THE FIN PRESS

Southern Comfort Coil LLC

Heatcraft coils used to cool new 1.1 million-square-foot Nissan factory

Canton, Mississippi facility to open in 2003

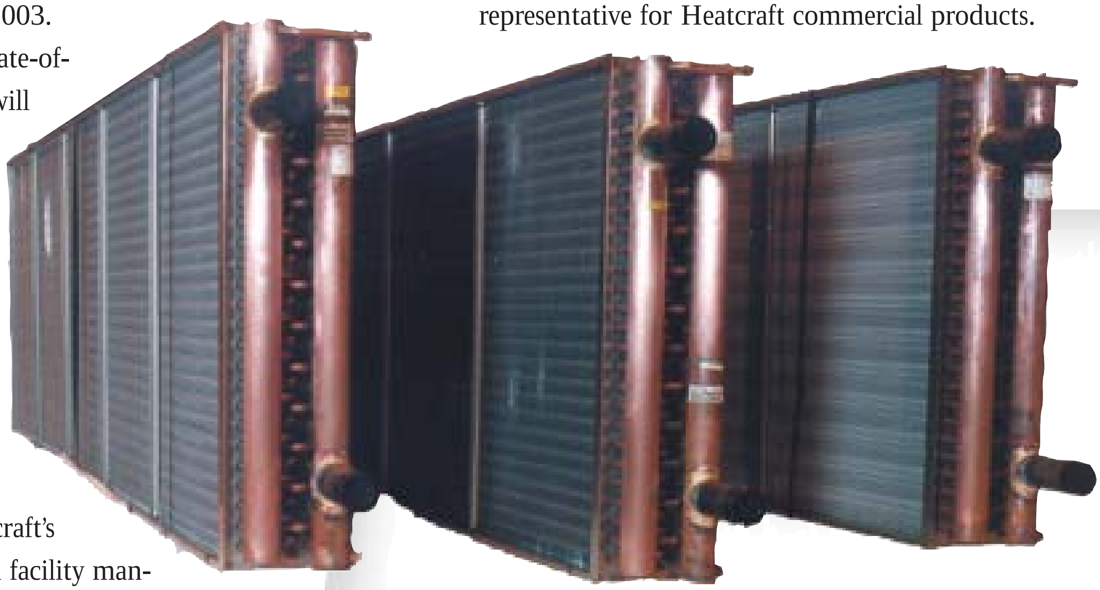
(CANTON, MS) — Heatcraft coils will cool the new 1.1 million-square-foot Nissan facility in Canton, Mississippi when it opens for production in 2003.

The new state-of-the-art facility will employ about 3,300 workers.

Heatcraft teamed with Webco, a custom air handler equipment manufacturer in Springfield, Missouri. Heatcraft's commercial coil facility manufactured 160 custom chilled water coils, which Webco installed in 56 air handlers, totalling more than 3 million cfm. The average size of the six-row coils is 39 x 148 inches.

"This is a sizable project and a high-profile job," said Mark Lien, sales manager for Heatcraft's commercial products group. "We competed against several companies. I believe we were selected because of our reputation of being a quality and reliable supplier."

Webco and Heatcraft have worked together on numerous projects and have a good working relationship. "Webco is a long-time, loyal Heatcraft friend and customer," said Dale Hotard, OEM sales representative for Heatcraft commercial products.



ONE HUNDRED AND SIXTY COILS LIKE THESE WERE MANUFACTURED BY HEATCRAFT'S COMMERCIAL COIL FACILITY TO COOL THE NEW 1.1 MILLION-SQUARE-FOOT NISSAN FACILITY IN CANTON, MISSISSIPPI

"This is a good example of two companies working together."

Kevin Trowhill, national sales manager at Webco, is also very pleased with the teamwork. "We get great service from local Heatcraft sales people. Heatcraft makes a quality coil. We work with Heatcraft because of the product and how Heatcraft stands behind it, and because of their competitive prices."

