Preventative maintenance and coil-cleaning questions are on the rise, so RSES Journal readers and RSES Members asked industry experts to shed some light on this constantly evolving topic.

Q: Pressure is a friend and a foe when washing coils—too much and the fins are bent; too little and the contaminants are not pushed out. Is there any consensus in the industry on a good [pressure] number?

A: Based on application experience, a pressure below 400 psi would be the target. This would be fin-safe, yet contain enough force to knock off any “junk” that may be on the coils. In the late ’70s, Nu-Calgon marketed the No. 200A Pressure Sprayer. It developed up to 200 psi and was very safe on the fins. That model was replaced with a more portable unit that produced a pressure of up to 350 psi, and that was found to be safe on the fins as well.

One other point to consider here would be the nozzle selected or, more specifically, the nozzle’s spray angle. The psi pressures just mentioned were based on a nozzle-spray angle of no narrower than 15 degrees. If a 0-degree nozzle (literally a jet stream) was used, fins could be bent.

Q: With increased efficiency standards and deeper coils, it is often difficult to really tell if a coil is clean. Other than
the somewhat destructive testing that requires bending fins to check, is there a way to do this?
A: There is not an easy, time-effective answer for this question. Visual inspection is easiest but obviously imperfect. The only way to clearly ascertain effectiveness of cleaning is to utilize instrumentation or data loggers over time. This requires the technician to measure and log pressure drop across the coil; starting and running amps over time versus load and outdoor temperatures, etc. on a dirty coil, and then perform the same measurements on a clean coil. Or, in a single setting on a good, hot day, a technician can measure the vitals (starting and running amps; outdoor temperature; and suction and discharge temps and pressures) on a dirty coil. Then, clean the coil and continue to gather the same data.

Q: What, if any, efficiencies are gained by removing surface oxidization from coils?
A: None, unless the oxidation progressed to the point where it had mass or structure that would impede heat transfer. Typical or natural oxidation of aluminum fins (aluminum oxide) yields a dull gray color or appearance on the fins, but does not necessarily affect heat transfer. This is nature’s way for aluminum to protect itself. However, in aggressive environments (misted salt water, food acids, etc.) the

Technicians whose customers are concerned about the environmental impacts of cleaners can use products listed with the EPA’s Designed for the Environment program, which approves products with contents that are environmentally safe.

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natural oxidation can yield to a more aggressive action on the aluminum fins. This creates actual deposits and eventually differential aeration cells (barnacles with air pockets), which can affect heat transfer, air flow and support further metal degradation.

Q: Some of my industrial customers prohibit me from using chemicals when cleaning condenser coils. They are concerned about EPA National Pollutant Discharge Elimination System permit regulations that limit their storm-water discharges. The amount of chemical used in cleaning coils is minimal, and the energy increase resulting from not using them is significant. Are my customers correct? Is this the EPA’s intention? Are there any chemicals that would be approved by the EPA when “used as directed?”

A: This is a thorny issue, or at least to the degree that municipalities—the contractors’ industrial customers—and local and state governments allow it to be. The EPA’s intention in the Clean Water Act and other legislation—often cited as the reason to control or prohibit coil cleaning—were promulgated for the expressed purpose of protecting the environment. They were not meant to directly prohibit coil cleaning. Certainly, if a given cleaner’s chemistry is prohibited by law and its rinse effluent could reach storm sewers, then its use should be controlled or even prohibited. However, cleaners are often denied the opportunity to be used without first determining whether their raw materials represent a problem.

The discussion is further compounded when a government or municipality exacerbates the issue by restricting the run-off from a water-only cleaning because it does not want the dirt or anything else that was on the coil to find its way into storm drains and then streams, etc. As previously stated, the issue is troublesome, and some efforts to control coil cleaning could be described as poorly conceived.

There is no question that the energy savings and energy efficiencies that equipment gains by being cleaned are important too. And yes, the amount of chemical coil cleaner involved is small—and many times has no chance to reach storm drains.

An interesting approach to this dilemma would be to consider using newer cleaners that are evolving with third-party certifications for environmental safety. For example, the EPA—the same entity being cited as the reason to restrict coil cleaning—maintains its Designed for the Environment or DfE program, wherein they review and note products as “approved” if they pass. These DfE-approved products have their ingredients fully vetted by the EPA. As part of the requirement for achieving DfE status, all of a product’s raw materials must be readily biodegradable. For typical soil loads, such cleaners do a very good job and are safe for the environment.

