Afraid to put Water Cooling near electricity?

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SHARING COMPETENCE

Pfannenberg
ELEKTROTECHNIK FÜR DIE INDUSTRIE

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1 Editorial

Keeping electronics cool in industrial environment is essential to maximizing their lifecycle while saving energy.

Considering Water for Enclosure/Process Cooling is still a delicate topic because of the proximity of electronics. This whitepaper helps you to understand why you should not be afraid to use Water Cooling near Electricity but more, you will learn how Liquid Cooling Solutions can reduce your energy costs, reduce downtime and lower your maintenance costs.

Enjoy reading,

Jeff Wiatrowski
National Sales Manager, Pfannenberg, Inc.

2 Using Water for Process and Enclosure cooling

2.1 Your enclosures already contain water

Air conditioners have condensate management precisely to handle the water that is already in your enclosure.

Many enclosure cooling devices for Industrial Thermal Processing are designed to handle environments where water is present. The off-the-shelf systems incorporate condensate management to handle the water in your enclosures.

The water is hidden in vapor form in the air. Fortunately, when managed correctly it has no effect on the components inside the enclosure.

2.2 How to manage the water correctly?

2.2.1 Keeping the temperature of the enclosure above the dew point

Managing the water correctly in this case means keeping it from condensing into liquid form. This is done by keeping the temperature of the enclosure above the dew point – typically by keeping the temperature of the enclosure above the ambient temperature or at 95°F (35°C). This helps because warmer air can hold more water vapor, making it harder to condense.

For example: If you are keeping you enclosure at 65°F -a temperature comfortable for you or me- and you are having problems with condensation forming on your electronics. The easiest solution is to raise the temperature. By raising the temperature to 95°F - a temperature comfortable for electronics - you move from 100% relative humidity to 40% relative humidity, eliminating your problem. Remember that 100% relative humidity is the point where the air is holding as much water vapor as it can; likewise, 100% relative humidity is the point at which water vapor starts to condense into liquid form.

2.3 Using a unit specifically engineered to avoid contact between liquid and electronics

Products that utilize water as a cooling medium are highly engineered to ensure that the water never comes in contact with the electrical components.

For example, figure 1 shows how the water lines running to the heat exchanger coil are physically separated from where the airflow enters the enclosure. If there is a problem with the water lines, the water has no way to get inside the cabinet.

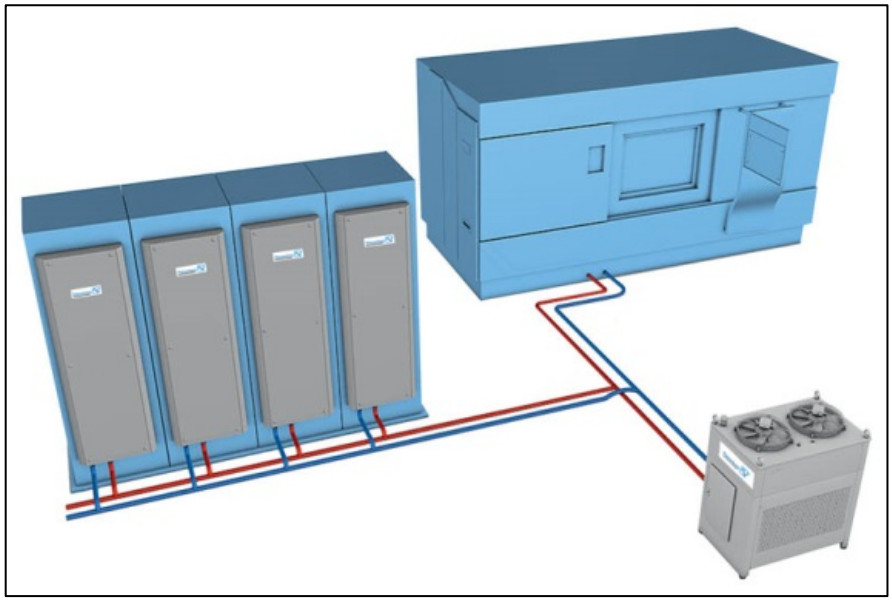

Fig. 1: Process Cooling example using a Chiller to cool Electrical Cabinets

Any condensation that is formed is also prevented from entering the cabinet by directing the condensation to flow along the side of the internal walls and then exit the unit through the drain. When used properly Air to Water heat exchangers help keep the enclosure safe, from water and the heat generated by the electrical components in the enclosure.

2.3.1 Air to Water Heat Exchangers

Using an Air to Water Heat Exchanger is safe and can be a good alternative to Packaged Air Conditioners. Air to Water Heat Exchangers are durable and can be placed in harsher environments without fear of failure. Also, little maintenance is required to keep them up and running.