HEATCRAFT

Using a back-up wrench can help prevent leaky coils

One of the most common causes of a leaking coil is not using a back-up wrench or the improper use of a back-up wrench on the male pipe thread and female pipe thread connections. Many of the coil leaks customers have asked us to repair or evaluate were caused by not using a back-up wrench. In the past three months, we have been on at least four field service jobs to repair leaks in the connection to header and tap tube. We discovered the leaks were caused by not using the back-up wrench on the connection.

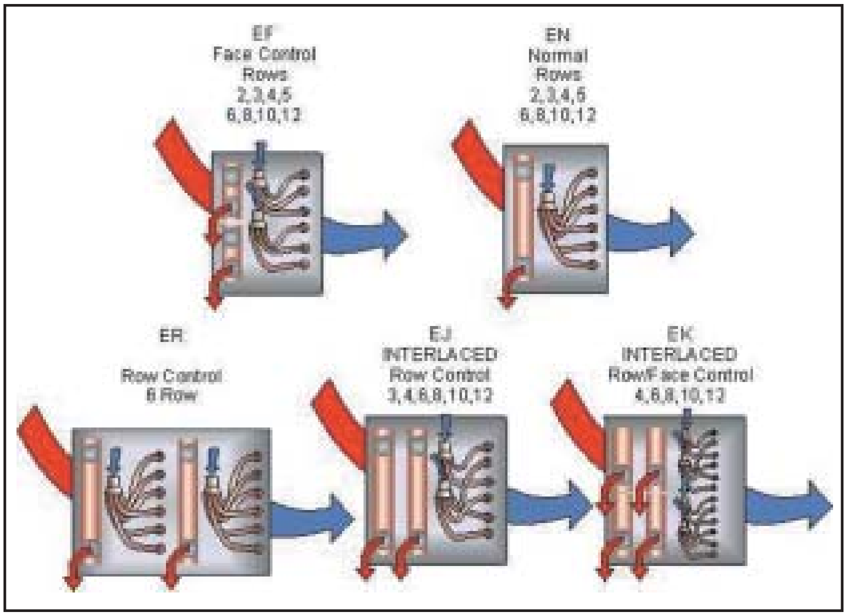
When contractors or pipe fitters hook up the connection, they may not realize the stress they are putting on the copper tubing and brazed joint on the coil. When the header or tap tube is stressed, the brazing rod or tube will fracture if the pressure applied during the hook-up of the connection is fatigued beyond its strength. The stress fatigue fracture can happen on the brazed joint, tap tube, coil tube to header plate, or anywhere behind this connection area. During this hook up, the operator may not see the damage being caused because the connection may be the only part of the coil exposed outside the unit. When a back-up wrench is not used, sometimes there is a noticeable twisting on the tap tube and header on the coil inside the unit.

Although a “Caution! Hold Connection With Back-Up Wrench” label is on the header manifolds, the problem continues. We have asked our OEM customers’ manufacturing facilities to place a label on the outside of the units near the supply and return connections to remind workers of this procedure. We believe this will help minimize this problem.

HEATCRAFT

If humidity is a problem, check the evaporator

by Joanna R. Turpin



THERE ARE ALSO DIFFERENT TYPES OF EVAPORATORS THAT HAVE VARYING TUBE PATTERNS AND FIN SURFACES. THE TYPE OF EVAPORATOR CHOSEN CAN DETERMINE HOW MUCH MOISTURE IT CAN PULL FROM THE AIR. SOME OF THE DIFFERENT TYPES OF FINS AVAILABLE ARE A FLAT FIN, A CORRUGATED FIN, AND A SINE-WAVE FIN.

There are lots of different types of evaporators out there, but the main goal of all of them is to transfer heat from the airstream to the fluid (refrigerant) being circulated within the refrigeration system.

But another advantage to an evaporator is dehumidification. When air passes through an evaporator, its temperature is reduced below the dew point temperature, causing moisture to condense out of the air. That moisture is the humidity in an occupied space.

