

UVGI Provides Maintenance and Energy Savings

by Mike Walrath, Commercial Products Sales Engineer, Fresh-Aire UV, Jupiter, Fla.

To most people, ultra violet germicidal irradiation (UVGI) means airborne microbial disinfection and indoor air quality (IAQ). However UVGI is also an increasingly popular green and maintenance strategy used by many North American hospitals, office buildings, schools, religious institutions and other commercial facilities.



While many building owners may aren't aware their consulting engineer had specified UVGI systems, they are enjoying a significant reduction in HVAC system energy and maintenance costs compared to other similar facilities without UVGI. Owners of older buildings are continuing the trend by considering air handler retrofits that include UVGI, because maintenance and increased efficiency cost savings typically result in a payback of less than two years.

The Southeast U.S. region is similar to other geographical areas across the globe with high outdoor humidity, which can lead to mold growth on the coils and interior surfaces of HVAC systems. The air conditioning circuit condenses moisture out of outdoor and return air that creates an ideal environment for mold to grow. This mold growth increases facility operating costs because either an outside contractor or the building maintenance staff must periodically remove it. Additionally, a film of coil-covering mold reduces the heat transfer process and air velocity across the coil, which in turn, reduces system efficiency and increases energy costs.

Therefore UVGI supplements the green mission of commercial facilities by preventing mold and other biological contaminants from growing inside HVAC systems.

Case Study

Case studies of commercial buildings that have tracked maintenance schedules before and after UVGI system provide documented proof of the technology's effectiveness. For example, four years ago engineers and architects of Junction City, Kan.-based Geary Community Hospital's (GCH) \$34 million expansion specified a cutting-edge HVAC design with UVGI systems that would reduce maintenance costs, increase energy efficiency and provide unprecedented indoor

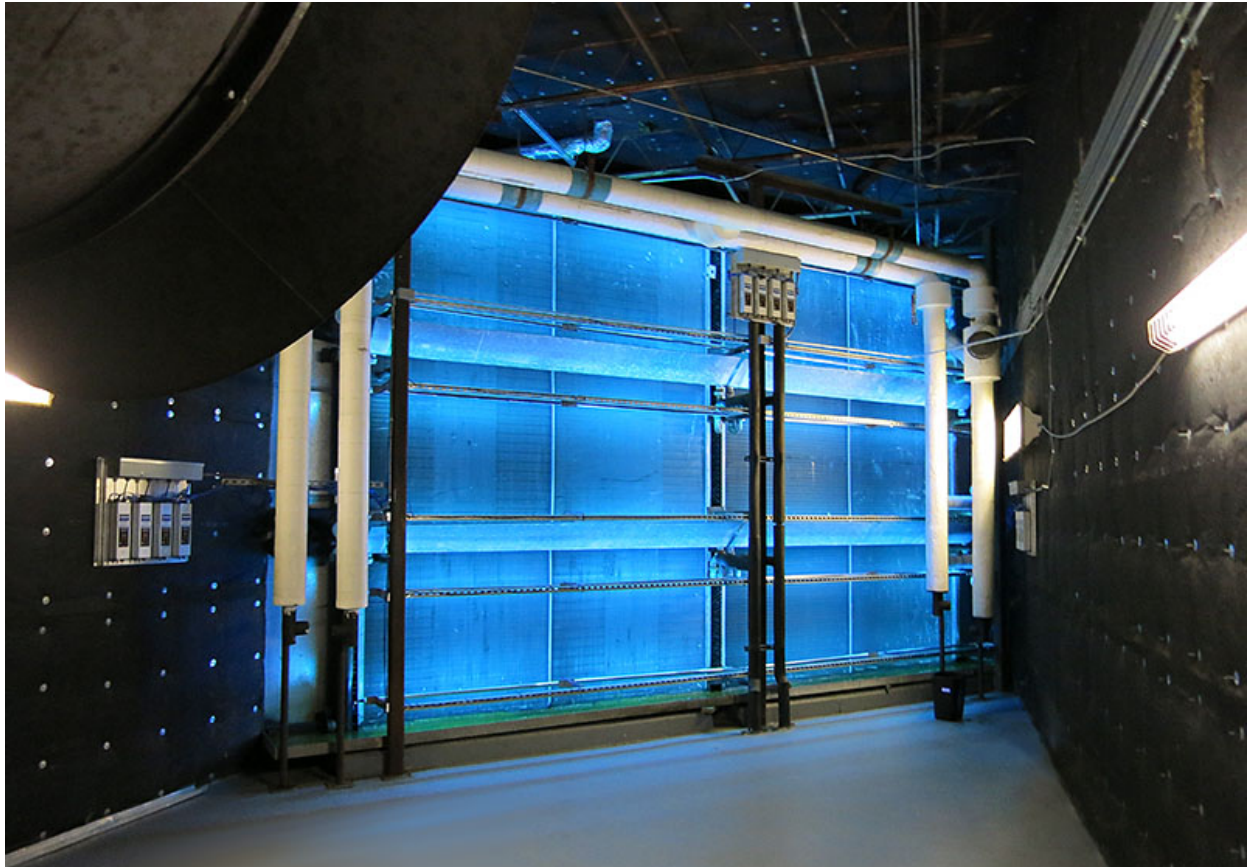
air quality (IAQ).

