

## **Operation of ventilation and air-conditioning systems under the conditions of the current Covid 19 pandemic**

Ventilation and air conditioning systems are an indispensable prerequisite for the operation of many buildings. Regular maintenance and service is of decisive importance for safe system operation.

Taking into consideration the current corona pandemic, operators of AHUs are confronted with questions regarding the operation of the systems, some of which have not yet been clarified. In this paper, the associations FGK, RLT manufacturers' association and BTGA summarise the current recommendations and pass them based on of the state of knowledge. As soon as further information is available, this recommendation will be supplemented.

Ventilation and AC-Systems, if properly designed and operated, reduce many pollutants by filtering potentially polluted outdoor air, supply air and, where appropriate, exhaust air, and provide good quality of supply air. Professional planning, zoning and pressure maintenance ensure that pollutants from the exhaust air of one room cannot spread throughout the entire building.

### **Basic questions about the transmission of corona viruses**

According to current knowledge, corona viruses are transmitted by droplet infection. In principle, good ventilation of rooms with the highest possible proportion of outside air is recommended. Recommendations for the save operation of the systems:

- Do not switch off air handling units with outdoor air, do not reduce the outdoor air volume flows.
- Reduce the recirculation air, if present in the systems, in favor of the outdoor air.
- If necessary, extend the operating times of the units before and after the regular time-of-use.
- Secondary air units (fan coil units, induction units) are effective only in the respective individual room and do not transfer the air to other rooms.
- Minimize overflow from different zones (if possible, balanced air volume flows in the zones). It should be noted that overflow in normal buildings is practically never excluded due to doors, windows and leaks (cross-ventilation works practically exclusively by overflow).

### **Transmission of corona viruses by air conditioning systems**

According to current knowledge, the transmission of coronaviruses via ventilation/air conditioning systems can be basically ruled out. Due to filtration, droplets which could contain the corona virus cannot be introduced into the rooms via outdoor air ducts and supply air ducts. Exhaust air ducts that take in any droplet-contaminated exhaust air from the rooms do not transport it to other areas, as the systems are operated in negative pressure and therefore no exhaust air can escape even if the ducts leak.

Depending on the design, leaks in the air handling unit and in the heat recovery unit (HRU) can result in a small proportion of the exhaust air being transferred to the supply air. Correct system design with modern concepts prevents from this:

- Overpressure in the supply air section compared to the exhaust air section:  
Due to the arrangement of overpressure and underpressure areas, no relevant extract air can be transferred to the supply air even by heat recovery systems such as rotors.
- If the supply and exhaust air units are located separately, e.g. with runaround heat recovery systems, the transfer of extract air components into the supply air can be excluded.

## **Filtration**

Air filters provide a relevant reduction of dust and aerosol concentration in air conditioning systems and in the supply air of rooms. HEPA filters are used for complete separation of suspended particles, even the smallest viruses (22-330 nm [nanometers]). Supply air filtered this way is required in air handling systems for clean rooms, operating rooms in hospitals or in special laboratories. Starting with filter class H-13, all substances with viruses are completely separated. A noticeable reduction is already achieved by using filter class ePM1  $\geq$  80 % (old F9).

## **Filter maintenance**

Viruses are always bound to aerosols or dust particles and therefore usually do not float freely in space. They are therefore accumulated in the filter material like all other particles. Personal protective equipment (protective gown, mouth/nose protection FFP3 and safety goggles) must always be worn when maintaining and replacing loaded filters.

## **Room air humidity**

The humidity of the room air could also play a role in the transmission of viruses. It is now known from studies that the transmission of influenza viruses decreases at room air humidity between 40 to 60%). Whether this circumstance also applies to corona viruses is not finally known. If humidity control with the ventilation/air conditioning system is possible, it should be carried out as follows:

- The room air humidity should be kept between 30 and 65 % rh. A target value of 40 % for systems with humidification could be advantageous, in no case less than 35 %, as dry air with < 30 % relative humidity poses a higher risk of infection.
- For systems without humidification, it is important to consider which ventilation rates are appropriate under the current occupancy rates.

## Sources:

- [1] Robert Koch Institute (RKI) / CCI: Should ventilation systems be switched off as a precaution against the transmission of COVID-19 ("corona viruses")?  
The RKI answered: Since COVID-19 is an infection primarily spread via droplets (and not primarily transmitted via air), it cannot be assumed, based on the current state of knowledge, that SARS-CoV-2 will be further spread via operated ventilation systems (e.g. in public buildings, hotels).
- [2] COVID-19  
Guidance for infection prevention and control in healthcare settings  
Department of Health and Social Care (DHSC), Public Health Wales (PHW), Public Health Agency (PHA) Northern Ireland, Health Protection Scotland (HPS) and Public Health England as official guidance:
- [3] WHO, INTERIM GUIDANCE DOCUMENT Clinical management of severe acute respiratory infections when novel coronavirus is suspected: What to do and what not to do:  
Airborne precautions Ensure that healthcare workers performing aerosol-generating procedures use PPE, including gloves, long-sleeved gowns, eye protection and particulate respirators (N95 or equivalent). Whenever possible, use adequately ventilated single rooms when performing aerosol-generating procedures.
- [4] Comment Prof. Dr. med. Dipl.-Ing. Hans-Martin Seipp  
Technische Hochschule Mittelhessen 17.3.2020 Excerpt:  
As a source for third parties, AHU systems can only work if:  
A) Recirculated air travels WITHOUT HEPA filters (HEPAs are completely safe from H-13 on!)  
From F-9 - depending on the load condition - a reduction of the risk begins.  
B) brings too little air exchange into the room.
- [5] Air, Surface Environmental, and Personal Protective Equipment Contamination by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) From a Symptomatic Patient  
JAMA Published online March 4, 2020
- [6] Walter Hugentobler, MD, Comment on COVID-19 guidance, 23.03.2020

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