

Germ Warfare

As SARS and other health issues become a bigger concern, P&HVAC looks at obtaining maximum effectiveness from a UV duct system.

by Simon Blake

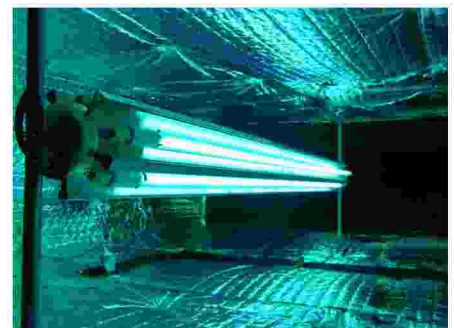
Intensity and exposure time. These are key factors in determining whether the installation of ultraviolet (UV) purification in an HVAC system will improve indoor air quality (IAQ). The battle for the contractor is to specify the best UV lamps for the application and to position them in the ductwork to subject airborne microorganisms such as mould, bacteria, viruses and fungi – contaminants that pass right through conventional filters – to the maximum UV exposure. It can also be effective on odors. Ultra-violet purification has been around since the early part of the 20th Century, primarily in medical facilities. In recent years there has been a dramatic growth in its use in HVAC systems as concerns about indoor air quality (IAQ) have grown. UV-C, the 200-280 nanometer band of ultra-violet light effective on microbiological contamination, works by penetrating the cell wall and damaging the genetic DNA structure of the microscopic organisms that make up most bacteria and viruses. It is measured in microWatt seconds per cm², established by multiplying intensity by exposure time. A manufacturer's chart will usually show the different mW S/ cm² required to deal with particular microbes – 60,000 to deal with *Aspergillus flavus* (the worst mould variety) and 6,500 to deal with Legionnaire's disease, for example. Two things should occur before the

contractor specifies a UV system. He must first talk to the customer and determine the problem. In many cases, the customer is simply looking to improve the air quality in general – removing odors, preventing colds from jumping from person to person so easily, etc. However, if there is a particular problem that is believed to be IAQ related, the air should be tested to determine its contaminants. With this knowledge, the contractor can determine whether UV is the best solution and what the intensity must be to deal with it. The second issue is to determine whether to purify an object or surface – the A-Coil for example – or the air itself. The first is straightforward, the latter anything but.

Surface control

A one or two-lamp insert-type UV purifier or 'stick light' will provide an effective solution for a microbial buildup on a particular surface as long as it is within three feet of that surface. There is some debate over whether the lamp should be placed on the supply or return side. Most manufacturers suggest the supply side as ideal. An A-coil is one of the worst breeding grounds for microbes. As a result, many manufacturers recommend placing the UV probe above the coil in at right angles to the airflow. This places the lamps downstream from the filter. Any microbial growth should be cleaned and disinfected prior to installation. Keep in mind

that UV destroys plastic. Any plastic in the ducting should be removed. Drain pans must be UV-resistant. In a typical residential installation, cumulative exposure plays a key role. The air is typically recirculated past the UV lamps anywhere from 30 to 60 times per day. (Remember to include the basement when calculating air changes by cubic footage.) A UV lamp loses efficiency if the air temperature is above or below the manufacturer's design temperature. The manufacturer will tune the lamp and the ballast to provide maximum UV within a particular temperature range. A 'normal output' UV lamp is rated for maximum intensity at 60-70°F – a typical return-air temperature. A HO (high output) or VHO (very high output) rated unit will do better in cooler temperatures. Some manufacturers advise putting the lamps on the return side of the coil. This does two things. It prevents efficiency-reducing blow-off from the coil from attaching itself to the UV lamp. And it allows the lamps to operate in the warmer return air. However, the installation is more difficult.



This UV system manufactured by Sanuvox Technologies Inc. provides 360-degree coverage

Germ Warfare

As SARS and other health issues become a bigger concern, P&HVAC looks at obtaining maximum effectiveness from a UV duct system.

Purifying the air

Purifying the air rather than a particular surface is considerably more difficult. If the air is moving at 500 fpm or more, the exposure of any microbe is very limited. Typically, only those passing within two inches of the UV light will be killed. The solution is to increase intensity and to maximize exposure time. The greater the intensity, the longer the lamp and the closer the air passes to the lamp, the greater the ability to kill microbes. Placing the UV lamp parallel to the airflow maximizes exposure time. And the longer the lamp, the greater the exposure. A reflective surface or tube inside the duct will bounce the UV light back on itself and further increase the lamp's effectiveness. Specifying a product specifically designed for this application is key. Again, there is some debate, but as a rule of thumb the lamp should be on all the time for surface purification applications while in air purification use it cycles on and off with the fan.

Safety issues

UV-C light can cause blindness. It is almost always equipped with some sort of safety power shut-off to

prevent accidental exposure. In a rare case where the technician must work on the system with the UV light on, he should wear safety glasses with a 100 per cent UV filtration rating. Obviously, ductwork should be sealed to prevent light leaks. The lamps must be located where the homeowner won't get flashed when he performs routine maintenance like changing furnace filters.

Maintenance

The typical UV lamp operates at peak efficiency for about 9000 hours or 375 days of continuous operation. And this brings up one drawback of UV duct purification. The lamps retail for between \$100 and \$150 each. They should be replaced once a year – a considerable expense for the customer. (Three-year lamps are available in some systems.) The homeowner should clean the lamps

periodically. Knowing how tough it is to get the average homeowner to check their furnace filter, this could be a problem. Therefore, UV is an option that a contractor would suggest to a customer as a solution for a specific problem where it has a clear advantage over other systems.

Thanks to Greg Burnett, Dust-Free, Royse City, Texas, Stuart Engel, Sanuvox, Montreal., Frank Kayta, Field Controls, Kinston, North Carolina, and Murray Rideout, Evolution Air, Mississauga, Ont., for their assistance in the preparation of this article.

<http://www.plumbingandhvac.ca/article.cfm?ID=123>
Issue Volume 13 Number 4
July/August 2003

Plumbing & HVAC

PRODUCT NEWS

Volume 13 Number 4

July/August 2003

Germ Warfare

UV a powerful weapon in the clean air battle

Inside

- B.C. teens appreciate their position on its head
- UV just never made it into the spotlight
- Maximize efficiency in hydronic heating

WOLSELEY Cools

General PIPE CLEANERS www.drainbrain.com

GRUVLOK PERFORMANCE UNDER PRESSURE



This unique duct system makes installing radiant heating over a wall-floor easy and simple. Find all about it on page 13.



This special angle bracket simplifies pipe joining connections to an angle-mounted termination point. Learn how on page 16.



This white brass faucet reflects a nice to darker tones in the kitchen. This trend revealed on page 22.



This attractive chip-see cuts just about any kind of metal at right or left angles. Join the cutting edge on page 24.