

COVID-19 UPDATE: March, 2021

CONTROLLING THE SPREAD OF COVID-19 THROUGH ENGINEERING MEASURES

There are various methods of adding technologies to an HVAC system to reduce the spread of viruses, bacteria, and other microorganisms. These include ultra-violet light (UV), bi-polar ionization, and hydrogen peroxide. Previous updates have discussed UV and bi-polar ionization (see that document [here](#)), so in this issue we'll review **hydrogen peroxide**.

HYDROGEN PEROXIDE:

Dry hydrogen peroxide (DHP) and vaporized hydrogen peroxide (VHP) technologies have been increasing in popularity as a method to sterilize interior spaces with the onset of the COVID-19 pandemic. Hydrogen peroxide (H_2O_2) works as a disinfectant due to its similar structure with water (H_2O). The hydrogen peroxide molecule, which is unstable, attaches itself to cell walls of a microbe and kills it through the oxidation process of transferring an electron. VHP is classified as a sterilant, which the EPA defines as "a substance that destroys or eliminates all forms of microbial life in an innate environment, including all forms of vegetative bacteria, bacterial spores, fungi, fungal spores, and viruses" (US Environmental Protection Agency). Not only is hydrogen peroxide recognized by the EPA, but also by the US Food and Drug Administration (FDA). Because hydrogen peroxide breaks down into oxygen and water, it is deemed a safe disinfectant agent. This is the same substance most of us use to clean cuts and scrapes in children.

VAPORIZED HYDROGEN PEROXIDE:

Vaporized hydrogen peroxide (VHP) has been used as a sterilization agent for the past 30 years. It began in the medical industry where it was used to disinfect laboratories and ICU's, assisting in the battle to create clean, safe environments. Rooms were completely saturated with hydrogen peroxide so that every surface could be disinfected without harming equipment or using toxic chemicals. Its application has expanded to multiple industries,

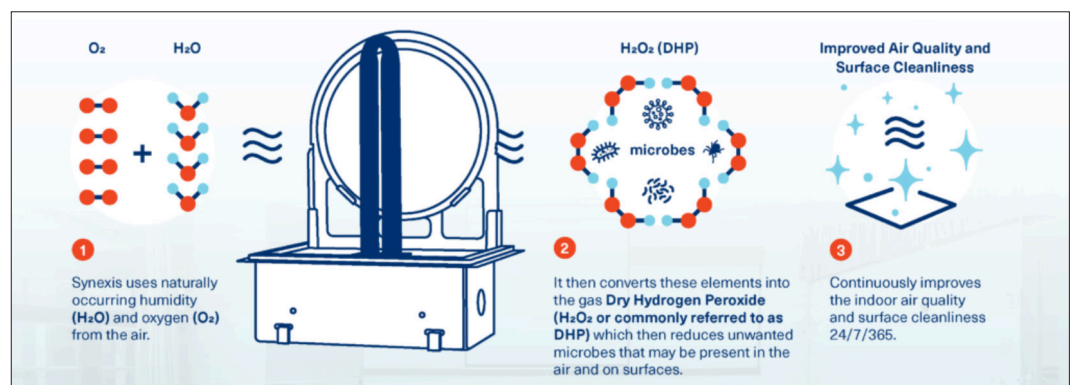
from sanitizing food processing facilities, to classrooms, and even aircraft. The FDA has recently accepted it as an approved method to decontaminate reused healthcare facility PPE equipment.

DRY HYDROGEN PEROXIDE:

Dry hydrogen peroxide (DHP) is like vaporized hydrogen peroxide (VHP) but remains in a completely gaseous state. Because the air is not filled with a high concentration of hydrogen peroxide vapor in a liquid form, this novel form of hydrogen peroxide delivery is safe for occupied spaces. DHP systems work by using a UV light and a photocatalytic coating to react with existing water (H_2O) and oxygen (O_2) in the air. The light hits the surface with the photocatalytic coating, causing passing O_2 molecules in the air to break apart and bond with water molecules, thus creating hydrogen peroxide. When installed as a stand-alone unit or in an HVAC system, air flows past the device and sends hydrogen peroxide molecules into the space that fill the air and cover every surface.

DHP has also been tested as safe for constant human exposure. The OSHA limit for hydrogen peroxide in a space is 1 PPM over eight hours. If the concentration in the air is over this limit, it quickly causes skin, eye, and respiratory irritation on humans. The machines that use DHP technology typically produce H_2O_2 in the 0.02 PPM range, which is well below the approved safety limits for human exposure.

DHP equipment can be either installed integral to the HVAC system in supply ductwork or can be installed directly in the space.



