Applications Corner

Chiller Solution Marketing

Utilizing Chiller Materials for Various Water Qualities

This Chiller Solutions Update Newsletter's edition of Applications Corner can be found in the Chiller Solutions Update Newsletter – November 2011.

This Applications Corner just provides a sneak-peak into the chiller materials we can offer for various water qualities. Please access the complete Application Guide: The Chiller Materials Application Guide for Various Water Conditions – Form 160.00-AD5 to learn even more about selecting chiller materials for various water qualities. The document can be found within the Applications Literature section of YK from the Chillers Home Page.

Water quality is a term used to describe the chemical, physical and biological characteristics of water, usually in respect to its suitability for a particular purpose. As customers utilize increasingly lower quality sources for chiller water, such as treated sewage effluent and sea water, chiller material selection becomes even more critical.

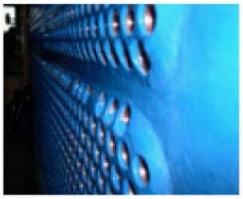
The Chiller Materials Application Guide for Various Water Conditions – Form 160.00-AD5, has been designed to provide a water and material chemical compatibility. The values shown on the tables in this document represent an individual chemical parameter for each chemical compound.

Chillers are most often designed with an evaporator (where heat is removed from a building in a "closed" chilled water loop) and a water cooled condenser (where heat is rejected to an "open" cooling tower loop). Under most conditions, the reliability of the evaporator "closed" loop design is easily controlled by conventional chemical water treatment. It is also true that the "open" condenser loop, when supported with proper water treatment, can provide many years of reliable service with the industry standard copper tubes and carbon steel waterboxes and tubesheets.

However, in some applications, the water cooled condenser "open" loop design may require additional attention. The source water may have higher scaling or corrosive tendencies. There may be acid or caustic contaminates in the air or make-up water to a cooling tower. In lieu of a cooling tower, the heat may be rejected to river water, pond water or sea water. In these applications, chemical water treatment alone may not be sufficient to assure long-term reliability. So various chiller materials and processes including the following are available:

Johnson Controls

Ceramic Coating - A liquid ceramic polymer composites that can be used to resurface and protect all wet areas on fluid flow components from aggressive erosion/corrosion attack. Ceramic Coating is typically applied to the tubesheets and/or the inside of the waterboxes. Coatings are subject to wear and tear and should be inspected annually and maintained as required.



Cladding - This is the process of covering one material with another. Typically, an exotic metal or metal/alloy (chosen to be used for protection) will be used to cover a steel component, most often a tubesheet or the inside of a waterbox. Cladding is a higher up-front cost, but virtually maintenance free.

Copper - The industry standard for heat exchanger tubes. Copper offers the best in thermal conductivity and is a good material for workability, which allows for a greater range of tube internal and external enhancement configurations. This typically results in the highest chiller capacity and highest heat transfer. All tubes are suitable for 300 psi waterside DWP.

Copper Nickel (CuNi) - A copper/nickel alloy often used for heat exchange tubes. Most commonly offered as 90/10 and 70/30 (% copper / % nickel), these alloys typically offer an increased level of protection at the sacrifice of capacity, efficiency, and cost.

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Epoxy Coating - A protective coating that can be applied to the inside of waterboxes, tubesheets or both. Epoxy coating provides limited protection against corrosion. Coatings are subject to wear and tear and should be inspected annually and maintained as required.

Galvanic Corrosion - A process that degrades metals electrochemically. This corrosion occurs when two dissimilar metals are placed in contact with each other in the presence of an electrolyte, such as salt water, forming a galvanic cell. The resulting electrochemical potential then develops an electric current that electrolytically dissolves the less noble material.

Holidays - a discontinuity or break in a coating, exposing the bare base metal underneath.

Monel - Monel is a nickel alloy, primarily composed of nickel and copper, with some iron and other trace elements.

Sacrifical Anodes - Sacrificial anodes serve as an electrode through which electric current flows into a polarized electrical device capturing charged materials in water therefore reducing corrosion.

Titanium - A very durable material that is extremely resistant to corrosion and erosion. Titanium will offer the highest reliability, but at the highest price and decreased heat transfer. Tube configurations are limited as titanium does not have very good workability and is difficult to enhance.

TOC (Total Organic Carbon) - This is the amount of carbon bound in an organic compound and is often used as a non-specific indicator of water quality or cleanliness of equipment.

If you have a question that you would like the application engineering team to answer in a future Applications Corner, please send questions / topics to jill.h.woltkamp@jci.com.