

FAQ

BTU Capacity in Boiler Plants with Glycol Solutions

Glycol solutions are used for freeze protection in hot water systems. These solutions have a lower ability to hold and transfer heat. Because of this, adjustments must be made to the heating system to compensate for the glycol characteristics.

Question: How much will my boiler de-rate if I am using a glycol mix in my system?

Answer: A boiler’s ability to transfer heat is not changed by the fluid passing through it. The “de-rate” seen is due to the glycol mix having a lower specific heat than water. If no adjustments are made to the plant, the amount of BTUs supplied will need to be increased.

Q: What adjustments do I need to make?

A: The specific heat of glycol solutions is lower than that of water. In order to transfer the same amount of heat, the lower heat capacity can be compensated for by increasing the flow rate of the heating plant. To calculate this, divide flow rate by the specific heat of the glycol solution at a given mix percentage and working temperature.

Q: Can you provide the glycol de-rate factors?

A: No, these factors are specific to each glycol formulation, and must come from the glycol manufacturer directly. The tables given below are examples only and do not represent a specific formulation.

Example Glycol Table

Physical Property	Temp °F	25% Glycol Solution	30% Glycol Solution	40% Glycol Solution	50% Glycol Solution	60% Glycol Solution
Thermal Conductivity Btu/(hr • ft ²)(°F/ft)	40	0.262	0.251	0.231	0.212	0.196
	180	0.303	0.288	0.262	0.238	0.217
	250	0.306	0.291	0.265	0.241	0.220
Specific Heat Btu/(lb • °F)	40	0.882	0.861	0.816	0.770	0.721
	180	0.930	0.913	0.879	0.842	0.812
	250	0.954	0.940	0.910	0.877	0.842

Q: When reading specific heat tables, should I use the supply or return water temperature of my system?

A: The supply temperature should be used.

Example Calculation

A 2000 MBTU heating plant at a 30°F ΔT using 100% water will require 133 gpm of flow. For a 30% glycol mix at 180°F, the specific heat is 0.913 BTU/lb*°F. The required flow using this glycol solution: 133 / 0.913 ≈ 146 gpm.

Q: What if the new flow rate exceeds the maximum flow rate of the boilers?

A: You may need to add an additional boiler, or change to a larger capacity boiler.

Q: What if this system is already installed and no additional flow can be achieved?

A: Depending on the amount of additional capacity in the designed system, the boilers may be able to supply the required additional BTUs.

Q: What is the maximum allowable percentage of glycol I can use in my boiler?

A: This depends on several factors, including the specific makeup of the glycol and the heat exchanger material. Generally speaking, there is no maximum allowable percentage of glycol. At high concentrations, the pH of the glycol may be the limiting factor. A 50% glycol solution may have a pH as high as 10.7. It is best not to exceed a pH of 9 for hydronic systems.

Q: What type of glycol should I use with my boiler?

A: This answer depends on the construction of your specific boiler. Some boilers use gaskets that may tolerate one type of glycol and not another. Aluminum heat exchangers require specific aluminum-safe formulations. You must reference the literature for a specific boiler model to determine what type(s) of glycol are acceptable.



Heating and Hot Water Solutions

AERCO International, Inc. • 100 Oritani Drive • Blauvelt, NY 10913
USA: T: (845) 580-8000 • Toll Free: (800) 526-0288 • AERCO.com

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