UVC Lights Enhance IAQ, Reduce AHU Operating Costs

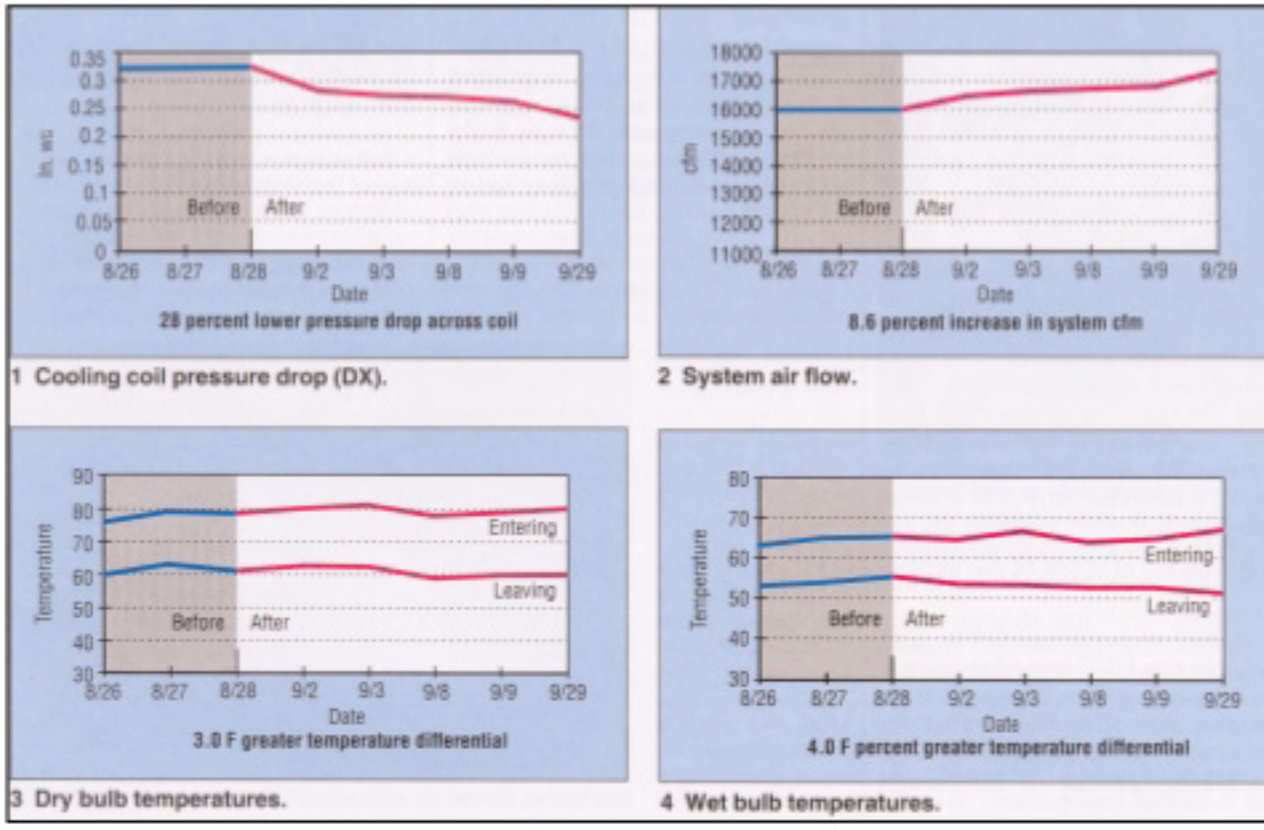
CITY OF INDUSTRY, CALIF.- Southern California Air Conditioning Distributors (SCACD), the world's largest Carrier distributor, wanted to investigate additional indoor air quality (IAQ) improvement methods in its 30-year-old administrative facility located here.

According to Bruce Fuhrmann, commercial manager for SCACD, he knew from visual inspections that there were typical accumulations of dirt and mold around the cooling coil and drain pan in the central station air handler. He believed that this condition might be the source of non-specific odors in the building and knew it was impeding heat transfer efficiency.