HVACR service professionals should always check the contents of the coil-cleaning agent, and follow instructions for the proper dilution of the substance before starting the cleaning process.

Water can be effective in the removal of loose dirt and buildup on coils. However, coils that are loaded with grease, grime or other deposits that adhere to the coils require a cleaner to loosen those substances.
Q: There is a perception that foaming cleaners push deep dirt out of the coil. Is this true? What are the advantages of a foaming cleaner?
A: Foaming coil cleaners achieve their foam by reacting with the aluminum fins, and to a certain extent, the foam can push dirt, even embedded soils, out of the coil. Therein lies their advantage and popularity. For cleaning condenser coils, technicians definitely favor foaming cleaners.

Q: What about “non-rinse” cleaners? Where does the dirt go with a non-rinse cleaner? If you do not rinse, how much of the dirt is still on/in the coil?
A: The no-rinse approach for cleaning evaporator coils gained popularity in the very early ’80s. It is reasonable but it has its limits. To be a truly effective approach, one needs condensing humidity present to provide a rinsing of the cleaner and the emulsified soil. Otherwise, the chemical remains in contact with the metal fin and the efficiency-robbing soils remain. And in that case, unless its chemistry is “metal safe,” problems could occur over time. The soil goes nowhere without a rinsing affect from condensing humidity. Highly specialized aerosols—such as evaporative foam, “no-rinse” and other similar products—have foam that breaks fast and runs off the A coil, taking the soils with it.

Q: What should the technician do to protect skin, eyes and lungs around cleaners, and what treatment should be followed when proper protection is not used by the technician, or in case of accidental exposure?
A: Without question, gloves, goggles and protective clothing should always be worn, and all coil cleaning should be done with adequate ventilation—always. As for the rest, always follow the manufacturers’ directions, which should include first-aid instructions in case of accidental exposure.

Q: What is the environmental impact of using acid-based chemicals, and are there any regulations regarding their use/disposal?
A: The environmental impact of using acid-based coil cleaners is minor compared to the issues concerning human exposure. Typically, such cleaners are based on hydrofluoric acid, which is extremely dangerous if it comes into contact with the technician. And unfortunately, there are no regulations against its use.
Dirty coils restrict air flow and reduce heat transfer—this is an absolute. Therefore, proper cleaning of coils to remove the soil loads that negatively impact heat transfer and air flow is a necessity.

Q: Are there any “green” (non-hazardous, non-toxic) chemicals available for indoor coil cleaning? Additionally, I have a customer who refuses to let me bring anything on site that is not green, so how do I clean their coils?
A: As was previously mentioned, the safest “green” approach is to use products that are listed with the EPA’s DfE program. They are truly green and environmentally safe; and you can provide proof that they are green to your customer.

Q: Different manufacturers sell their chemicals in different concentrations. Perhaps a short discussion on the finer art of proper chemical dilution would be helpful.
A: The best approach here is to read the label and follow instructions as different products have different dilution needs. Moreover, use of any cleaner will typically require dilution to some extent. Using such cleaners straight (without dilution) is not a good idea.

Q: What about water alone as a way to clean coils—can water be used by itself be effective?
A: If the soil load is loose dirt, then water and some pressure can “knock” this debris off the coil. However, when the soil load is grease, grime, or other impacted or adhering deposit, the chemistry of a quality coil cleaner is needed to break up or emulsify the deposits.

Q: Is there any data (lots of variables here) to support the resulting improvement in air flow, reduction in operating cost or improved equipment life when coils are properly cleaned?
A: Refer to the Nu-Calgon clean coil program for data that supports the value of coil cleaning. Without question, dirty coils restrict air flow and reduce heat transfer—this is an absolute. Therefore, proper cleaning of coils to remove the soil loads that negatively impact heat transfer and air flow is a necessity. [Editor’s Note: Nu-Calgon’s clean coil program highlights some of the benefits and savings that proper cleaning provides. For example, a 10-ton A/C system operating for an average cooling season of 1,500 hours, when the coils are clean, will cost approximately $1,650 to operate for the season, given a typical kWh cost and equipment SEER. However, when the condenser coil becomes dirty, the six-month cost of operation escalates to $2,268—a 37% increase. For more information on the clean coil program, visit www.rsesjournal.com, where a link to more information is available with the online version of this feature.]

The responses to these questions were provided by numerous technical support staff at Nu-Calgon Inc., which markets and distributes a variety of specialty chemical products for the HVACR aftermarket, including coil cleaners, descalers and refrigeration oils. For more information, e-mail support@nucalgon.com or call 800-554-4431.