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How to Pick an HVAC Centrifugal Pump Part 7: Mechanical Seal Materials

Monday Morning Minutes | by Norm Hall, July 17, 2017

Part 6 of “How to pick an HVAC centrifugal pump” explained the value of internally flushed seals. One question that our customer service team fields every week concerns the material of construction of seals for various applications. This week, the R. L. Deppmann Monday Morning Minutes looks at the seal material you should specify.



Mechanical Seal Components

Mechanical seals are simple devices. There are metal parts, a metal spring, a stationary seat, a rotating seat also called the primary ring, and elastomers.

The majority of HVAC centrifugal pump applications use water as the heat transfer fluid. The second most used fluid is a heat transfer fluid based with glycol. In addition, the temperature range is normally well below 225°F and there is very little particulate or solids in the fluid. The majority of seals used in pumps are typically Carbon-Ceramic. The mechanical seals provided by Bell and Gossett have stainless steel metals, BUNA elastomers, a 99.5% pure aluminum oxide ceramic stationary seal face, and a carbon rotating face. These seals work well with the temperatures mentioned



above and a pH neutral range of 7.0-9.0. They can handle up to 400 ppm of dissolved solids and 20 ppm of undissolved solids which satisfies most system requirements. When is a different type of seal material needed? Let's look at three conditions.

Mechanical Seals and Higher pH Levels

Most HVAC hydronic system applications maintain a pH to 7.0 to 9.0. Once in a while the system pH is too high for this carbon-ceramic seal material. The main issue may be located in the chemical treatment portion of your specification. There are specifications that call for the pH to be maintained at levels in the 9.0-11.0 range. If your specification calls for this pH range, the pump seal material specification should be changed to EPR/Carbon/Tungsten Carbide (TC) or EPR/Silicon Carbide (SiC) /Silicon Carbide (SiC). I would recommend the EPR/SiC/SiC material since that seal can handle pH up to 12.5 which gives some "wiggle room."

Mechanical Seals and Higher Solids Levels

Another area of concern for mechanical seals in HVAC centrifugal pump selection is solids, also called dirt. If the system is dirty or has silica in the water, you may find that you need the EPR/SiC/SiC seal. As previously stated, the standard Buna/Carbon/Ceramic seal cannot handle any silica. The silicon carbide seal can handle 60 times the dissolved solid content and double the undissolved solids content with 20 ppm silica content thrown in for good measure.

Why not just always specify EPR/SiC/SiC seals? There are two reasons: cost and lead-time. This seal will cost three times as much as the standard seal. In addition, since the carbon-ceramic seal is standard, there may be additional lead-time to get a pump with this seal.

Mechanical Seals and Glycols

Use of the term glycol when referring to heat transfer solutions used in HVAC systems is incorrect. Glycol is used in many applications including automotive antifreeze. In HVAC systems, you want a glycol based heat transfer fluid with the material quality and inhibitors that match the application. In fact, if you use automotive antifreeze in HVAC systems, the silica based inhibitors will create a gel in the coils that blocks heat transfer and flow. That's if the seals don't leak first!

R. L. Deppmann recommends the use of Dowtherm* SR-1 and Dowfrost* HD heat transfer fluids. It is recommended they be pre-mixed with deionized water before filling the system. If you mix with city or well water, the calcium and magnesium in water will mix with inhibitors and cause a particulate that exceeds the ppm of normal seals. In addition, some contractors put the glycol based fluid in the system, fill it with water, and turn on the pump to “mix” the solution in the piping system. This subjects the pump seals to shots of up to 100% ethylene or propylene glycol which exceeds the maximum recommendation for even silicon carbide seals.

This is one reason R. L. Deppmann provides [Dowfrost* HD and Dowtherm* SR-1](#) premixed with deionized water; available in 55 gallon drums, 275 gallon totes, or by tanker.

Another name for an EPR/SiC/SiC seal is a glycol seal. In our experience, standard carbon ceramic seal works fine most times with the properly mixed Dow products. Since these heat transfer fluids do carry a higher pH than water, we recommend your specification clearly identifies using this glycol seal.

If you would like a review of your pump specification and you are in Michigan or Northern Ohio, give us a call, email, or fill out a [request form](#) on our website. If you are in another geography, you may fill out the web request form and we will forward it to the appropriate company in your area.

Next week the R. L. Deppmann Monday Morning Minutes continues with HVAC centrifugal pump motors.