

REDUCING the COST of Ice-machine Mold Cleanups

Utilizing ultraviolet-light germicidal irradiation to keep ice machines free of contamination.

BY DALE HARRISON

Images courtesy of Fresh-Aire UV.



⚡ UVGI technology is more than a century old, however, manufacturers have only recently developed smaller systems that can fit the cramped quarters of ice machines.

Few refrigeration service technicians prefer ice-machine cleaning maintenance. Instead of applying years of refrigeration schooling and technical experience, the majority of the ice-machine service-calls typically involve the dirty, menial and unpopular task of mold removal.

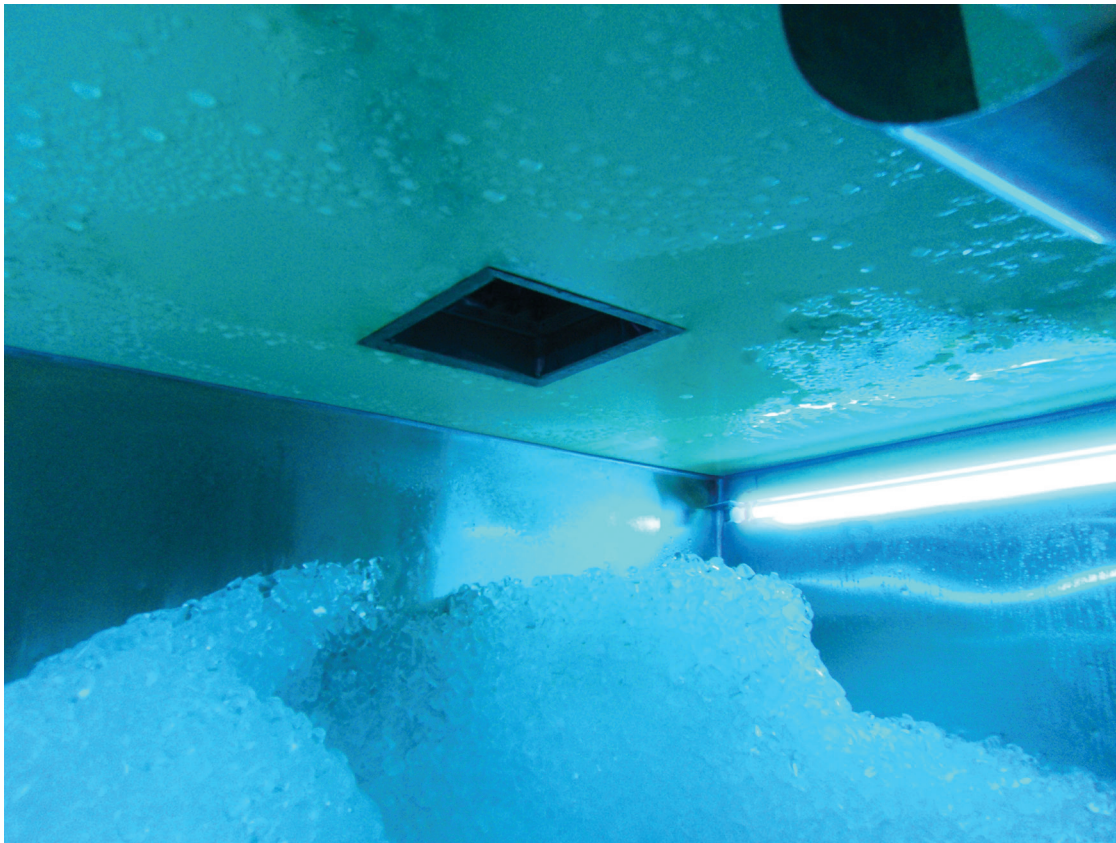
Fortunately, ultraviolet light system technology is making the service tech's job significantly easier by reducing biological contaminants that grow in the wet, dark interiors of ice machines and the time it takes to remove them. Mold affects the appearance, taste and smell of ice. More importantly, mold in ice is a potential health concern for consumers, and health-code inspectors have become increasingly more interested in ice-machine mold during equipment inspections.

For years, it was commonly believed that ice-machine contamination was purely from the source water. It is true that source water contains minerals that can foul the taste and smell of ice, and that sump tabs, regular flushing and filters can control scale accumulations. However, mold is produced from the ambient environment and microorganisms in the air.

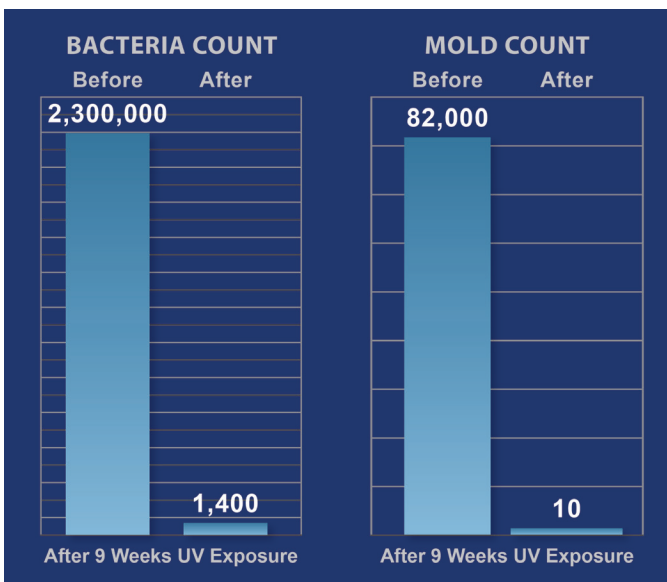
Probably the worst-case scenario for ambient-air contamination is for ice machines located in kitchens where baked bread or micro-brewing remnants are present. These facilities typically have airborne baking and brewing yeast particulates in the environment that help accelerate mold growth and accumulation.