In fact, most commercial applications rely on the evaporator in the mechanical cooling system to do most of the dehumidification in the building. That takes on special meaning, considering ASHRAE Standard 62-99, which calls for more outside air to be brought into commercial buildings. That air can be humid, increasing the latent load on the evaporator. Paying attention to the evaporator design, installation and maintenance should keep the occupied space at the proper humidity level.

Size it right

The first step that should be taken to ensure the evaporator will work correctly is to size it right. Although the thermostatic expansion valve (TXV) will make up for most of the errors if a coil is somewhat under- or oversized, it can't help if the coil is greatly mis-sized.

"An oversized coil can actually help system efficiencies, but it will generate high suction temperatures. This leads to higher fin surface temperatures, which will result in less dehumidification," says Jeff Maxwell, product and applications engineer, Heatcraft, Grenada, MS.

On the other hand, an undersized coil will result in lower system efficiencies. That's because the TXV will try to close off the flow of refrigerant to achieve the desired superheat. This will cause lower suction temperatures. This combined with either a dirty coil, due to low maintenance or poor filtering, or insufficient refrigerant charge can result in a coil freeze-up.

Different designs

There are also different types of evaporators that have varying tube patterns and fin surfaces.

The type of evaporator chosen can determine how much moisture it can pull from the air. Some of the different types of fins available are a flat fin, a corrugated fin, and a sine-wave fin. However, the type of fin chosen can also affect air pressure drop and capacity. The more enhancements made to the fins, the higher the air pressure drop is going to be, but the more capacity the evaporator will have. That's because the heat transfer coefficient is going to be higher as there's more turbulence in the air.

The flat fin has the lowest air pressure drop, but it also has the lowest capacity. The sine fin, which has the most enhancements, would be more conducive to pulling more water out of the air. But while it has more total capacity, the air pressure drop will go up. It's also possible to add rows and fins, as that all adds capacity.

"Everything is done in efforts to increase how much total capacity your coil can handle. If you opt to go with a higher fin count per inch or more rows to get more capacity out of your coil, then naturally you're going to increase your latent capacity as well," says Maxwell. "But the sensible to latent capacity ratio will increase, which may result in an insufficient amount of dehumidification."

However, adding rows and increasing fin density will increase the air pressure drop. "It's a trade-off," notes Maxwell. "Air pressure drop versus capacity. With chilled water coils you can look at it as the same thing – increasing your fluid flow rate or increasing your tube side enhancements with a rifled tube or a cross-hatch tube it increases your fluid pressure drop but it can also increase your capacity as well."

Maintenance is also an issue

If an occupied space is suffering from high humidities and it's been determined that the evaporator is of the correct size and type, then improper maintenance may be the problem. "I get calls all the time from customers complaining that their evaporator is not getting the capacity that it was supposed to, or the leaving air conditions aren't what they should be," says Maxwell. "Then we have to sit down and virtually troubleshoot their system. It could be a hundred different things, but it's often a dirty coil."

Maxwell says that the magic question to ask in this instance is, "Has the system ever worked properly?" If it did work correctly at the beginning, but system performance has degraded over time, then it's likely the evaporator has not been cleaned properly. Of course, if the system has never worked correctly, then it becomes necessary to look at other issues, such as how it was originally installed.

"If the coil wasn't designed properly, if it's undersized or oversized, or if it isn't maintained, all these things can contribute to humidity problems inside," notes Maxwell.

So if a space has humidity problems, a good first place to look is at the evaporator.

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Sprayed Coil Applications

by Geoff Tetley
Heatcraft Director of Product Engineering

There are some HVAC applications where control of relative humidity is as important as controlling temperature. These applications use the normal cooling process to remove moisture from the air during the cooling season and the same coils are sprayed with water to increase humidity during the heating season. Water is sprayed on the entering air side of the coil in the form of a mist delivered from a series of nozzles piped across the face of the coil. The piping set up is usually called a "tree." When the sprays are functioning, the coil actually acts as a dispersing medium to insure that the water is distributed evenly throughout the air stream. The sprays are usually turned off during the cooling season.

