

ORISON

IceClear® PGX

Propylene Glycol Replacement

IceClear® PGX is a highly refined, bio-based alternative to petroleum derived propylene glycol (PG). IceClear® PGX can be used as delivered or diluted to achieve desired results. IceClear® PGX is a cost effective substitute for PG in many commercial, industrial and agricultural applications, including the following:

- Heat Transfer Fluids
- Freeze Conditioners
- Coal and Ore Treatments
- Deicing Fluids
- Antifreeze/Coolant Formulations
- Hydraulic Fluids
- Dust Suppressants
- Frost Protectant for Agricultural Products (e.g. Fruits)

IceClear® PGX is supplied in a food-grade material and with a corrosion inhibitor added for closed loop systems as **IceClear® Anti-Freeze (AF)**.

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 glycols (see Figure 1), but with the following advantages:

Cost-effective. IceClear® PGX is formulated from complex carbohydrates derived from renewable resources and/or process side streams that facilitate cost-effective and not subject to the market swings of glycols.

Better Physical Properties. IceClear® PGX 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.

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

Environmentally Friendly. IceClear® PGX is non-toxic, contains no salts, heavy metals or solvents, it is non-corrosive, fully biodegradable (with a lower BOD/COD than glycol), and it will not affect combustion processes.

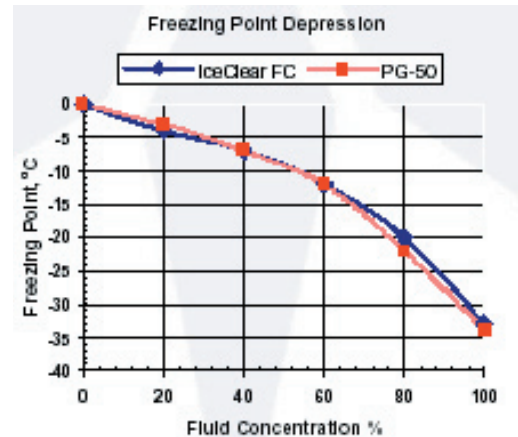


Figure 1. Performance Comparison - Freezing Point of IceClear® PGX vs. Propylene Glycol

Physical Properties

· Color	Clear Liquid
· Odor	Mild
· pH	7
· Water Solubility	100%
· Percent Volatiles	40%
· Specific Gravity	1.17
· Density	@ 9.5 lbs/gallon
· Viscosity @ 20°C (cSt)	8.0
· Freeze Point	-34 °C (-30 °F)



IceClear AF or PGX

				Boilng	Points	
By Weight	Water	Freezing	Points	at 760 mm Hg		Vapor Pressure
%	%	(F)	C	(F)	C	100C (mm Hg)
0	100	32	0	212	100	760
25	75	26	-3.33	214	101.3	728
50	50	15	-9.44	217	103	690
75	25	-2	-18.89	221	105	639
100	0	-30	-34.44	228	109	565

IceClear PGX or AF

Viscosity in Centipoises

VISCOSITY												
%	-20	0	10	20	30	40	50	60	70	80	90	100
100	108	29.9	17.4	10.8	7.19	5.08	3.76	2.85	2.29	1.84	1.52	1.28
50		5.14	3.49	2.5	1.87	1.46	1.16	0.956	0.816	0.69		

IceClear PGX or AF

Thermal
Gram Calories, Second, -1cm, -2C, -1cm(2)

By Weight										a20(1)%
%	10C	20C	30C	40C	50C	60C	70C	80C		C-1
0	0.00138	0.00138	0.00138	0.00138	0.00138	0.00138	0.00138	0.00138	0.00138	0.26
25	0.00125	0.00128	0.00131	0.00134	0.00137	0.0014	0.00143	0.00146		0.23
50	0.00112	0.00115	0.00117	0.0012	0.00122	0.00124	0.00126	0.00129		0.20
75	0.00102	0.00103	0.00105	0.00106	0.00108	0.0011	0.00111	0.00113		0.15
100	0.00090	0.00091	0.00091	0.00092	0.00093	0.00094	0.00095	0.00096		0.10