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The Salt Air Nemesis And Solutions

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For *The News*

Environmental factors, such as airborne vapors from chemical plants and paper mills, cause substantial damage to HVAC coils each year. In coastal areas, however, the main cause of finned coil damage comes from Mother Nature.

Naturally occurring atmospheric conditions such as wind and hail from storms and erosion from sand blown in from the beach are contributing factors. But the exposure to salt air in these regions is by far the most destructive component to finned coils.

The growing population in coastal areas, combined with the warmer climate, creates a high demand for air conditioning equipment. A large number of these air conditioning systems utilize air-cooled plate fin condenser coils to reject the heat transferred from the conditioned space.

Standard materials of construction for condenser coils are aluminum fins mechanically bonded to copper tubes. The most susceptible component of the coil affected by salt air, or fog as it is sometimes referred to, is the aluminum fin.

Working in the HVAC industry in Florida, I have observed many condenser coils exposed to salt air and the damage it has caused. Bare aluminum fins can deteriorate rapidly depending on a number of factors including fin design, location of the equipment relative to the salt water, and maintenance. A typical indication of corrosive damage is visible in the disintegration of the fin, often resulting in flaking of the aluminum. In severe cases, strips of the fins will peel away from the copper tube, disrupting the mechanical bond to the tube and reducing the finned surface area and its ability to transfer heat. Some of the disintegrated fin material can be pulled into the coil, obstructing airflow and further reducing overall heat transfer.

Condenser coil degradation impacts the entire mechanical cooling system. As the coil surface deteriorates, the coils can no longer transfer heat according to design specifications, thereby decreasing efficiency.

Head pressure begins to increase, causing nuisance shutdowns from the high-pressure limit system. Compressors and condenser fans must work harder, drawing more current and possibly shortening their life. This results in increased energy costs and premature component failure. Consequently, the equipment owner will see higher operating and repair costs.

Find The Right Solution

Many different products are designed to preserve the fin surface of coils located in corrosive environments. Some of the alternatives utilized to combat fin deterioration include using copper instead of aluminum for the fin stock, coating the aluminum fins with an anti-corrosion material, and even some in-place wash systems.

Copper fins typically double the cost of the coil versus aluminum. It has been my experience that copper suffers the same downfall as aluminum, though copper fins usually last longer. Coating manufacturers offer a variety of different compounds and application techniques to protect fins from corrosion. Baked phenolic coatings can be brittle and may tend to chip or detach from the fin surface due to thermal expansion and contraction caused by temperature fluctuations.

One challenge in the application of spray-on coatings is getting total coverage of the entire finned surface. Any coating is only as good as the preparation of the surface to be coated. If the cutting oils and other surface contaminants are not removed, the coating may not adhere properly.

We have investigated and tested many of the different methods and systems available on the market to protect coils from salt air corrosion.

So far, the most effective combination we found is using standard materials of construction, copper tubes with aluminum fins, and a galvanized case coated with a polymeric dipped coating that is baked on. The polymeric coating has elastomeric qualities that flex with thermal expansion and contraction. The dipping process ensures that the total fin surface, including niches that might not be covered by spraying, is coated.

Again, the coating is only effective if it maintains adhesion to the metal surface. Proper preparation of the bare metal is very important.

At The Cape

One application that has been very successful with a polymeric coating is in the cruise terminal at the Port of Canaveral in Cape Canaveral, Fla. The condensers are about 100 feet from the ocean. The condenser coils were originally copper fins and lasted less than four years.

We replaced the coils with standard materials — copper tubes and aluminum fins with galvanized case but dip coated with the polymeric coating. Maintenance of the coils is done by simply rins-



In coastal areas, exposure to salt can result in coil damage that shortens the life of the equipment.

ing the coils monthly with tap water. The fins are showing no sign of degradation after five years.

The most important step in providing long life for coated condenser coils is proper maintenance. Most coil manufacturers and coating providers suggest a monthly rinse with potable water straight from the garden hose connected to the municipal water system. Removal of the salt buildup is fundamental, even with the best coating.

For more information on coil coatings, visit www.heatcraft.com.

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