Fuhrmann had heard that a new, high-output UVC light source designed for HVAC applications was being marketed specifically for these problems. He had also heard about this product's ability to degrade accumulated organic materials, so he decided to try it and evaluate the results.

SCACD had another reason for testing the UVC Emitter, manufactured by Steril-Aire, Inc. If it worked, SCACD would market the device to the engineering community and commercial and residential customers through its network of contractors and dealers. Before taking that step, they needed to be sure that the device worked as claimed.

The product is a multi-patented, germicidal device that uses a newly developed combination of tube construction and matched solid state power supply to eradicate mold, bacteria, viruses and



1 Cooling coil pressure drop (DX).

2 System air flow.

3 Dry bulb temperatures.

4 Wet bulb temperatures.

other pathogens that grow and circulate in HVAC systems. The Steril-Aire device operates at peak efficiency in the cold and/or moving air environments of air handling systems-a major breakthrough in artificial UVC production and bioaerosol control. It also breaks down organic materials, including volatile organic compounds (VOCs) and other odors. SCACD also selected this product because its performance was independently tested and selected by NIOSH on behalf of the Centers for Disease Control (CDC) for efficacy testing of tuberculosis in HVAC air streams.

Prior to installation, microbial sampling was performed on and around the cooling coils and drain pan. Laboratory testing on the samples showed average to high counts of mold and bacteria growth. Also, pressure drop readings across the cooling coils were recorded, along with air entering and air leaving dry and wet bulb temperatures, to determine the system's existing capacity. According to Fuhrmann, these steps established a baseline that would enable him to determine whether any of the system's existing performance characteristics would actually change and by how much.

On August 28, 1997, the UVC emitters were installed according to manufacturer's recommendations. The lights were easily installed in the 16,000 cfm constant volume DX system.

In just a short time, the mold and bacteria in the system and the associated odors disappeared. Identical microbial sampling gathered only a few days after installation verified an average 99 percent drop in colony-forming units over the original samples.

Based on readings taken just prior to the UVC installation and one month after, the pressure drop across the cooling coil decreased by over 30 percent (Fig. 1), while system air flow went from 16,000 to 17,400 cfm; an 8.6 percent increase (Fig. 2). Wet and dry bulb coil leaving temperatures also dropped (Fig. 3 and 4), thus providing a greater temperature differential between entering air and leaving air. This combination of factors has brought about an increase in capacity.

Because the rejuvenated coils allow more heat transfer and air volume, SCACD is enjoying a 30 percent increase in total system cooling capacity from 548,502 (prior to UVC installation) to 797,094 Btu. SCACD has since performed monthly testing for nearly a year, and every result is equal or better, thereby maintaining the increased capacity.

Because of these operational improvements, SCACD reports an improvement in energy efficiency. Based on a conservative 3000 annual operating hours, an energy efficiency ratio (EER) of 8, and an energy cost of $0.10 per KWH, the company is close to realizing a first year energy improvement of over $5000. Subtracting UVC initial installation and operating costs (slightly over $5000) from this total, SCACD anticipates a complete payback in the first year.

In subsequent years, operating and replacement costs for the lights are expected to be only about $1000 annually, so savings will be over $4000 per year using current costs.

Fuhrmann noted that when the lights were installed, the IAQ and health aspects were of prime consideration. And while the devices have definitely enhanced air quality in the building, he was impressed with the operational benefits. The device's ability to increase system performance to almost "as-new" levels is expected to prolong the life of the mechanical equipment, and the increase in capacity is a much-needed advantage, given the current occupancy of the building.

Savings can manifest themselves in several ways, depending on operating conditions, stated Fuhrmann. In SCACD's case, it was able to eliminate the costs of adding supplemental cooling, and the cost of replacing the entire unit. For others, it can reduce the compressor and fan run-time of a DX system, or allow chilled water users to raise their chilled water temperature back to original design conditions. Also, potential air horsepower savings should not be ignored, especially for those who utilize variable frequency drives. These can all be significant, hard-dollar savings that can continue for the life of the system.