Four years later the predictions by project MEP consulting firm, Henderson Engineers, Lenexa, Kan., and architect Hoefler Wysocki Architects, Kansas City, Mo., were confirmed by Steve Rippert, CHFM, GCH's director of maintenance.



The 95,000-square-foot expansion's four air handlers and dedicated dehumidifiers haven't needed coil cleaning during four years of monthly checks. This is in comparison to other hospitals that don't use UVGI systems, which typically require HVAC system cleanings costing thousands of dollars in labor and materials annually. Additionally, coil cleaners many times contain biocides and other toxic chemicals that are sometimes difficult to completely rinse and which may also pose a risk to the building's IAQ.

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"We've seen the effects of no UV lights in older HVAC systems," said Shane Lutz, P.E., LEED AP, BD+C, CHFM, principal, Henderson Engineers, "and there's a tendency for coil microorganism growth that you definitely wouldn't want distributed throughout a critical environment such as operating rooms or any other healthcare environment."

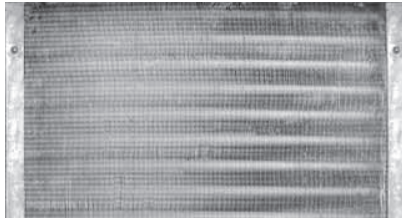
UVGI use adds significantly to IAQ in the expansion's critical environments, such as the 15,000-square-foot surgery suite. The expansion's five air handlers use 32-inch-long UV lamps manufactured by Fresh-Aire UV, Jupiter, Fla., that are installed in modular racks affixed to the supply side of every coil.

GCH's UVGI is part of an HVAC system anchored with a conventional four-pipe chiller and boiler loop concept. Besides UVGI, Lutz and Henderson Engineers' project designer Jared Wagner, P.E., LEED AP, BD+C, mechanical engineer, incorporated a host of other IAQ healthcare design strategies supplement the UVGI:

- High Efficiency Particulate Arrestor (HEPA) filters manufactured by Camfil Farr, Jonesboro, Ark;
- A 100-ton dedicated outdoor air dehumidifier by Munters, Selma Texas, and which enables surgeons to quickly and easily set temperature and humidity 65°F and a 30-percent;

- Linear stainless steel ceiling Hospital Operating Room Diffusers (HORD) systems manufactured by Price Industries, Atlanta, that creates an enveloping air curtain and prevents any unwanted air infiltration into the immediate operating table area;

All totaled, these technologies helped the facility surpass guidelines for healthcare mechanical engineering design by the Facility Guidelines Institute (FGI), Dallas; and Standard 170--"Ventilation of Health Care Facilities"--of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Atlanta.



Higher Efficiency, Increased Air Velocity

Studies prove that clean coils are also more efficient in heat transfer. Just a .002-inch-thick bio-film on coils can reduce the free area and increase air velocity up to nine-percent. This also leads to an increased blower electric load. The result is a system with higher static pressure across the coil for which it was designed. Therefore, eliminating biological growths can result in an up to 30-percent cooling capacity increase compared to a dirty coil.



The California's Energy Commission's Public Interest Energy Research Program proved these premises in the study, "Advanced HVAC Systems for Improving Indoor Environmental Quality and Energy Performance of California K-12 Schools," prepared by Energy Utilization Consultant, Morton H. Blatt. The study found that schools could cut maintenance "from use of UV-C lights to keep coils continuously clean, avoiding the laborious coil cleaning actions that will otherwise be required to return coils to a clean condition." The study also said energy benefits could "be provided by UVGI lighting that cleans cooling coils, reducing pressure drop, improving heat transfer and increasing system capacity, resulting in overall cooling energy savings."

Florida Hospital tested UVGI devices and preceded to roll out a retrofit program that included many air handling units throughout its seven locations. As reported by a 2004 edition of Engineered Systems Magazine, Firouz Keikavousi, a mechanical engineer in charge of facilities management for Florida Hospital, Orlando, Fla., first tested UVGI on a 27-year-old, 6,000-cfm air handler that had a visible buildup of mold and a coil that was clogged by approximately 50-percent. Within weeks of retrofitting with UVGI, static pressure over the coil decreased from 1.8 to just 0.7-w.g., air velocity doubled from 230 to 520-fpm, and wetbulb temperature supply air improved from 57°F to 53°F.

Keikavousi calculated the capacity increase to be 95,245-Btuh or approximately 7.9 tons of air conditioning or a total annual savings of \$4,867. Multiplying those figures by the many air handlers at other Florida Hospital locations, Keikavousi estimated yearly energy savings could easily surpass six figures.



The savings figures don't include the fact that mold did not reappear, which means more savings with reduced maintenance.



The U.S. southeast's is one of the most energy conscious regions in the world. Green design and sustainability are major factors for this area's facilities as energy efficiency becomes an increasing concern. UVGI should be considered in all planning stages for future buildings and as a retrofit for existing HVAC systems. UVGI should be considered by any building owner looking to improve their energy savings and cut their bottom line operating expenditures.

BIO:

Mike Walrath is a 14-year HVAC industry veteran and the sales engineer for the commercial products division of Fresh-Aire UV (www.freshaireuv.com), a division of Triatomic Environmental Inc., Jupiter, Fla. Fresh-Aire UV is an international manufacturer of UV systems, such as APCO, which combines UVGI, gas-phase air purification and PCO into one unit. Fresh-Aire UV also offers its Blue-Calc online sizing service and software for engineers or contractors planning UVGI equipment projects for new or retrofitted HVAC systems.