

**Comparison of Phosphate-based and Organic-Acid-based Heat Transfer Fluids
BOSS Chill PG / EG AND MULTIGARD PG / EG**

	BOSS CHILL PG / EG	MULTIGARD PG / EG
CHEMICAL MAKE-UP	<p>Phosphate-based with potassium Phosphate and sodium tolytriazole as the primary corrosion inhibitors.</p> <ul style="list-style-type: none"> • Phosphate-protects "white" or "hard" metals, cast iron, steel and aluminum • Tolytriazole-protects "yellow" or "soft" metals, brass bronze, copper, solder 	<p>Organic-Acid-based with 3 organic acid salts and sodium tolytriazole as the primary corrosion inhibitors.</p> <ul style="list-style-type: none"> • Organic Acid-protects "white" or "hard" metals (cast iron, steel, aluminum), and the "soft" or "yellow metals. • Tolytriazole-back-up protection "yellow" or "soft" metals, brass Bronze, copper, solder • All-organic formulation
CORROSION PROTECTION	<p>Protects steel, cast iron, copper brass, bronze and solder from -50°F-45°C to 150°F-65.5°C</p> <p>Protects aluminum up to 150°F/65.5°C</p>	<p>Protects all metals,, including aluminum from -50°/45.5°C to 400°F/204°C</p>
HEAT TRANSFER FLUID MAINTENANCE PROGRAM	<p>Analyze for inhibitors and impurities Every 6-12 months, with emphasis on phosphate and tolytriazole. If anything is abnormal, analyze a sample chill for inhibitors, phosphate and/or tolytriazole based on analysis, or change-out fluid if badly contaminated with foreign materials.</p>	<p>Take a sample and do a pH test and a visual inspection for liquid phase separation/layering. Precipitation and color change. If everything is normal, no analysis is required. Check again in a year. If anything is abnormal, analyze a sample for inhibitors and impurities; add Multigard inhibitor or change-out fluid if badly contaminated with foreign materials.</p>
OVERALL LIFE	<p>Should have a service life of 5-10 years or longer.</p>	<p>Should have a service life of 10-15 years. Has a longer life than phosphate-based HTF and a longer life before analysis or maintenance is required.</p>
WATER HARDNESS SENSITIVITY	<p>Water hardness compounds interact with Phosphate, taking it out of solution and forming scale deposits. Phosphate concentration is reduced and precipitation formed.</p>	<p>No sensitive to water hardness.</p>
SHIPPING/HANDLING	<p>Winter weather and freezing temperatures can create problems for the HTF blender since additives can fall-out of solution if they get too cold. Additives do not add significantly to freeze point depression in HTF</p>	<p>Multigard additive is much less sensitive to temperature; it can experience temperatures below 20°F/-6°C without any fall-out. Additives add about 5°F/-15°C to freeze point depression at 50/50.</p>
COST OF ADDITIVE	<p>Less expensive than all-organic types of inhibitor system.</p>	<p>More expensive than phosphate-based types.</p>

Summary of Multigard PG / EG advantages over a phosphate-based BOSS Chill PG / EG Inhibitor Systems

- Maintenance is much easier, because the fluid lasts longer without analytical testing or addition of any inhibitors: analytical expense is lower.
- Has a longer overall service life.
- Protects aluminum metals to 400°F/204°C
- Protects all non-aluminum metals to 400°F/204°C
- Less sensitive to water hardness or impurities, in general
- MULTIGARD PG/EG additive is less sensitive to freezing temperature (a blender advantage) and can be blended with colder glycol/water base
- The pH of the Multigard additive is significantly less than Chill additive, therefore when making fluid for an all-aluminum system no pH reduction is required (no cost of additional phosphoric acid)
- The Multigard additive adds about 5°F-15°C to freeze point depression at 50/50