Optimizing and monitoring air quality in buildings - by John Bohlmann

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Optimizing and Monitoring Air Quality in Buildings: How Can It Be Done in a World Dealing with the COVID-19 Pandemic and Environmental Challenges?

The health crisis due to the COVID-19 pandemic has brought the debate surrounding indoor air quality to the forefront - there is more of a need than ever for outdoor air to be well-circulated in residential and commercial buildings. According to the EPA, Americans spend roughly 90% of their time indoors, and this is not accounting for the inevitable increase since the start of the COVID-19 pandemic. Given this alarming statistic, there is abundant pressure on employers to prioritize the safety of staff in order for them to return to work in an office environment.

Balancing the requirement for increased ventilation without using far more energy in the process is the ultimate challenge for businesses. Whilst there are some solutions available which meet this challenge, it is going to be incredibly difficult to roll them out on the level necessary at this stage. The problem is also compounded by the winter months, as there are going to be rising energy costs for buildings.

However, despite these difficulties which businesses face, let’s examine how they can optimize and monitor air quality to both keep people safe and not cause further damage to the environment.

How Can We Return To Work Safely?

COVID-19 has changed the way companies have to think about ventilation, but comprehensive guidance from the government on what new measures should be taken has not been forthcoming. The only advice businesses have is from The American Society of Heating, Refrigerating and Air-Conditioning Engineers, who recently updated their guidelines. The two most notable changes highlighted the importance of a pre and post flushing strategy to reduce concentration of airborne infections particles by 95% and Energy Recovery Ventilation (ERV) to determine if energy wheels

are being well maintained.

The COVID-19 pandemic has made many of us question whether we need to work in an office at all. A recent study from Cusham & Wakefield reports that the percentage of people working permanently from home in the US and Europe will increase from roughly 5-6% (pre COVID-19) to 10-11% (post COVID-19). However, this does not stop the need to increase indoor ventilation to recommended levels, which can be as effective as vaccinating 50% of a building's occupants in preventing the spread of airborne viruses.

Engineers will have to think about how to bring existing buildings with reduced occupancy levels to an acceptable standard. Possible strategies include dilution ventilation, cleaning air ducts, filtration, ultraviolet germicidal irradiation (UVGI), and other smart controls.

What Strategies Could Be Rolled Out?

HVAC companies are developing new solutions all the time to try to meet the demand for increased ventilation without being inefficient. This process is in its early stages, but hopefully it will start a trend of sustainability in HVAC where reducing carbon emissions is made a priority. One of the most successful new technologies is BiPolar Ionization (BPI)—this device replicates the air's natural conductivity to create bipolar air ions. It is especially useful in combating COVID-19 as the ions destroy the virus' surface structure on a molecular level, stopping it from being able to infect a host, even if it enters the body.

BPI is preferable to some other methods as the technology is active. Alternatives such as High-Efficiency Particulate Air (HEPA) filters and UV lights are passive, which means the virus has to pass through the devices for them to be effective. Another useful method is targeted ventilation, a more efficient method than simply increasing ventilation.

Targeted ventilation only sends the ventilation to rooms which are occupied. For example, in a school the room use is scheduled, therefore you can open up the vents before class starts. For it to be effective, it's necessary for buildings to have good occupancy sensors and a system which can control, monitor, and relay the information back.

It is often assumed that it is too expensive or time-consuming to implement these kinds of solutions. However, in reality, modern building management technologies can now be used to modernize existing equipment much faster than was previously possible, so ripping out old equipment and replacing it is no longer necessary.

How Can We Solve Environmental Challenges?

Natural ventilation methods worked well over the summer in office blocks, but there has not been much advice from the US government about what we can do over the winter months without ramping up HVAC units. Utilization of modern, IoT-enabled building management systems and occupancy-aware control will be critical to driving adequate ventilation where it needs to go without

breaking the bank.

With windows being firmly shut for the winter months, energy bills will increase. BPI is one of the few solutions discussed above which limit carbon emissions. There is still a long way to go for buildings to be able to effectively ventilate for the winter period in the context of a COVID-19 world.

The new generation of smart air quality monitoring systems, which are already being rolled out with success in schools and commercial buildings across the country, allow building owners to meet the regulatory requirements, and simultaneously provide critical peace of mind to building occupants through real time metrics on air quality in the building.

Implementing new systems will no doubt be an expense for businesses, but it’s a necessary one, especially as it could still be a long time before the majority of the population is vaccinated for COVID-19. Therefore, to ensure the safety of employees, offices are going to have to consider taking the plunge.

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