Five Design Considerations for a Chilled Water Insulation System

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Chilled water insulation systems that operate at below ambient temperatures don’t play by the same rules as systems that operate at above-ambient temperatures. The interaction between chilled water systems and the ambient air around the pipes can cause condensation on the pipes. This, in turn, can lead to a host of other problems, including corrosion, insulation damage, mold and fungus growth, and in extreme cases cracked and leaking pipes. Subscribe to our blog here.

Given the unique challenges posed by below ambient systems, there are critical design considerations that need to be carefully addressed during the design and specification process. Here are five of the top design details that specifiers should take into account when designing and specifying chilled water insulation systems.

1) The first critical consideration for a chilled water system begins with understanding the thermal performance needed to prevent condensation. Ideally, a chilled water system will be designed with sufficient insulation to avoid condensation completely. It is critical to understand and design for the range of anticipated ambient conditions, especially the worst-case conditions that can intermittently occur. From this information it is possible to calculate the minimum insulation thickness that is necessary to prevent condensation. In order to ensure the insulation meets the minimum system needs, ASHRAE 90.1, the NAIMA 3E program, and Johns Manville technical professionals can provide guidance.

2) The second critical design consideration is the insulating system’s integrity. It is important to note that in all cases an insulation system requires some form of vapor barrier. Vapor barrier typically comes in the form of jacketing, tapes, and sealants, and they have various degrees of performance. The purpose of a vapor retarder is to minimize the flow of moisture that is available from the moist ambient air and protect the chilled water system and the insulation from this moisture drive.

Moisture drive is measured in perms, and insulation or its vapor retarder should have a perm rating at least as low as 0.02 perms. For example, Micro-LokHPis a pre-formed fiber glass pipe insulation with a vapor-retarder jacket. It has a maximum water vapor permeance rating of 0.02 perms. When installed correctly, Micro-LokHP creates a properly-sealed insulation system that prevents water condensation on the pipe surface.

Bear in mind that once the insulation system is fully installed, it must be completely sealed. Prior to operation, the chilled water system should be activated and the insulation system inspected for leaks or other visual evidence of incomplete sealing.

3) When designing a chilled water system, make sure the insulation and vapor barrier is designed for the setting. In areas with high traffic or maintenance, protective jacketing should be used to prevent damage to the insulation and vapor retarders. There are a number of metal and PVC jacketing systems available. Johns Manville’s Zeston® PVC systems, which have a perm rating of 0.02, are offered in a multitude of colors as well as UV-resistant white. If you use the correct jacketing (like metal jacketing or UV-resistant PVC), fiber glass insulations, like Micro-Lok HP, can even be used on chilled water systems in exposed, outdoor environments.

4) It is important to provide a specification that contractors can implement. If contractors are familiar with the insulation system, they have the experience to know what works and can potentially head-off issues before they start. JM can help with the specification as well. We have the 3-part JM Insul-spec, which is a complete fiber glass chilled water specification. We can also personally review your specification and provide feedback. NAIMA also has a chilled water insulation guide that has information on writing a chilled water specification.

5) Finally, the insulation contractor should be experienced and familiar with the insulating system being specified. Many mechanical insulation contractors have extensive experience with fiber glass systems and are familiar with the practices required to ensure a high-performing insulation system. Ensuring that the contractor is familiar with the insulating material and the application will improve both installation quality and efficiency. In this regard, using insulations that are more common, like fiber glass, can make a significant difference in the time and effort it takes to install a product.

While there are a number of insulations available that can be used in chilled water applications, understanding the unique needs of a chilled water system and how each insulation interacts with chilled water applications can make a significant difference in the success of the design and installation.

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