Healthcare Facility Chiller & Condensing Coil Maintenance

Balancing Deferred Maintenance Risks With Maintenance and Budgetary Decisions

By Randy Simmons

As most healthcare facilities and maintenance engineers know, proper maintenance on chiller and condensing units is critical to efficient, trouble free operation. However when you combine the fact that most chillers and condensing units are situated in low traffic locations and out of sight (i.e., behind buildings, hidden behind walls, on rooftops, etc.,) with the fact that the coil cleaning portion of the maintenance process is an unpleasant and time consuming task, chiller and condensing unit maintenance isn't one of those jobs that most maintenance engineers look forward to. In situations where the maintenance department is busy or understaffed, coil cleaning is likely to be deferred beyond the time when maintenance is actually required by the equipment.

> **"When budgetary constraints are placed on the maintenance of "mission critical" equipment, the results can be catastrophic to the operation"**

It is commonly known throughout the HVAC industry that even the slightest coil fouling leads to what can be described as the first level of failure which is distinguished by the following characteristics:

First level Chiller Failure *(characteristics)*

- Higher operating compressor head pressure *(caused by elevated refrigerant pressure resulting from restricted air-flow and poor heat exchange).*
- Reduced cooling capacity *(caused by poor air-flow through the coils).*
- Increased kW draw coupled with a reduction in cooling tonnage capacity.
- Unit runs longer and works harder to achieve set temperature points.
- Compressor keeps cycling off and on under high head pressure. *(Compressor is being stressed under dirty coil conditions – system is overheating).*

Chillers suffering from high-head pressure conditions pass the impact along in the form of employee and Patient discomfort and complaints, a reduction in employee productivity and higher energy costs. As long as the coils remain dirty and airflow is reduced, the energy penalty will occur during all hours of operation (during both part-load and full-load operation). Unless you monitor the chiller kW draw with an energy management system or with a separate metering device, you will most likely learn about the problem when it's hot and you are unable to maintain chilled water and/or environmental temperatures, when you see your energy consumption sky-rocketing or when your compressor fails. In applications where a chiller supports critical systems infrastructure such as computer rooms, operating rooms and critical care facilities, fouled coils can result in the overheating and failure of computer equipment, effect access to patient care, billing and purchasing information, impact operation schedules and effect indoor comfort and air quality – the impact can be enormous.

Consider This Scenario*:*

A 20 ton chiller used to cool a computer control room of a hospital becomes fouled and is in need of cleaning; but because the maintenance department was short handed, they didn't have the time to perform the maintenance when it was needed hence; maintenance is deferred for an unspecified period of time. Eventually, the debris load completely fouls the chiller coils resulting in a second level of failure which results in a catastrophic computer failure that impacts automated business processes across the facility.

Split Coil System with a Dirty Inner Coil

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Second Level Chiller Failure

(Characteristics & cost implications)

- The compressor fails and cooling to the computer room is lost.
- The computer room overheats resulting in computer failure. Although computer back-up systems are in place – they too are vulnerable to overheating because the computer room cooling system is down. Spot coolers are available but are not designed for the full heat load of the computer room.
- Procurement of a new compressor takes 2-days resulting in a significant increase in employee work effort and a reduction in overall efficiency and productivity (Note: efficiency reductions will vary depending upon systems and work processes affected).
- Increased employee overtime cost due to system efficiency reductions – low conservative estimate $150,000 + (*$75,000 + daily)*.
- Compressor replacement cost - $7,500
- Compressor installation cost - $4,000
- Coil Cleaning Cost: $1,500

As you can see, if the coil cleaning and maintenance are performed before the first level of failure, it would only cost $1,500 to keep facility systems running smoothly; however if maintenance is deferred and operation continues until the second level of failure, the costs associated with the second failure could easily wind-up costing over $100,000.

Coils Severely Fouled With Cottonwood Seed

Why Companies Defer Maintenance on Chillers and Condensing Units.

There are many reasons cited by facilities and maintenance directors; however it's important to keep in mind that regardless of the reasons, when equipment is in need of maintenance, deferring it for any reason will not change that fact. Do any of these reasons sound familiar?

- **Budgetary Constraints** – *"We'll put-off the maintenance until next month so we don't go over budget"*. When you consider all of the risks to a business associated with a system failure, deferring maintenance due to budgetary constraints is not usually a sound decision. When budgetary constraints are placed on the maintenance of "process and comfort critical" equipment, the results can be catastrophic to the facilities and maintenance budget.
- **Man Power & Time Constraints** – *"We'll get around to cleaning the chiller as soon as we can – we have too many other things to do right now"*. This reason for deferring maintenance is more common today than ever before. Why? Because businesses & institutions have been forced to reduce staff and streamline operations to conform to the economic realities of their business, or they cannot find qualified personnel. This places additional demand on maintenance engineers because they now have to do more with less. If chillers and condensing units support mission critical operations and facilities, then maintenance of those systems should be near the top of the TO DO LIST even when the maintenance department is busy or short handed. To help improve maintenance efficiency and reduce the time required for performing the maintenance task, the maintenance should be outsourced to a reliable service company or maintenance reducing technologies such as air intake coil filters should be adopted. In short, investment in technologies that can optimize operational efficiency and reduce the maintenance effort should be considered in lean maintenance staffing situations.
- **Maintenance Complexity and Knowledge Constraints** – *"Maintaining this equipment is very difficult - we don't have the skills to maintain it properly"*- this reason is especially common in companies using advanced

mechanical systems. Maintenance workers must be trained to properly maintain them or, the maintenance work should be outsourced to a service company that is knowledgeable about the maintenance process.

- **Unfriendly Maintenance Process** – *"We hate cleaning chiller and condensing units because it's a dirty job – we get dirt and debris all over us when we power wash the coils – we'll clean the coils later"*. Although cleaning coils are in fact a dirty job, it is not a sound reason for deferring maintenance. When cleaning coils, proper safety equipment including eye and respiratory protection, rubber gloves and protective outerwear should be worn to protect against coil cleaning chemicals and possible mold or bacteria problems that can pose a health hazard. As an alternative, air intake filtration systems that isolate the debris on the outside of the coils where it is visible and easy to clean using an ordinary broom, brush or shop vacuum can reduce the "hassle factor" associated with this important maintenance task.

Chiller unit shown with coil filters that isolate debris on the outside of unit for quick & easy cleaning.

The list of reasons for deferring maintenance can go on and on but one thing is clear, deferring maintenance on HVAC equipment can be risky and can increase the odds that a system failure will occur; and when it does, it will usually cost more than the cost of the maintenance that could have prevented the failure in the first place.

In the end, the decision for performing or deferring maintenance on HVAC systems fall squarely on the shoulders of the maintenance and facilities directors as they balance their maintenance and budgetary decisions, recognizing all the risks involved.■

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