

# Carefully Choosing

Proper selection of chemicals and cleaning techniques are critical in A/C coil cleaning.

BY JAMES BOWMAN

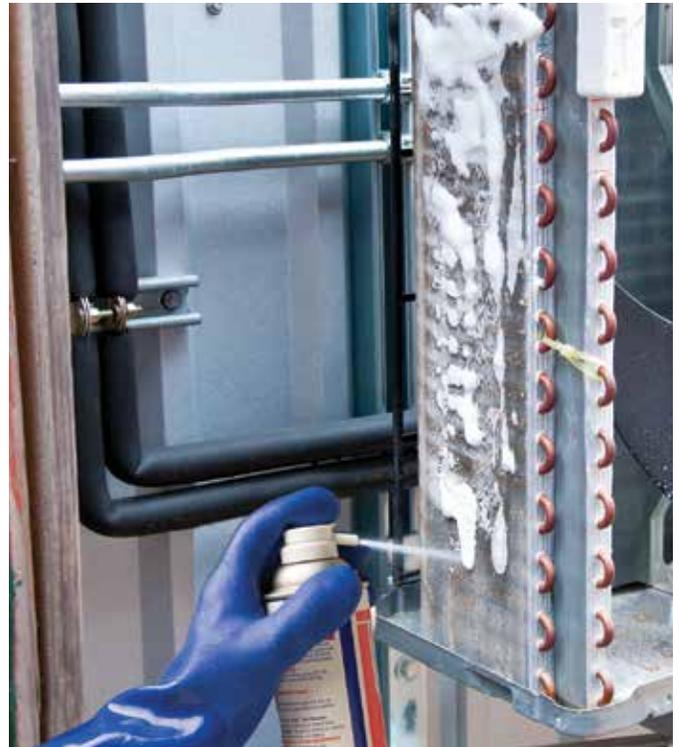
*Images courtesy of RectorSeal Corp.*

Applying improper cleaning solutions and techniques for air-conditioning condenser and evaporator coils can not only damage the coils, but it can also cause long-term premature refrigerant leaks and heat-transfer reductions.

Unknowing service technicians may be slowly destroying most of the coils they are supposedly degreasing, cleaning and brightening. The wrong coil cleaner on fins can show visible destruction, but the hidden danger is the electrolytic breakdown of the all-important heat-transferring bond between copper tube and fin that typically remains unseen.



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For example, several service techs misdiagnosed a homeowner's complaint of high electric bills and insufficient cooling as the result of a slightly corroded and dirty outdoor coil. They thoroughly cleaned it. However, the problem persisted until a thorough exam found little heat transfer from tubing to fins. The bonds had apparently disintegrated from another service company's improper rinsing after applying chemical coil cleaners. The only solution was a coil replacement.

Applying the wrong product can also potentially endanger patrons as well as service techs. For example, a popular restaurant chain location in Nebraska called for service on a reach-in freezer that was installed inappropriately next to deep-frying equipment. As a result, the freezer's condenser coil had caked layers of grease. Unfortunately, the service tech used a high-pressure aerosol degreaser designed for outdoor use only, even though the EPA-mandated "vapor harmful" warning label emphasized use outdoors or in

# Coil Cleaners

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well-ventilated areas. Consequently, the degreaser's strong fumes necessitated closing down the restaurant for the day to exhaust the sickening toxic chemical odors. The service tech was rushed to the hospital.

## Matching the chemical to the application

Coil cleaners come in several application methods, such as a hand-held foaming aerosol can or a hand-held high-pressure solvent aerosol spray can. They are also available in bulk liquids that range from 1-gal to 55-gal containers, typically concentrated for a 3:1, 4:1 or 5:1 mixture with water ratio. The mixed product should be applied with a minimal-pressure pump sprayer. Power washers should be avoided because they damage coil fins and disperse chemicals into unwanted areas. Powdered chemical concentrates for mixing in water have the disadvantages of potentially clogging sprayers or blowing into the service tech's eyes or respiratory system on windy days.

Coil-cleaning chemicals are available as foaming or non-foaming liquids. The foaming strategy is designed to be dispersed as a liquid so that it reaches deeply into small inaccessible coil surfaces.

Afterward, its foaming action helps dissolve, dislodge and lift out harbored contaminants. Chemicals are most effective when the foaming process is delayed a few seconds after spraying, so that the liquid can penetrate into deep, inaccessible coil areas. A chemical that foams prematurely or immediately out of the sprayer head will not have time to access these hard-to-reach places.

Chemicals also vary by pH, such as acid-based, non-acid and self-rinsing cleaners. Non-acid based treatments must be rinsed in the manufacturer-specified allotted time, typically about 8 minutes, or else the alkalinity will eat away at the fins instead of leaving them bright and shiny.

It is also important to understand basic chemistry, especially the acid/alkalinity pH scale, which has a criteria range from 0 to 14. Extreme acid is 0, extreme alkalinity is 14 and 7 is neutral. It is well-known that extreme acidity is corrosive. However, extreme alkalinity at the opposite end of the scale can be equally corrosive. Acid coil cleaners and non-acid coil cleaners have a pH of around 0–1 and 13–14, respectively. On the neutral middle of the scale, self-rinsing evaporator cleaners

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» Chemical coil cleaners should be sprayed from the outside in, but rinsing should be from the inside out, so as not to rinse chemicals into internal parts of the system. Additionally, some coil cleaners must be rinsed in no more than 8 minutes after application to prevent any corrosive effects to the fins or coils.



are designed to be a fairly neutral detergent with a slight alkalinity of 8 on the scale.

