

Expert commentary #4

A series of articles from Systemair Group specialists aimed at providing accurate technical information to the public

Let's get the facts straight regarding ventilation terms in relation to COVID19



Toine van den Boomen
Systemair Group

COVID19 has trained the spotlight on the importance of ventilation and indoor air quality, following increasing global awareness on its impact on the health of building inhabitants and rate of infection. However, there is some confusion in the market when it comes to certain terms used to discuss ventilation in the context of the pandemic.

Ventilation is different from circulation and internal leakage is different from recirculation. Ventilating by opening the windows is an emergency measure and, overall, there is a need to clarify the different terms to avoid being used interchangeably.

Ventilation is the intentional replacement of used indoor air with fresh, outdoor air. The air is used by the people inhabiting the space, who inhale oxygen (O₂) and breathe out carbon dioxide (CO₂). The concentration of CO₂ serves as a measure of the quality and freshness of indoor air. However, the concentration of virus particles in the air also depends on how many sick people are inside.

A ventilation system facilitates the introduction of fresh outside air in an intentional and controlled manner.

Fresh outside air can typically enter the building through **infiltration, which is considered unconscious or non-intentional ventilation.** A way to temporarily increase ventilation through infiltration is to manually open a window or door. By consciously making larger openings in the facade, more fresh outside air will flow in, allowing for better ventilation. More fresh air indoor leads to lower CO₂- concentration and reduces the possible concentration of harmful virus particles.

However, there are major drawbacks to opening the windows, include reduced energy efficiency because of increased heat requirement and pollution in terms of outside particles, insects and even noise. It also leads to drier air especially during the winter, which makes inhabitants more susceptible to respiratory infections including COVID19. We recommend maintaining indoor relative humidity between 40% and 60%.

In the reporting surrounding COVID19 and ventilation, internal leakage in a central ventilation unit is often confused with recirculation. Following greater awareness on the Sick Building Syndrome (SBS) of the 1990s, we no longer use recirculation systems. SBS was caused by often too little ventilation and too much recirculation to save energy. Together with inadequate maintenance of the systems, this resulted in buildings where inhabitants became ill.

Recirculation is largely 50%-90% reduction of ,used' air. Essentially, the air that is extracted from a room is returned to the same or other rooms. This is done consciously in new systems for clean rooms, surgery rooms and operating theatres, where the recirculated air passes through a very good filter, such as HEPA filters, so that the supply air to the room will be rinsed clean.

If there is a concern that virus particles could be spread again through the exhaust air from a certain room throughout the building, it is, in principle, possible to upgrade recirculation systems with virus-killing UV lamps or photocatalysis filters.

An important condition for the application of UV and photocatalysis is to make sure that there is no ozone (O₃), which is carcinogenic, or other residues dangerous for humans are formed in the supply air. That could make the remedy worse than the disease. By installing a balanced air handling "fresh air ventilation" unit a good and healthy indoor climate can be guaranteed.

Summary

The table below gives a weighting of the various ventilation options.

System comparison	Open window	Natural ventilation	Hybrid ventilation	Circulation	Recirculation	Balance ventilation		
Weighting criteria					central	local	central	local
Refreshment regarding COVID 19	++	-	+	--	--	+ / -	++	++
Tour	--	--	--	-	++	++	++	++
Sound fans	++	++	+	--	+	-	+	-
Sound of Outside	--	-	-	++	++	++	++	++
Pollution of Outside	--	-	-	++	++	++	++	++
Controllability	--	--	-	+ / -	++	+	++	+
Energy heating	--	-	-	++	++	++	++	++
Energy fans	++	++	+	-	--	--	--	--
Compatibility	++	+	+	++	--	+	--	+
Installation space / budget	++	++	+	-	--	-	--	-

Weighting according to system performance in comparison: ++ good + sufficient + / - neutral - insufficient -- poor

Weighting criteria	Explanation
Refreshment regarding COVID 19	How much fresh air is coming in? With natural ventilation this depends on the wind. You can choose this yourself with mechanical ventilation. An air conditioner is not ventilation. Central recirculation is undesirable because of the possible spread of COVID 19 through the building.
Tour	Controlled introduction of treated ventilation air produces less draft.
Sound fans	If fans are closer to the user, the chances of noise disturbance increase.
Sound of Outside	With more openings in the facade, more outside noise will enter.
Pollution of Outside	With more openings in the facade, more particulate matter will enter from the outside.
Controllability	Balanced ventilation allows temperature control of the ventilation air (including cooling) and humidification (40% <RH <60%).
Energy heating	More fans use relatively more electrical energy.
Energy fans	With balanced ventilation, heat and moisture recovery is possible / mandatory.
Compatibility	Local systems are often better suited to existing buildings than central systems.
Installation space / budget	More installation takes up more space and requires a higher budget.

For a more comprehensive overview of ventilation terms, please email: info@pacificventilation.com

Ask us if in doubt

If you are ever in doubt, ask your supplier for advice. At Systemair, our experts are always at your service to meet your specific requirements.

Disclaimer While our recommendations are based on the best available evidence and knowledge (including our own internal knowledge as one of the world's leading HVAC manufacturers), the Systemair Group excludes any liability for any direct, indirect, incidental damages or any other damages that would result from or relate to the use of the information presented on this page.



PV00152_FEB_2021_Version 1.0.0