The Cold Facts

Spring 2002

Evaporative Condensers:
The Cooling Systems' Forgotten Component

Typically, everyone is concerned with the components in the engine room of an industrial refrigeration system. However, we frequently overlook or ignore an essential part of the system, the evaporative condenser. All the heat that is extracted from the product or space has to go somewhere, right?

At one time or another, most operators have experienced a system running with high discharge pressure. It's at those exciting times, which usually occur in the middle of summer, that you wish your condensers were new, perfectly clean and 100% efficient again. If you could only click your heels and have a new condenser appear before your eyes, ready to operate. Or, we often think, "If I only had some extra capacity, at least for June, July and August!" One way to avoid this problem is through proper maintenance.

Unfortunately, our tendency is to think of the condensing system as relatively simple, since we are just dealing with water, air, heat and galvanized steel. However, it must be dealt with properly and in a timely manner. Let's spend just a few minutes reviewing some basic information about the evaporative condenser system.

First, the water entering your condenser is never pure. It's typically supplied from the local municipality, a well, a river or a lake. Even when we think it is clean, it's more like a mixture of dirt, sand, dissolved minerals, bacteria and algae. In addition, there is always some amount of intended or unintended chemicals. Let's also look at the air. One refrigeration technician we know calls the evaporative condenser an "air washer." And, in a sense, he's correct. Anything carried through the air collects in the condenser sump. Then it will circulate with the water over the tubes. A short list of potential airborne contaminants might include leaves, seeds, dust, minerals, pollen, feathers, smoke, grease and gases from nearby local processes.

Okay, now let's mix the "tainted water source" with the "air" and add heat. Can you imagine how this might affect performance if the situation occurs for very long? Even the heat isn't consistent. Depending upon the type of compressors, the type of oil cooling, the load on the system and the weather conditions, the heat entering and leaving the evaporative condenser changes in quantity and intensity.

The solution to this problem is proper water treatment! With all these variables, it's impossible to prescribe one universal method of condenser water treatment. Nevertheless, it's very important to you and the proper operation of your plant to have an appropriate solution for your application. It will help to avoid those panic times in the summer months we described earlier. There are a variety of treatment options. A program that works perfectly in one plant may not work in another because of different water composition and air conditions. Proper treatment requires scheduled testing of the water chemistry as environmental conditions change to ensure that it's doing the job.

We might also add that a good supplier program does not absolve us from the responsibility of monitoring the condition of the condensers.

A *minimum* evaporative condenser maintenance program includes:

1) Proper greasing of fan and pump motor bearings with the recommended lubricant. All manufacturers make recommendations regarding the type of grease to use, as well as the frequency.
2) Use of the proper type and size of belts, and keeping them adjusted.
3) Checking and cleaning the water spray nozzles. Note: There are new spray nozzles that are very efficient and are self cleaning, like the Frick/Imeco "Powerflow" nozzle. They are exclusively applied to all new Frick/Imeco condensers, but it is also available as a retrofit. For more information on retrofitting your condensers with these efficient, low maintenance nozzles, please contact your RSC office (see page 4 for a complete list).
4) Cleaning the water pump inlet screen/strainer.
5) Periodic draining and washing out of the sump(s).
6) Cleaning blocked and replacing deteriorating mist eliminator sections.
7) Physically/visually inspecting the tubes. If scale is building, you need to do something about it—or it's going to do something to your operation and energy usage. If the tubes and cabinet are very bright and shiny, zinc is being etched from the galvanized surfaces. Etching means something is seriously wrong with the water treatment chemistry.

Clean condensers are an essential part of an efficient refrigeration system. If you do not have the staff, expertise or the time, call an RSC office and ask us to start worrying about your condensers for you! In addition, we urge you to develop a relationship with a competent water treatment expert. If you're not familiar with the issue or need help selecting a vendor, we'd be pleased to assist you.

A clean, well operating condensing system will save you money in energy costs, operating down time, and perhaps even save you a few sleepless nights.

—Jim Draper, V.P., Nashville Tennessee branch

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Ammonia Gas Detection

Most people are confused by the differences in the refrigerant gas detectors available on the market today. The following is a description of the three most popular types and where they are best applied.

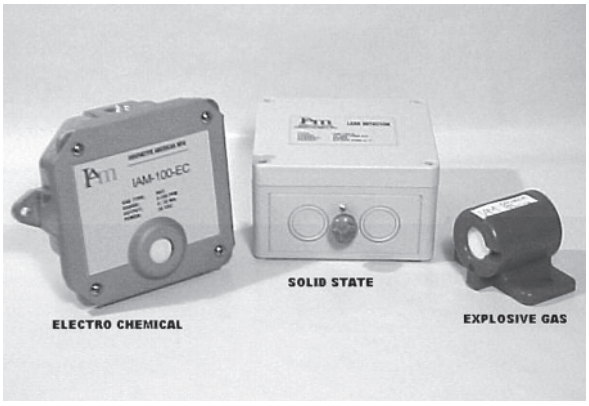
Solid State: This detector is noted for low cost, long life and medium sensitivity. It's not gas specific and will alarm on most common gases. It does require higher alarm settings to prevent false alarms. It's an excellent choice for general refrigerant gas detection.

The solid state detector has a life of 5-8 years and is not damaged by constant low level concentrations of ammonia.

This sensor is great for engine room applications. Ranges are generally 25-300 PPMS and 100-3000 PPMS. The 3000-PPM sensor is used for relief line monitoring.

Electro Chemical: This detector is noted for its capability to detect low levels of gas and its specificity to a single gas type.

Ranges are 0-100 and 0-250 PPM. This sensor is rather high cost when compared to solid state (about 50% higher) and requires the element be replaced at least once every 18 months.



The three types of refrigerant gas sensors— (left to right) Electro-Chemical, Solid State and Catalytic Bead.

It is generally not a good choice for engine room applications, as constant exposure to levels as low as a few PPM of ammonia will poison the sensor and require frequent replacement. This sensor is usually applied in the refrigerated space for early detection of a leak.

Catalytic Bead: These sensors are used to detect higher concentrations of ammonia. NH3 has a relatively narrow critical range, approximately 16-26% by volume, or 160,000-260,000 PPMS. The sensors are set to 25% of the lower explosive level (LEL) of NH3, or somewhere between 30,000 and 40,000 PPM.

Should the sensor detect these levels of gas, it may be used to signal when some equipment might shut off.

RSC can supply any of the above sensor types, along with sophisticated monitoring and control systems.

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