Biological contaminants can appear throughout an ice machine. Evaporator-coil contamination is the most common, but other components, such as the service-door rubber gasket, collection bin, interior walls, drip curtain, pump and drain hose interiors are all suitable mold-growth environments.

Because the ice chute has the most open environmental exposure to the surrounding ambient areas and their airborne contaminants, it typically acquires a slimy biological accumulation that is typically different than what grows inside the enclosed parts of the machine.



« Multi-lamp UVGI systems enable technicians to place a lamp behind the evaporator coil and in other areas where mold growth is a problem, such as the storage bin shown here.



⤴ This chart illustrates the effect UV exposure had on bacteria and mold growth after 9 weeks.

UV light to the rescue

One solution to this ongoing problem is ultraviolet-light germicidal irradiation (UVGI), which can simultaneously prevent mold, reduce maintenance costs and increase coil efficiency. UV-light systems are typically positioned inside the ice machine's evaporator area to provide a continuous, chemical-free disinfection source of UV-C wavelengths.

UV-A (used for black lights), UV-B (used in tanning salons) and UV-C wavelengths are all present in sunlight. However, higher-frequency UV-C wavelengths are filtered by the Earth's atmosphere, and microorganisms have no defense against it. UV-C light kills microbes by scrambling their DNA, which prevents reproduction. For that reason, UV-C light systems are used to sterilize microbes so they can no longer grow in ice machines.

UVGI technology is more than a century old. However, UV-light manufacturers have only recently developed smaller systems that can fit the cramped quarters of ice machines.

UV-light disinfection systems should not be confused with ozone generators. Ozone generators do use UV lights, but they do not shine directly on mold-inhabited surfaces. Instead, an enclosed UV light produces airborne ozone molecules. These molecules have a sanitizing effect, but because they are airborne, they typically stratify and are not distributed evenly to all enclosed ice machine areas for oxidation. Furthermore, ASHRAE is now studying airborne ozone as an alleged respiratory irritant. The results are expected later this year.

The advantage of direct UV-light disinfection is the technician can position the lamp to any location where mold tends to accumulate. The same lamp positioning will not necessarily work for every model due to each manufacturer's unique component configuration. The best placement is typically above the evaporator coil. Surrounding areas, such as walls and gaskets, will most likely get an ample UV-light residual from an evaporator-coil positioning. If not, multi-lamp



⌘ After a proper disinfection, this previously mold-/bacteria-fouled ice machine (inset) was fitted with a UVGI system.

systems are connected via quick-connect cables to the same power supply so that they can be positioned in other areas.

There is no rule-of-thumb for positioning that provides comprehensive coverage for every model on the market. Positioning and the number of lamps will depend on the size of the machine, the number of evaporator coils it uses and the extent of mold contamination.

Japanese ice-machine manufacturers tend to have evaporators with vertical-slab or vertically angled configurations, whereas American manufacturer designs tend to use horizontal evaporator coils. Some Japanese models that produce more than 1,000 lb of ice per hour have multiple coils configured in a “W” shape. This type of arrangement may require three to four lamps in order to properly cover all the evaporator coil angles.

UV technology for ice machines is still fairly new. The actual lamp and its quick-connect cable receptacle actually span less than 8 in. long and are designed to fit nearly every ice-machine model that produces more than 500 lb of ice per hour and most configurations under that capacity. UV technology has yet to be designed for ice chipper and flaker configurations. Low-capacity machines that produce less than 100 lb of ice per hour, such as those commonly found

at nurse stations in hospitals or under-counter models in the foodservice industry, are typically too small for a UV-light system. Very large ice machines can often accommodate UV-light systems with 32-in.-long, polytetrafluoroethylene-coated lamps originally designed for large HVAC air-handling units.

Start clean, stay clean

The typical scenario of a service technician called to reverse ice-machine mold first requires conventional cleaning before installing a UV-light system. However, there may be instances where demonstrating the effectiveness of UV light on an existing mold area may be helpful in selling it to a prospective end-user.

Most ice-machine manufacturers have their own branded, recommended coil-cleaning solutions. There are also many ice-machine coil-cleaning specialty chemicals that all HVAC wholesalers provide. Generally, a nickel-safe food-grade, acid coil-cleaning chemical (typically citrus-based) designed for indoor use with minimal toxicity should be applied so as not to corrode the coil fins or tubing surfaces. If the cleaning solution’s label lists respiratory warnings, then an after-hours cleaning may be needed. Cleaners specializing in the removal of scale and general dirt that can cause foul odors or tastes in ice should also be considered.

