CHAUVIN ARNOUX

Controlling the cost of COVID ventilation

Increased ventilation is recommended as an aid to reducing the risk of **Covid-19** transmission in indoor environments, but there's a trade-off: more ventilation potentially means more heat loss and higher energy bills. What can energy managers do to achieve a balance? **Julian Grant** of **Chauvin Arnoux** has some helpful suggestions.

Numerous scientific studies have shown that one of the major methods of transmission for viruses, such as the **Covid-19** corona virus at the root of the current pandemic, is via aerosols. In this instance, however, the word 'aerosol' does not refer to spray cans with pressurised contents; it has its specialised scientific meaning of fine particles or droplets in the air. In fact, aerosols are usually considered to be made up of particles that are 1 micrometre or less in diameter, and particles of this size are entirely invisible to the naked eye.

We all expel these tiny particles when we breathe, speak and, of course, when we sneeze or cough. What makes them particularly effective in the transmission of disease is that, unlike larger particles, they don't sink quickly to the ground; they float in the air for a considerable time, and for distances of up to around five metres. The two-metre social distancing rule therefore helps to reduce the risks associated with infection via aerosols, but it is not completely effective.

This is a particular problem indoors as, in the outside environment, there is usually enough wind to quickly disperse aerosols. Indoors, the amount of air movement is often minimal and also people tend to be closer together than in outdoor environments. For these reasons, many authorities are recommending or even requiring that levels of ventilation are increased, particularly in public buildings like schools, colleges and medical facilities.

This is all very well but there is also a requirement to keep the occupants of those buildings comfortable, not least by ensuring that reasonable temperatures are maintained. And, on a cold day, heating a room that has all of the doors and windows open can be somewhat costly! Which raises the question of how much ventilation is enough to minimise the risk of Covid-19 transmission without leading to unaffordable energy bills?

This is not a question that can be answered simply by considering, for example, the design of the building or the layout of the room. Nor is it easy to measure the concentration of aerosols in a room, which would otherwise make it possible to estimate the effectiveness of the ventilation. Fortunately, however, there is an indirect approach which is both straightforward and affordable.

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Studies carried out by two scientists, Anna Hartmann and Martin Krieger, working in the Hermann Rietschel Institute at the Technical University of Berlin, have shown that CO2 concentration is a good indicator of the effectiveness of ventilation. They note that "with high rates of air exchange, both low CO2 concentrations and low aerosol concentrations can be achieved. The lower the aerosol concentration, the lower the dose of aerosols that a person in the room inhales and, therefore, the lower the risk of infection." This implies that measuring the CO2 concentration in the room gives a useful, albeit indirect, indication of the aerosol concentration.

Devices for measuring CO2 concentration are readily available and the C.A.1510 indoor air quality monitor from Chauvin Arnoux is an excellent example. This can measure and record not only CO2 concentration, but also relative humidity and temperature, two other factors that have a critical bearing on comfort levels within a room. As well as providing instantaneous readings, this versatile device also has a data logging function. This makes it possible to examine measurements over a period of time to see, for example, if there was ever any point where acceptable CO2 concentrations were exceeded.

C.A 1510

But what is an 'acceptable' CO2 concentration? In normal times, it is usually considered desirable not to exceed 1,000 parts-per-million (ppm) and it would seem reasonable to adopt this figure as a guide for the Covid-19 era. Higher concentrations suggest the need for additional ventilation, while lower concentrations are both welcome and desirable provided that they can be achieved, along with reasonable temperatures, without the exorbitant use of energy.

In cases where the measurements indicate that it is desirable to improve ventilation, the German research offers suggestions about how best this can be achieved. It finds that the very common method of simply opening windows and doors more or less at random is ineffective and likely to lead to energy wastage by unnecessarily cooling walls and furniture. In contrast, adopting a strategy of "cross ventilation" where windows on the opposite sides of a room are opened to create a cross draft not only aids faster air exchange, with consequent rapid reductions in CO2 and aerosol levels, but also minimises heat loss.

No reputable organisation would want to compromise the health of those working in or using its premises simply to economise on its energy bills. However, in these challenging times it is arguably more important than ever to keep costs under control. Bearing this in mind, along with the certain fact that the first step to controlling something is to be able to measure it, investing in a Chauvin Arnoux air quality monitor may well provide you with benefits and savings that well beyond those that its original designers could ever have envisaged!

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