Since the coil is almost always covered with a film of water, coil corrosion is a cause for concern in these applications. Coils for sprayed applications are often specified with copper fins and stainless steel casings, or are protected with a metallic or organic resin coating. Normally, cooling coils almost always stay wet during the cooling season, but stay dry during the heating season. Water condensing out of the air will be relatively pure unless it picks up contamination from the air stream or the coil surfaces. Water supplied during the spray application periods can be of varying quality, depending on its source. Water treatment is highly recommended to reduce the potential for corrosion, especially if the water is recirculated. The most common forms of corrosion are general dissolution, localized corrosion, and galvanic corrosion. Water quality would have to be severely compromised for general corrosion to occur. The pH would have to be very low to attack metals such as steel and copper and quite high to attack aluminum. Localized attack occurs at breaks in a protective coating or locations where water is retained and concentration cells form. The major concern is with galvanic corrosion, which is why copper fins and stainless casings, or coated coils, are generally specified. On coils made of galvanized steel, copper tube and aluminum fins, the zinc coating on the steel will begin to be consumed in about two years, so this construction can only be considered if the water quality is maintained at a high level of purity. Coils made of copper fins and stainless casings will last many years, particularly if the chloride content of the water is kept at a low level. Coated applications are only necessary where the water conditions are very aggressive.

Water quality factors that may affect corrosion of metals are pH, dissolved oxygen, hardness, alkalinity, and total dissolved solids (particularly chlorides and sulfates). The relative combination of pH, hardness, and alkalinity controls the tendency to form protective carbonate films on the metal surface. When these relative conditions are maintained, the risk of corrosion is lowered. The greater the deviation from these conditions, the greater the tendency for corrosion to occur. This ideal combination is called the saturation index or Langelier index. Maintenance of this index should be the basis of the water control system. This type of water quality control is normally used when the water is hard (greater than 150 ppm total hardness). It is essential when the water is very hard (greater than 300 ppm total hardness). Soft water has been known to produce corrosion erosion in copper tubes, but this usually occurs at elevated temperatures (110°F to 140°F) on the inside of tube surfaces. Soft water should not have any deleterious effect on sprayed coil applications.

Dissolved oxygen cannot be avoided in

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sprayed coil applications because the spray nozzles act as efficient aerators. For this reason, all other aspects of water quality should be closely controlled because their individual effects will be heightened by the presence of the dissolved oxygen. Total dissolved solids can give rise to galvanic corrosion because electrical conductivity increases with increases in dissolved solids. Chlorides and sulfates are of particular concern.
Microbiologically induced corrosion (MIC) is sometimes a problem with copper in continuous contact with water and the presence of dissolved oxygen make things worse. For this type of corrosion to occur, the cultures must be present and have food to live on, usually tramp oil floating on the surface of the water. In normal operation, there is enough agitation and flow to prevent MIC from occurring. However, provisions must be made to thoroughly drain the coil casings when the system is not in the spray application.

Questions have arisen about the use of deionized water. Deionized water is very pure and will not conduct electricity. In fact, it is usually specified by its electrical resistivity (in megaohms). There is nothing in deionized water to react with the metals used in coil construction and, because it will not conduct electricity, galvanic corrosion cannot occur. This type of water has been described as "hungry" for ions. Because there are no dissolved compounds in the water, any ions that it does come into contact with that are available for dissolution will pass into the solution very readily. This dissolution is still very slow. We have not found any reference in the literature to support anecdotal claims that heat exchangers in contact with deionized water quickly corrode away. We have found claims in the published literature (see references) that the dissolution rates in deionized water are much slower than for drinking water collected from the surface or pumped from wells. It is believed that the concern originates from fears of compromising the quality of the deionized water, rather than corrosion of the materials with which it comes in contact.

In summary, coils supplied for sprayed water applications should be built with stainless steel casings. Either aluminum or copper fins are adequate, but if there is any concern about maintaining the quality of the water supply (especially dissolved solids), then copper fins should be considered. Coated coils are only necessary when the condition of the water or the air supply is extremely aggressive.

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