An Air to Water Heat Exchanger is comprised of a fan, a controller or thermostat, a solenoid, the heat exchanger coil, and the housing (see Figure2). The fan pulls air from the enclosure into the air water heat exchanger and blows it across the coil, cooling the air. Then, the air flows back into the enclosure. Unlike an Air Conditioner an Air to Water heat exchanger does not use outside air at all. This allows Air to Water Heat Exchangers to be put in hot, dusty, or corrosive environments without worry about changing filters or having to replace a coil due to corrosion. There is no condenser coil, refrigerant or exposure to the ambient conditions.

Many manufacturing plants utilize chilled water in their manufacturing processes. Typically they get the chilled water from a large centralized chiller that can be used to also supply chilled water to air to water heat exchangers. This would be an ideal application because the plant already knows the value of using water to cool their machines.

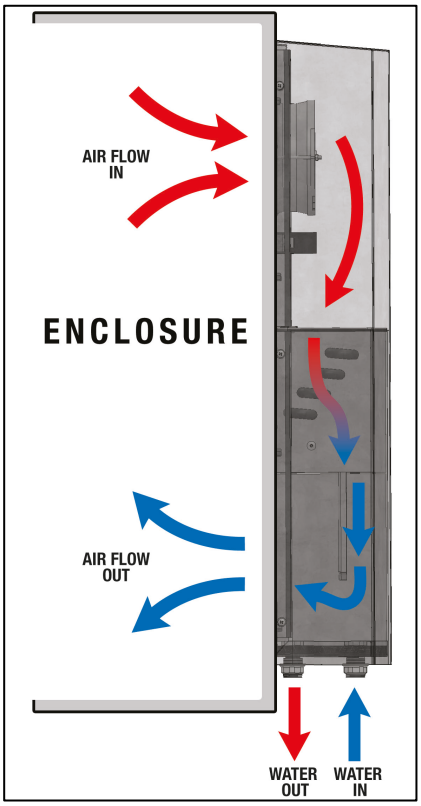

Fig. 2: Composition of an Air to Water Heat Exchanger

2.3.2 Reduce costs with Water solutions

Water solutions reduce costs in several ways:

- First, they lower upfront cost due to the simplicity of the design. No compressor, no refrigerant, only one fan, and less sheet metal lead to a lower price than a comparable size air conditioner.
- Second, the only power used by an Air to Water Heat Exchanger is the power needed to run the fan and the controller. So, it can have a lower operating cost than traditional air conditioner.
- Third, Water Cooling Solutions often have lower maintenance requirements. There are no filters to replace or refrigerant to be monitored.
- Fourth, Air to Water Heat Exchangers may reduce the cost of down time. By having longer service life, they will not need to be repaired as often. It is easy to keep a fan and a solenoid in stock near the Air to Water Heat Exchanger to speed up the repair and get the machine up and running if there is a failure. This reduces the mean time to repair (MTTR).

3 Conclusion

In conclusion, you should not be afraid of using water near electronics in your plant. When managed correctly, water can be used alongside electronics for cooling without causing problems, while providing many benefits. Using Air to Water Heat Exchangers can save money and time. It is safe and affordable.

Due to the amount of money and energy that can be saved, many states are offering rebate programs to offset the cost of a project which replaces inefficient systems with air to water heat exchangers.

4 Company Profile

Pfannenberg is a medium-sized company that operates globally and develops and sells high quality electro-technology for industrial applications. The company manufactures components and system solutions for the business sectors thermal management and signaling technology. The product range for the business sector thermal management comprises air/water heat exchangers, air/air heat exchangers, cooling units, liquid chillers in various cooling capacities as well as fan heaters and thermostats. Thermal management solutions from Pfannenberg are used above all in industrial environments, e.g. for the cooling of electrical enclosures and machines in automobile production, the food industry, wind and solar power plants.

In the field of signaling technology Pfannenberg provides visual and audible signaling devices which conform to internationally recognised standards. These are used in building management or by machine and plant constructors to comply with fire regulations and other health and safety regulations. In both business sectors the companies provide the customers with single components and complete system solutions with individual consultations.

Pfannenberg sells its products in over 50 countries and has worldwide four production plants: in Germany, Italy, China and the USA. A comprehensive distribution network is guaranteed by its 9 subsidiaries. The company was founded in 1954 and still has its headquarters in Hamburg. It has a worldwide staff of about 400.

More information about our products can be found here: www.pfannenbergusa.com

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All details were carefully researched in May 2015.
We can, however, not offer any guarantees with regard to the completeness and correctness of the stated information.

Publisher:
Pfannenberg Incorporated
68 Ward Rd.
Lancaster, NY 14086 USA
Phone: 716-685-6866
www.pfannenbergUSA.com

Contact:
Jeff Wiatrowski, National Sales Manager – jeff.wiatrowski@pfannenbergusa.com

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