Enertech Global, LLC 2506 S. Elm Street Greenville, IL 62246 www.enertechgeo.com	**TECHNICAL BULLETIN**	**TECH BULLETIN #:**	TB19.001
	Water Chemistry & Freeze Protection Guidelines	**PUBLISH DATE:**	06/03/2019
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Introduction:

Water quality is a major factor in premature failures of pumps and even heat exchangers in geothermal systems. The purpose of this technical bulletin is to provide guidance on water chemistry and freeze protection for Enertech products for the source fluid (ground loop or well water) and the load fluid (hydronic loop) if applicable.

Water chemistry guidelines:

- For new systems, water quality should be tested before determining the best solution (see requirements, below). Local water should not be used if it does not fall within the published guidelines in the unit's I.O.M.
- Do not use automotive antifreeze or ethylene glycol-based solutions. Do not use windshield washer fluid, or other non-HVAC antifreeze solutions.
- Do not fill the piping system with softened water.
- State/provincial requirements and local code requirements supersede any recommendations in this document.
- For open loop (well water) systems with poor water quality, a ground loop or secondary heat exchanger should be considered to avoid any potential warranty issues.

Antifreeze requirements (closed loop systems):

To ensure that the water-to-refrigerant heat exchanger will not be subjected to freezing conditions, which could cause the heat exchanger to rupture, all units require antifreeze in the source (ground loop) fluid if the temperature will drop below 40 deg. F or there will be any piping exposed to freezing/outdoor conditions. In addition, antifreeze is required in the load (hydronic) fluid if the system will be used for chilled water for cooling purposes. Antifreeze concentration must provide a minimum freeze protection of 10 to 15 deg. F below the minimum expected entering water temperature.

Water quality (closed loop systems):

To ensure that the heat exchanger/pump(s) will not be subjected to adverse conditions, treatment with the appropriate concentration of Fernox F1 Inhibitor* or an Enertech Global LLC approved equal is required for all water-to-water and combination units ordered after July 1, 2019. This requirement extends to all equipment, starting January 1, 2020. Any warranty claim related to a water circuit component (water-to-refrigeration heat exchanger failure/water in the refrigerant circuit, pump/flow center failure, or any other water circuit component) requires a water sample to be submitted to Enertech Global LLC for evaluation.

*Fernox Alphi-11 propylene glycol already includes F1 inhibitor when used at a concentration of 25% or higher. At lower concentrations, additional F1 is required.

Water quality (open loop / well water systems):

To ensure that the water-to-refrigerant heat exchanger will not be subjected to adverse conditions, a water sample must be submitted to Enertech Global LLC for evaluation for all water-to-water & combination units ordered after July 1, 2019 if installed in an open loop (well water) application. This requirement extends to all equipment, starting January 1, 2020. In the event the sample fails to meet published guidelines at the time of unit shipment, the application will be considered an improper installation, as outlined in the warranty certificate, and therefore the refrigerant circuit will be excluded from the limited warranty.

Approved antifreeze and inhibitors:

For closed loop systems, Enertech is partnering with Fernox USA to provide a comprehensive solution. Fernox is Enertech's preferred antifreeze/inhibitor vendor. Enertech offers Fernox products for customers to purchase if desired. There are states/provinces that have requirements that may not be met by Enertech's preferred vendor. Therefore, the list below provides alternatives in those situations.

- Approved solutions where antifreeze is not needed (entering loop temperature does not drop below 40 deg F and unit has coaxial heat exchanger):
    - Water with Fernox F1 inhibitor (1 pint per 26 gallons)
- Approved antifreeze solutions:
    - Methanol with Fernox F1 inhibitor (1 pint per 26 gallons)
    - Fernox Alphi-11 propylene glycol (25% by volume)*
    - Kilfrost GEO (Kilfrost Inc., Boca Raton, FL, 954-282-5050)**
- Approved antifreezes (where food grade is required):
    - Kilfrost GEO Plus (Kilfrost Inc., Boca Raton, FL, 954-282-5050)**
    - Rhomar EnviroGard Ultra (Rhomar Water, Springfield, MO, 800-543-5975)**
- Approved antifreezes (where ethanol is required):
    - Loopanol #2 (Quatic Industries Inc., Guelph, ON, 519-821-7780)**

*If used in a lower concentration (e.g. 20% by volume), additional F1 is required.

**At manufacturer recommended concentration to provide sufficient corrosion and freeze protection.

The use of other approved brands (besides Fernox):

1. Brands of antifreeze/inhibitor other than Fernox do not void the Enertech limited warranty. However, it is impossible for Enertech be an expert on all antifreeze/inhibitor products on the market. The above approved solutions provide choices that should meet state/provincial/local requirements to the best of our knowledge. If an antifreeze or inhibitor is used that is not listed above, and there is a warranty claim for a component failure that is in the water circuit, a water sample may be requested. If the water quality falls outside of the water quality guidelines, the warranty claim may be denied.
2. Some antifreeze/inhibitor solutions require different maintenance intervals. The solution should be checked annually or whatever frequency the manufacturer recommends ensuring that the chemistry of the solution is within the guidelines and that there is sufficient inhibitor.

The use of non-approved antifreeze/inhibitor:
Some customers have very little or no water-quality related warranty failures. This may be due to diligence in ensuring that the water used in the system is of high quality and/or the use of other brands of antifreeze with inhibitors. Although Enertech has a list of approved antifreeze and inhibitors, it does not void the equipment warranty if another brand is used. However, if water quality is determined to be the cause of a component failure in the water circuit, the refrigerant circuit will be excluded from the limited warranty coverage moving forward, as outlined in the warranty certificate (July 1, 2019 for water-to-water and combination units; January 1, 2020 for all units).

Water Testing:
A water test kit is available from Enertech that can test for most of the chemicals that can cause corrosion in system components. Plus, it can even check for the amount of Fernox F1 inhibitor in the fluid. All systems should be tested prior to installation to ensure that the water quality is within the ranges required for warranty. Enertech has a new instruction manual (located on the Enertech Secure Site, https://www.enertechgeo.com/technical-support/instructions), making it even easier to provide customers with an analysis of the loop fluid. It's also helpful to determine if the local water will be adequate, or if water will need to be hauled to the job site. Fernox Alphi-11 inhibited propylene glycol can typically be used with onsite water (see test kit instructions for determining when onsite water is acceptable).

Please direct any requests for additional information & specific application or installation related questions to Enertech Tech Support at 618-664-5860.