

# School District Chiller & Condensing Coil Maintenance

## Balancing Deferred Maintenance Risks With Maintenance and Budgetary Decisions

By Randy Simmons

As most school district directors 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 district and maintenance budget”**

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 building occupant discomfort and student and faculty complaints; it is a well established fact that an uncomfortable indoor environment is not conducive to the teaching and learning process. While student and faculty discomfort manifests itself during occupancy periods, the energy penalty occurs 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.

### Consider This Realistic Scenario:

A 20 ton chiller used to cool the computer room of a district administration building becomes fouled and is in need of cleaning; but because the maintenance department is short handed and tending to other important matters across the district, they don't have the time to perform the maintenance when it is needed hence; maintenance is put-off for an unspecified period of time. Eventually, the debris load completely fouls the chiller coils resulting in a second level of failure which has a catastrophic impact on the district and the maintenance budget.



*Split Coil System with a Dirty Inner Coil*

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## Second Level Chiller Failure

*(characteristics & cost implications)*

- The compressor fails.
- The computer room experiences computer failure due to overheating and the district is unable to access school records, provide internet access to school buildings; stops email communications between administrators, teachers and parents; effects ability to process employee payroll and impacts access to information and reports. In short chiller failure can quickly bring district operations and communications to a stand still and can cause important local, state and federal reporting deadlines to be missed. Use of back-up computer system is not deployed because they too would be subject to failure under the high temperature conditions.
- Procurement of a new compressor typically takes 2 – 3 days resulting in significantly reduced administrative efficiency during chiller down time.
- Compressor replacement cost - \$7,500
- Compressor installation cost - \$4,000
- Maintenance overtime cost - \$3,500
- Coil Cleaning Cost: \$1,500

As you can see, if the coil cleaning and maintenance had been performed before the first level of failure, it would have only cost \$1,500; however, because it was deferred and operation continued until the second level of failure, the costs associated with the second failure level wound up costing the district over \$16,000; *that's eleven times the cost of the preventative maintenance that would have prevented the failure in the first place!* – Note: this doesn't even include the additional energy cost leading up to the failure nor the additional administrative cost due to system failure.

Now, if you're thinking that having chiller redundancy is critical to this "mission critical" location you'd be right; however, today's realities of district funding commonly doesn't permit the luxury of having full system back-up hence, the need for districts to invest in diligent preventative maintenance practices and maintenance saving technologies.



*Coils Severely Fouled With  
Cottonwood Seed*

## Why School Districts Defer Maintenance on Chillers and Condensing Units.

There are many reasons cited by facilities and maintenance managers and 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 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 “mission critical” equipment, the results can be catastrophic to the district 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 school districts have been forced to reduce staff and streamline operations to conform to the economic realities of their district due to failed school levy's, changes or reductions in state and federal funding, 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 technologies such as air intake coil filters should be evaluated. 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 correctly”*- this reason is especially common in districts 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 “time and hassle factor” associated with this important maintenance task.



*Air Cooled Chiller coil filters that isolate debris on the outside of unit for quick & easy cleaning.*



*Rooftop Unit with Air Intake Filter Protecting Coils.*

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 significantly 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 facilities directors and maintenance engineers as they balance their maintenance and budgetary decisions, recognizing all the risks involved.■

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