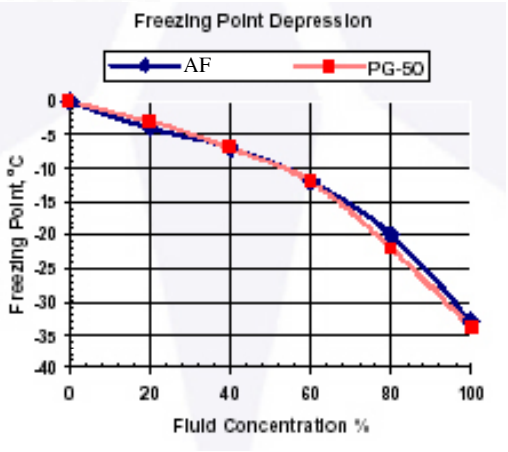

Figure 1. Performance Comparison - Freezing Point of BioTherm Fluids® AF vs. (50%) Propylene Glycol

Derived from agricultural materials or bio-based processes, this environmentally friendly product is engineered to match the freezing point performance of conventional antifreeze products based on 50% (ready-to-use) glycol fluids (see Figure 1), but with the following advantages:

Environmentally Friendly. BioTherm Fluids® AF is a leader in quality, safety and environmental concerns. AF is a certified USDA Biobased Product in the USDA BioPreferred® Program and is NSF listed (HT1). AF is readily biodegradable, non-toxic, non-hazardous and has a neutral pH. Glycerin is considered "GRAS", (Generally Recognized As Safe) by the FDA (Federal Food and Drug Administration).

Cost-effective. BioTherm Fluids® AF is formulated from complex carbohydrates derived from renewable resources and/or process side streams that are not subject to the market swings of glycols.

Better Physical Properties. BioTherm Fluids® AF is more viscous than conventional antifreeze materials. As such, it adheres to particle surfaces and clings to transportation and conveying equipment with little run-off and settling. This prevents freezing, clumping and sticking, and keeps product moving freely.

Physical Properties

· Color	Clear Liquid
· Odor	Mild
· pH	7 - 9
· Water Solubility	100%
· Specific Gravity	1.15
· Density	@ 9.5 lbs/gallon
· Viscosity @ 20°C (cSt)	11.0
· Freeze Point	-34 °C (-30 °F)

Won't Dry Out. Due to its viscous nature and hygroscopic character, AF will not dry out after initial application, making it effective for extended periods of time as an antifreeze and a dust suppressant.

NSF

NSF registered and acceptable for use where there is possibility of incidental food contact (HT1).

The chart below is supplied as a guide for diagnostic / maintenance purposes. The values are calculated values and are only approximations. BioTherm Fluids® AF is designed as a ready-to-use and dilution is possible, however, the result would weaken the corrosion inhibitor package. Custom blending is available to meet specific physical properties such as freeze point and/or heat transfer capabilities. **NOTE:** Dilutions more than 20% may be subject to bacterial contamination.

BioTherm Fluids® AF %	Brix Value (Refractometer)	Freeze Point °F / °C	Boiling Point °F / °C	Specific Heat @ 35° F	Viscosity cSt @ 68° F (20° C)
100	46.6	-30° / -34°	228° / 109°	.74	11
90	42.5	-17° / -27°	225° / 107°	.775	8
80	38.4	-8° / -22°	222° / 106°	.804	6
70	34.1	0° / -18°	220° / 104°	.826	5
60	30.2	7° / -14°	218° / 103.5°	.848	3
50	25.6	13° / -10°	217° / 103°	.866	2.5

HMIS	
HEALTH	0
FLAMMABILITY	0
INSTABILITY	0
SPECIFIC	0

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Orison Antifreeze / Heat Transfer Fluids Properties Chart

Custom Blends Available

PRODUCT	DILUTION	FREEZE POINT °F	FREEZE POINT °C	BOILING POINT °F	BOILING POINT °C	SPECIFIC GRAVITY @70F	VISCOSITY cSt @70F	SPECIFIC HEAT @ 35°F
GLYCERIN BASED FLUIDS*								
BioTherm Fluids® AF (RTU)	**100%**	**-30**	**-35**	**228**	**109**	**1.155**	**10.8**	**0.74**
BioTherm Fluids® A & I (RTU)	100%	-31	-35	228	109	1.155	10.8	0.74
PG BASED FLUIDS								
BioFROST® Concentrate	70%	<-60	<-51	229	109	1.049	11	0.78
BioFROST® Concentrate	60%	-53	-47	224	107	1.047	8	0.82
BioFROST® Concentrate	50%	-25	-31.6	222	106	1.043	6	0.85
BioFROST® Concentrate	40%	-4.5	-20	219	104	1.036	4	0.89
BioFROST® Concentrate	30%	10	-12	216	102	1.029	3	0.93
BioFROST® GEO (RTU)	100%	18	-7.7	215	101.6	1.026	2	0.95
BioFROST® Eco Concentrate	70%	<-60	<-51	228	108.8	1.043	11	0.77
BioFROST® Eco Concentrate	60%	-40	-40	223	106	1.042	8	0.82
BioFROST® Eco Concentrate	50%	-21	-29.4	221	105	1.039	6.19	0.85
BioFROST® Eco Concentrate	40%	-2.5	-19	218	103	1.032	4	0.89
BioFROST® Eco Concentrate	30%	10.5	-12	215	102	1.025	3	0.92
BioFROST® Eco Concentrate	20%	19	-7	213	101	1.015	2	0.95

*NOTE: Even though glycerin has a lower specific heat compared to glycols, it's heat capacity (how much heat it can load into itself) is higher than glycols.

This table is supplied as a guide for engineering / diagnostic / maintenance purposes. It is not a specification. The values given are calculated values based on actual analytical and known base properties and are only approximations.

(RTU) = Ready-To-Use

DEFOAMER

*Addition of TRAMFLOC® 1142 FOAM CONTROL AGENT may be beneficial for some applications. TRAMFLOC® 1142 FOAM CONTROL AGENT is a nonionic, nonsilicone, food grade defoamer. TRAMFLOC® 1142 FOAM CONTROL AGENT performs well in a wide range of pH and temperatures. All ingredients used in the manufacture of TRAMFLOC® 1142 FOAM CONTROL AGENT are either GRAS or listed in the Code of Federal Regulations: Title 21, Section 173.340. Recommended use at 1 oz/ 10 - 20 gallons of system fluid.