DEPPMANN
Cleveland | Detroit | Grand Rapids | Saginaw
Deppmann.com | P:800.589.6120 | F:248.354.3763

Monday, November 29th, 2021

Ice Rink Cooling System - Commissioning the Glycol Expansion Tank

Monday Morning Minutes | by Norm Hall, November 29th, 2021

A customer recently called us about an unusual occurrence in a closed hydronic cooling system for an ice rink. The system was filled using a 50% Dowtherm™ SR-1 ethylene glycol heat transfer fluid and commissioned by our normal published processes. The contractor called describing the conditions saying the gauges at the expansion tank and pump suction were showing a deep vacuum.

Expansion Tank Fill Pressure and Commissioning

The normal process we teach for filling and pressurizing closed hydronic cooling systems is well documented.

1. Determine the fill pressure required to have 4 PSIG at the top of the system.
2. With the system at cold or room temperature, set the pressure reducing valve (PRV) to achieve that pressure, and

3. Set the expansion tank air pressure to this cold fill pressure with adjustments for elevation differences between the tank and the PRV. This will provide a starting condition with no fluid in the tank, just 100% air. As the system heats up, the tank bladder will expand to keep the system pressure within the design limits. Now circulate the system and, zone by zone, bleed off all the air in the piping system. This is rote for anyone with two years in the business.

A Surprise for an Industry Veteran of 45 Years: A Contraction Tank

The contractor for this ice rink system followed the procedures perfectly. The system was in a vacuum when the temperature got to the design point. Here is what I learned that day.

The system operated at a 4ºF design supply temperature to the rink with less than a 10ºF rise on the return. The system pressure was positive during commissioning but dropped into a vacuum as the temperature approached the design of 4ºF. The light bulb went off.

The system was starting at room temperature and dropping to the design point. The fluid was trying to contract, not expand. Since the tank was empty of water at room temperature, there was no water to enter the system from the tank when the temperature dropped. It was like there was no expansion tank. We needed some water to enter the pipe when the system fluid tried to contract.

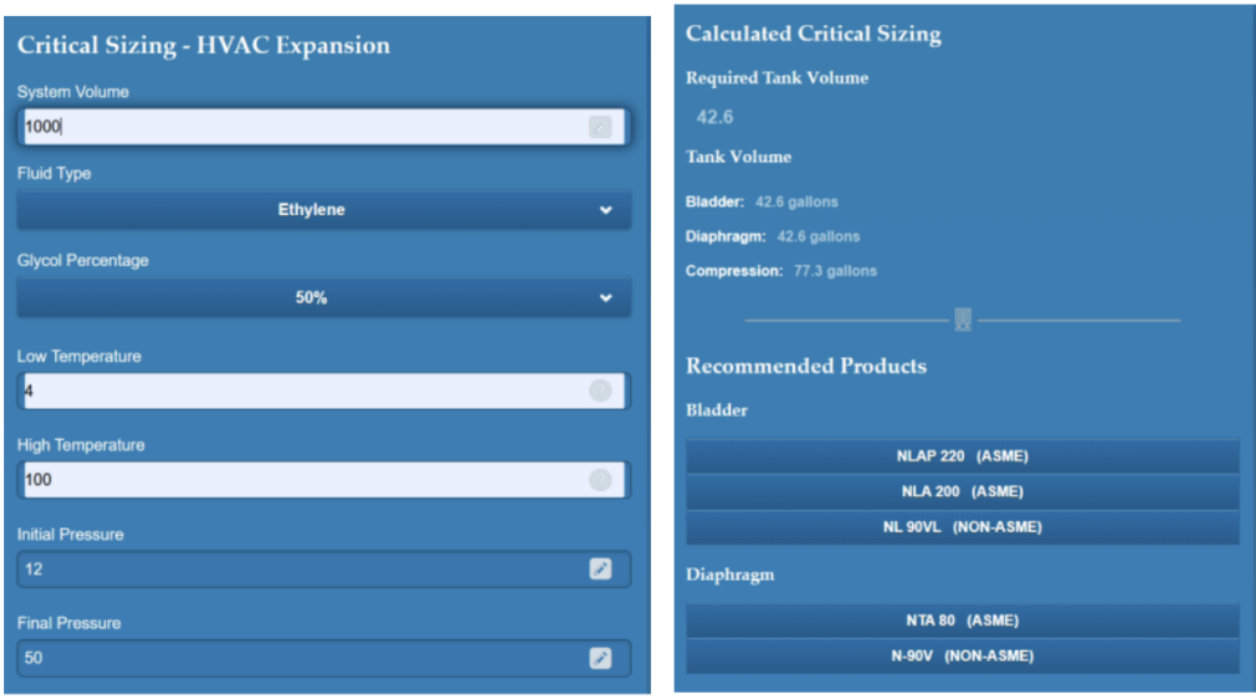
The Low-Temperature Glycol System Fill Process.

The solution was simple. Allow the fluid to drop down to the 4ºF design point and set the **“cold fill”** pressure at the cold point. Now as the system “**heats up**” to a high average temperature under 10ºF, the pressure will rise.

If the system ever shuts down, there will be no skaters. But hydronically speaking, the expansion tank would be sized starting at the cold fill pressure at 4ºF and allow to rise to the expected maximum air temperature which we normally default to 100ºF.

Expansion Tank Sizing – Is There a Concern?

Our friends at Wessels Tank have a sizing program that goes below 40ºF.



Screen Shots from the Wessels tank calculator

In this example, we require 42.6 gallons of tank volume. Interestingly, the volume required from 4ºF to 40ºF is less than 20 gallons and the rest gets us from 40ºF to 100ºF. If the engineer sized the tank from 40ºF to 100ºF with the same fluid, the tank volume would be 28.8 gallons. This would seem undersized. What would happen if the

temperature started at 4ºF with this 28.8-gallon tank? The tank would be fine if the fluid was allowed to rise no higher than 72ºF.

It's always better to size things with the right numbers but in this case, there will be no issues.

Moral of the story, you can teach a senior old dog a new trick.

Before we close:

HAPPY THANKSGIVING.

Thank you to all our customers, specifiers, suppliers, consultants, employees, and followers of the R. L. Deppmann Monday Morning Minutes. You make working in this industry a true joy.

I also thank the Detroit Free Press for selecting and recognizing the R. L. Deppmann Company, for the fourth year in a row, a **2021 Midsize Top Workplace Award Winner. If**

you would like to see job openings in our employee-owned company, visit our [Employment Opportunities] page.