Cleaning preparations include bleeding refrigeration and water supply lines and removing all ice. Remove as many parts contacted by water as possible, such as the trough, curtain and easily removed tubes. Place the removed parts in a container with the prescribed water dilution of the chemical. Clean non-removable parts with the diluted solution on a sponge or rag and rinse thoroughly. A prescribed diluted

solution can also be used to circulate through the machine until the scale is removed. After application, the ice machine should be run through at least two ice-making cycles to rinse residual chemicals.

UV installation tips

Like any technology, UV-light systems are most effective when installed in accordance with the manufacturer's recommendations. The following tips will help make the installation effective and safe:

→Installers should use proper safety equipment, protect eyes and shut the UV-light system off when servicing or making adjustments during installation.

→Direct exposure of UV light can damage eyes and skin. Therefore, any enclosed ice-machine area using a UV lamp, whether it is the evaporator-coil area or the ice bin, must have a door interlock switch that deactivates the system when the door is opened.

→The UV-light system power supply can be hardwired to the ice machine's line voltage and inline before the control package. They can also be ordered with a grounded plug for use with any nearby electrical outlet.

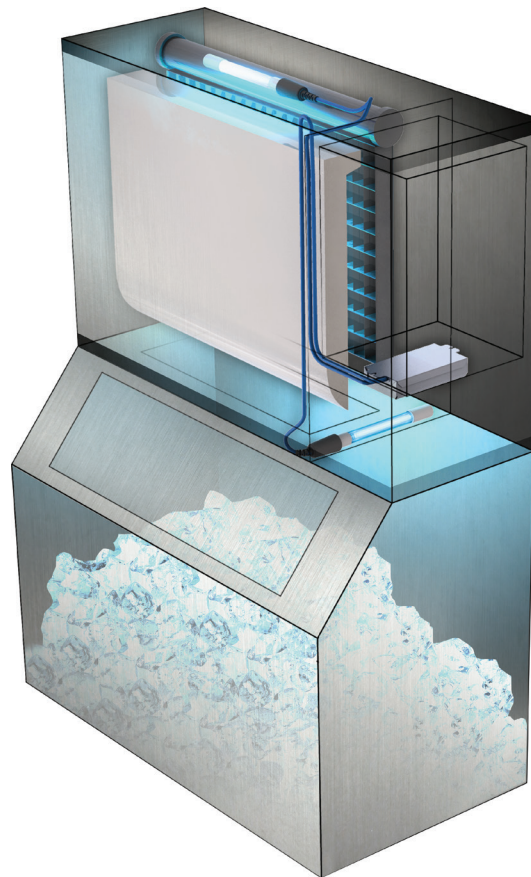
→Once the UV-light system is mounted, it should run continuously and not cycle on and off. UV-light systems are designed to run 24/7 and the only maintenance required is a lamp replacement every one to two years.

→UV light does not compromise the structural integrity or chemical composition of internal ice-machine plastics. A UV lamp may discolor plastic however, so it is good practice to adhere blocking tape (typically included in a UV-light system kit) on any plastic surfaces within 2 in. of the lamp.

Conventional ice-machine cleanings can be as frequent as every month, depending on the source-water minerals and the environment, especially if the unit is located outdoors or near a constant yeast source. A typical ice-machine cleaning ranges in price from \$200 to \$300. A UV light costs less than \$300, therefore the end-user's return-on investment is immediate.

From the service technicians' perspective, a UV-light system will greatly reduce ice-machine mold cleanup on service calls and enable them to concentrate more on refrigeration performance and efficiency. ☺

Dale Harrison is an 18-year HVAC industry veteran, a licensed journeyman of the Plumbers & Pipefitters Union and currently the Technical Services Manager for Fresh-Air UV, a division of Triatomic Environmental Inc. in Jupiter, FL. Fresh-Air UV is an international manufacturer of UV systems for all types of HVAC and refrigeration systems. Harrison regularly speaks to HVAC association chapters and assists contractors with UV-system sizing, first installs, sales presentations and product servicing. For more information, call 800-741-1195, email dale@freshaireuv.com or visit www.freshaireuv.com.



« Although there is no rule-of-thumb for positioning these systems, this illustration shows where a multi-lamp unit could be installed.

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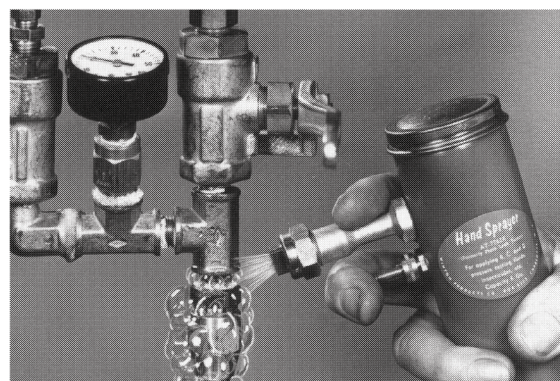
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