Another industry misconception is the term “detergent.” Many coil cleaners are detergents that are custom-formulated for refrigeration systems, but that does not mean they can be substituted with dish or clothes-washing detergents, many of which have chemicals that are corrosive to metals.

### ► It Might Look Clean, but... ◀

A thin film of mold or other biological growth acts as insulation on HVAC-system coils and reduces heat-transfer energy efficiency. Studies have proven that just a 0.002-in.-thick bio-film on coils can reduce the free area and increase air velocity up to 9%. The result is a system with higher static pressure across the coil for which it was designed. Eliminating biological growths can result in up to a 30% cooling-capacity increase compared to a dirty coil. This results in significant energy savings.

For service technicians cleaning U.S. government building A/C systems, it is important to note that some agencies, such as the U.S. Post Office, prohibit trichloroethylene, a chemical popularly used in some brands of coil cleaners. It is always important to investigate a school district, hospital or government building’s restrictions on particular chemicals, which can be found on every brand’s Material Safety Data Sheet (MSDS).

### Stocking the truck and shop

Most service companies carry just two different coil cleaners, an evaporator cleaner for inside equipment and a foaming-acid condenser cleaner for outside equipment. While stocking just two varieties saves truck and shop space, service techs can get caught with the wrong chemical for an application on a service call, and then use it inappropriately to save time.

Those two products are fine for most residential applications. However, a commercial service tech may need to stock a wider range of coil cleaners. For example, restaurant rooftop coils commonly get filled with cooking grease from nearby exhaust vents. This situation calls for a third product stocked on the truck, such as a foaming non-acid coil cleaner.

There is also the choice of carrying hand-held aerosol cans vs. jugs of concentrate and spray applicators. The cans are more expensive per ounce of chemical than jug

concentrates. However, cans are more convenient to bill on an invoice, whereas partially used jug concentrate is more difficult to calculate.

Indoor coils require a self-rinsing coil cleaner to minimize post-cleaning messes and prevent residual chemicals that can potentially enter the airstream supply air that occupants breathe. Self-rinsing chemicals use condensation formation on the air conditioning coil to drip away any residual chemicals into the unit's evaporator pan and drain. An important factor in self-rinsing cleaners is that they do need manual rinsing in the winter heating system because there is no air-conditioning condensation formation to rinse the chemicals away.

The drain pan and drain should always be included in the cleaning processes of indoor units for unobstructed condensate flow.



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### Special care for mini-splits

Ductless mini-splits require additional care when cleaning the evaporator coils. The aluminum, copper and metal alloys used in the manufacturing of fins and tubing of mini-split evaporator coils, as well as the unit's plastic blower wheel, are more sensitive and must be cleaned with a safe, non-acid cleaner.

The cleaning solution should not only be safe for the coils, but also non-toxic for the building occupants, such as the chemically sensitive or seniors in nursing homes, hospitals or other healthcare facilities that can breathe residual chemicals left on coils. Therefore, non-fragrant, bacteria-static formulas are also ideal for healthcare environment occupants with high sensitivities to odors, chemicals, airborne microbial contaminants or gaseous chemicals. Manufacturers of cleaning solutions have recently catered to this specialty market with non-caustic, no-rinse formulas that expedite cleanup.

Additionally, in many cases mini-splits have condensate pumps with piston, diaphragm or peristaltic operations that can become damaged with caustic cleaners.



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⌘ **Coil-cleaning concentrate mixtures are applied with a minimal-pressure pump sprayer. Power washers should be avoided because they damage coil fins and disperse chemicals into unwanted areas.**



Mini-splits and PTACs are unique in that they do not connect to ducts. Therefore, their evaporator coils are typically in the room they cool vs. an air handler in a mechanical or remote room. Thus, in new construction projects they may need cleaning right after project start-up and are more susceptible to drywall sanding and other

contaminants that can coat the coil if workers use the unit for cooling during construction. Pre-startup cleaning is particularly important in preventing the inherently small evaporator condensate drain-pan orifices from clogs.

## ▶ Coil-cleaning Guidelines ◀

1. Shut off unit before cleaning.
2. Always wear protective clothing, eyewear and gloves.
3. Avoid skin contact with coil cleaners.
4. Do not inhale the vapors of the coil cleaner.
5. When mixing, always add the concentrated coil cleaner to the water in the sprayer.
6. Do not use sprayers with aluminum parts.
7. Always read coil-cleaner directions and follow dilution ratios.
8. Avoid back spray from wind.
9. Liberally apply coil-cleaning solution to coil surface.
10. Let solution work for 5 minutes before rinsing.
11. Rinse coil and surrounding area thoroughly with low-pressure water.
12. For cooking-grease applications, allow a non-acid coil-cleaning solution to work 8 minutes before rinsing. Repeat if necessary.

## Using proper techniques

On outdoor condenser coils the best method is to spray the cleaner into the coil from the outside. Then, if required in the manufacturer's instructions, rinsing should be sprayed from inside the condenser to the outside.

It is likely that every service technician has seen corroded coils serviced by a client's previous contractor. It is difficult to pinpoint exactly why for example, a coil has white spots all over it. Several years ago, some newly manufactured units were prematurely corroding because of residual chemicals not properly removed at the factory. The effects of that typically appear in a specific corrosion pattern because the residual chemical was not properly removed from all the surfaces. Environmental corrosion or coil-cleaning errors exhibit less uniformity and can be identified by shape, location and more of a sporadic pattern.

Service techs need to become educated on the many different coil cleaners from manufacturers' websites and customer service departments. On the job, however, technicians need to double-check product labels and fully think through the cleaning task in order to choose the correct product for the application. ☁

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