Technical Brief no. 4

UVR UV RESOURCES

Inactivate Airstream Pathogens with UV-C

Hundreds of studies over the past century have proven the disinfectant efficacy of Ultraviolet Germicidal Irradiation (UVGI or UV-C) energy, having first inactivated viruses and other microbes on surfaces in 1877,[1,2] in water in 1910[3] and air in 1935[4].

The 2019 COVID-19 pandemic is no exception. Both the U.S. Centers for Disease Controland Prevention (CDC) and ASHRAE now include UV-C as a recommended mitigation strategy to slow the spread of the SARS-CoV-2 Virus.[5]

DISINFECTION EXPERTS

The founders of UV Resources pioneered the application of UV-C energy in HVAC equipment nearly 25 years ago.

Today the company helps facility managers disinfect airstreams, interrupt the transmission of airborne infectious diseases, and inactivate microbial contaminants that impede HVAC efficiency.

INACTIVATING AIRBORNE PATHOGENS

The UV-C electromagnetic radiation is well absorbed by microbial DNA and RNA—disrupting the cell's protein structure—inactivating the microbe and rendering pathogens unable to replicate.

Instead of relying on a chemical reaction, UV-C uses energy to damage the microbial DNA/RNA, preventing pathogens from infecting or reproducing.

There are three primary means of deploying UV-C for air and HVAC surface protection against infectious agents: 1) Upper-Room or Upper-Air UVGI. 2) HVAC airstream disinfection and 3) HVAC coil/surface irradiation. For the purposes of this paper, we will focus on HVAC airstream inactivation.

The DLX-N™ high output, ultraviolet NEMA-4 fixture from UV Resources efficiently disinfects HVAC/R airstreams, cooling coils.

HVAC AIRSTREAM-DISINFECTION SYSTEMS

UV-C air disinfection systems can be installed in air-handling units, HVAC ducts, or air distribution systems to inactivate microorganisms and disinfect airstreams "on-the-fly."

It's important that specifying engineers and installing contractors understand that pathogen inactivation rates are influenced by UV-C intensity, length of exposure (aka residence time), UV lamp placement and lamp life cycle.

Many operational conditions also factor into this equation, including the target pathogen and its susceptibility to UV-C; exposure time and the airflow (duct length, volume and velocity); the air temperature and RH; and the duct material reflectivity

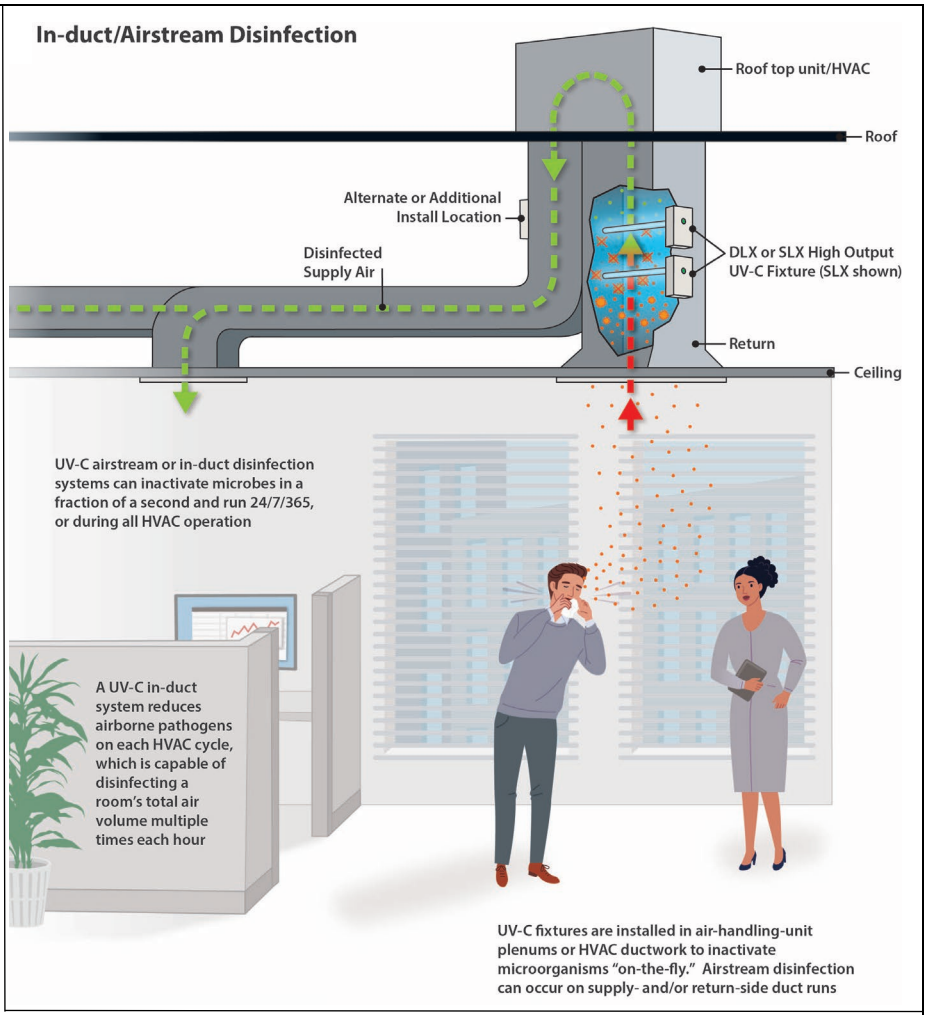
More specifically, UV-C dose is determined by the amount of germicidal energy a pathogen absorbs over a specific length of time. Therefore, UV-C dose is a function of time and intensity.

It is important to note that UV-C operates by line-of-sight; it inactivates only what it can see (e.g. the inside of a closed drawer cannot be disinfected unless the drawer is exposed to the UV energy).

CONCLUSION

Despite eight decades of research and thousands of successful applications, it was the COVID-19 pandemic that has shifted building manager's perception of the germicidal technology from HVAC energy savings accessory to a healthy and safety necessity.

Now, the market is starting to view UV-C along the same must-have components as air filtration.



What's more, germicidal UV has been recognized in the CDC's guidance for office buildings,[6] health-care facilities[7,8] and dental settings.[9]

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