HOW IT CAN WORK: Source - www.synexis.com



COVID-19 UPDATE: February, 2021

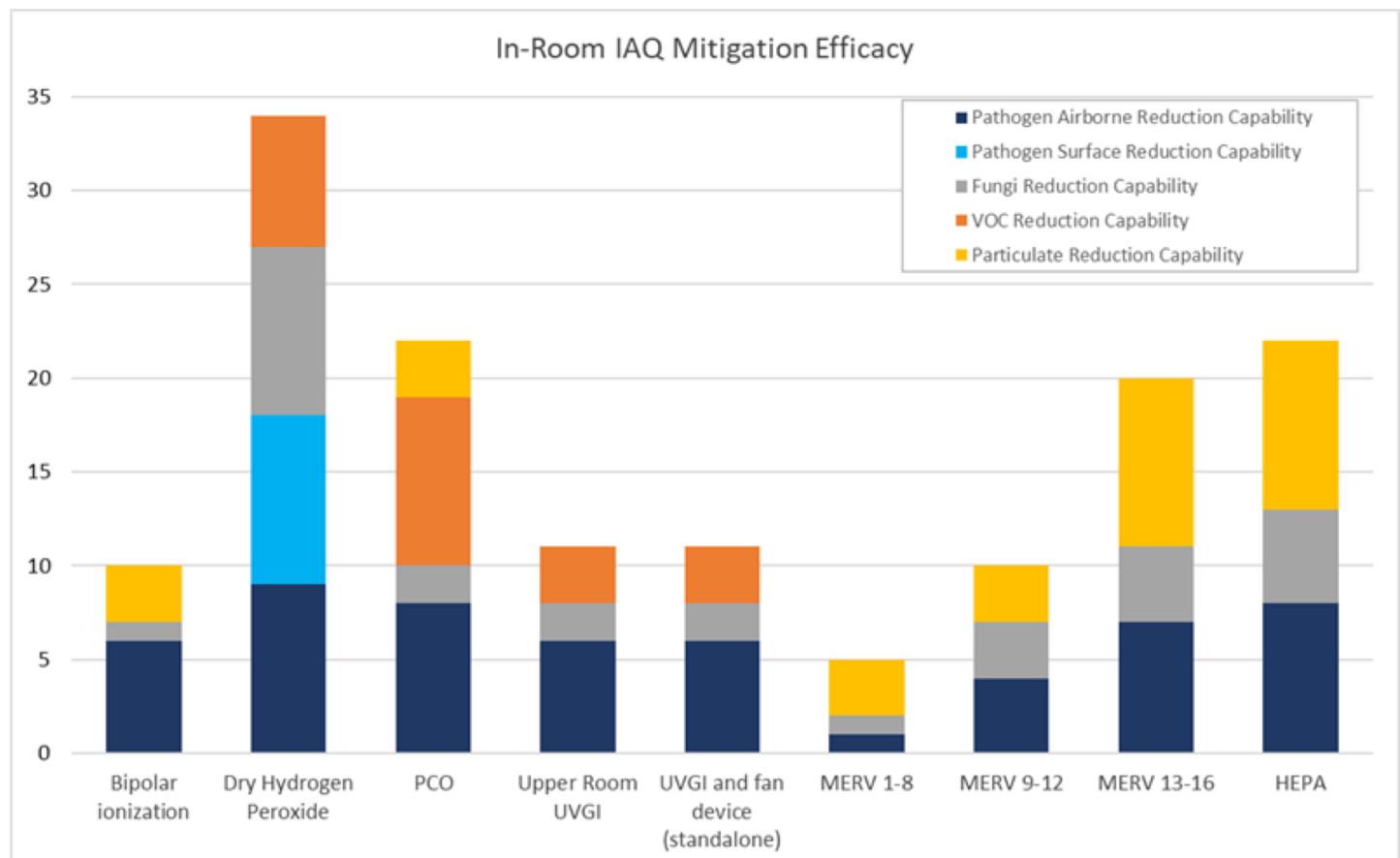
VERDICT

The DHP technology does appear to have a high efficacy for both air and surface reduction of pathogens. The most comprehensive testing was completed by a manufacturer of the DHP technology using MS2 virus which is often used as a surrogate for the SARS-CoV-2 virus. Furthermore, this technology boasts a 99.8% Aerosol Efficacy applied to Influenza Type A virus in a 60-minute timeframe using 3rd party testing agency.

There are a couple of factors with the technology that do need to be considered. First, depending on the manufacturer, the catalyst in each device may need to be changed quarterly and

the UV bulb is replaced every two years. Secondly, because this technology uses existing water in the air to create hydrogen peroxide, it works best if the relative humidity of the space is kept at 20% or above.

As shown in the data below, DHP may be the most proven and effective technology out there for engineered air cleaning solutions, including both airborne and surface mitigation. This capability comes at a high cost though, with a significant upfront cost for the units themselves and a reoccurring cost to replace the UV bulbs in the units. If the highest air purification is required for a space, this is a great technological option to pursue but would not be recommended for all applications due to cost.



IN-ROOM IAQ MITIGATION EFFICACY: Source - www.synexis.com



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