Keeping Cooling Towers and Heat Exchangers Clean is Key To A Healthy and Efficient Process Cooling System

Filtration Systems Can Significantly Reduce Maintenance, Downtime and Lost Productivity.

By Randy Simmons,

To strike an interesting analogy, your cooling tower and heat exchanger is what the lungs and heart are to the human body; when either isn't working properly, it effects other parts of the body and your health suffers. Similarly, when your cooling tower and heat exchanger isn't clean, the heat exchange process doesn't work efficiently and the health of your production and process cooling system suffers.

Process cooling systems that rely on cooling towers to dissipate heat from process cooling water accomplish this by drawing massive volumes of air into the cooling tower as the water travels through the fill material on its way back to the basin. Through the natural evaporative process, heat is dissipated from the water before it reaches the water basin from which it is re-circulated through the chiller then through the heat exchanger and back *again (kind of like when you perspire while working and letting the air evaporate the perspiration to cool you down)*. It is important to realize that cooling towers are gigantic air scrubbers that capture all airborne debris that happen to be floating nearby, and if your system doesn't have effective filtration, the debris can clog the fill and get circulated and trapped in the heat exchanger where it can build-up, restrict water flow and cause your process equipment to malfunction due to overheating.

An example of this is illustrated by a major automotive assembly facility that had faced periodic downtime due to their robotic welding systems not holding tolerances and causing quality problems. After the robotic technicians spent several days trying to initially solve the problem, one of the maintenance workers opened the heat exchanger and discovered that it was impacted with cottonwood seed, insects and other debris – flow had been reduced and the robotic equipment was running hot. Now you might be asking yourself, whey didn't they have some sort of filtration equipment? The answer is simple; at the time the facility was built, the ambient conditions in that area didn't require a filtration system. However, as the years went by and the area became more developed and cottonwood tree populations grew, the need eventually surfaced.

Debris & Sludge Build-up in Cooling Tower Sump

The interesting thing to note about this situation is that even though cleaning the heat exchanger got the robotic welding system back on-line and running at peak performance, it didn't solve the problem. In fact, cleaning heat exchangers is like taking a cold capsule to relieve the symptoms of a cold. Unless you treat the root cause of the problem, the cooling system will suffer time and again. The root cause in this case and in most heat exchanger fouling situations is the cooling tower – stop the debris from getting into the cooling tower and it will protect the entire process cooling system including fill, cooling water, chiller and heat exchanger. With the proper filtration technology, your process cooling system will stay clean and running efficiently all season long.

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Selecting The Right Filtration System

It is important to realize that optimizing the ecology and operational efficiency of your evaporative cooling system is best accomplished by combining a chemical treatment regimen with some type of filtration. The reason is that chemical treatment specifically targets suspended solids and particulates of 40 microns and below, while filtration systems are designed to stop larger debris, especially the kind that causes system clogging and fouling.

This Is The Kind Of Debris That Will Clog Cooling Tower Strainers & Heat Exchangers

For cooling tower filtration, there are two general technologies: *Water Based Systems* for which there are a few different variations and *Air Intake Filtration Systems*. With water-based systems, the choices include basic water strainers that remove debris by simply passing water through a mesh strainer; sand filtration systems that remove debris by passing the water through sand and centrifugal separators that spin the water and remove the debris through centrifugal action. In contrast, Air Intake Filter Systems remove the debris by filtering the air as it is being drawn into the cooling tower, keeping the debris out of the system in the first place. When considering your filtration options, the following questions should be asked.

- What is the cost associated with downtime due to heat exchanger or cooling tower fouling or clogging? (Knowing this will help you justify your filtration system cost)
- What type of debris is most problematic (can you see it or is it microscopic)?
- Specifically what part of the system does the filter protect?
- Which system provides the greatest filtration surface area (this can directly impact frequency of cleaning – the smaller the filter the more frequently it needs cleaning)
- Can the system be installed without shutting down the cooling tower? (If the cooling tower must be shut down for installation, you need to factor lost productivity into the cost of your filtration system if it's not being installed during shutdown periods.)
- What is the cost associated with both the filter and installation?
- How easy is the system to install and maintain?

Answering the above questions will help you to fully understand your options and to make the best choice for your operation.

In the case of the automotive manufacturer, the solution they selected was the Air Intake Filter system. The reason was that they needed a system that would protect their entire process cooling system including fill material, cooling water, chiller and heat exchanger. When they evaluated water-based systems, they discovered that the options provided varying degrees of protection for the chiller and heat exchanger but didn't protect the cooling tower where the root of their problem was. If they had selected a water-based system, their cooling tower would have still drawn airborne debris into both the fill and water where the water filter would have captured the debris before it circulated throughout the system. From a maintenance standpoint, that would have solved the heat exchanger problem but it would have done little to reduce maintenance on the cooling tower. Further, when they compared the cost of water based filtration versus air intake filtration technologies, Air Intake Filtration was found to be the more cost effective approach for their operation.

Air Intake Filter Keeps Airborne Debris Out of Cooling Tower

If you are not currently using a filtration system as part of your process cooling system, then any filtration technology will give you more protection than you have now, however, selecting a solution best suited to your operation requires that you know what kind of debris is causing the problem and where it is getting into the system. As a rule of thumb, " don't select a small debris solution to solve a large debris problem". Conversely, "don't select a large debris solution to solve a small debris problem". There is clearly a place for both water based filtration and air intake filtration – be sure you're selecting the right filtration for your specific need.

If you are looking to protect only your chiller and heat exchanger from airborne debris, then one of the water-based filtration technologies in combination with a good water treatment program can help you manage the debris that gets into the cooling water. If on the other hand, you're looking for full process cooling system protection, then you should look at Air Intake Filtration - It will stop the debris from getting into your system in the first place . □

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