Reduce the airflow in large spaces that are not in use

In many restaurants, auditoriums and multi-purpose halls, the ventilation setting is too intensive outside of usage times. Also, excessive airflows are often encountered in rooms where smoking has taken place in the past.

Action

Adjust the ventilation airflows to the effective requirements.

Requirement

It must be possible to control the airflow fan with a frequency converter, a step switch or an EC (electronically commutated) motor.

If the airflow is halved, the energy consumed by the ventilation decreases by 80 percent

What to do

1. Record the initial situation

- Determine the airflow setting (supply and exhaust air). These values should be recorded in the commissioning record for the ventilation system. If the data is missing, a ventilation specialist can determine the volume flows.
- Note the current supply and exhaust airflows in the logbook (plant journal).

2. Analyse the demand and measure the air quality

(See page 2 for procedure and details)

3. Adapt airflows

- Compare the measured values with the default values (see page 2) and adapt the airflow if necessary.
- In case of major variances in occupancy, adapt the airflows to the specific occupancy situation.

4. Note, observe and correct

- Enter the newly adjusted airflows and setting values (frequency and speed) in the logbook.
- Observe the users (are there any complaints?) and correct the set values if necessary.

Costs – effort

- Your own labour (measurements, settings, updating the logbook): approx. 4 hours
- Air quality measurement (CO_2, air humidity): CHF 200 per measuring point

Please note!

- If additional requirements are defined for the rooms (overpressure/underpressure), they must be taken into account.
- The supply and exhaust airflows must be coordinated with each other.

Additional explanations

Analyse the demand

Ascertain whether the ventilation system – as originally planned – is still needed today, or whether it can be shut down completely (especially outside of usage times). If you are not sure about this, proceed as follows:

- Switch the ventilation system off completely.
- Using a time switch, turn the system on only at times when it is definitely required.
- Monitor the air quality with a CO_2 meter (note that the increase in CO_2 is delayed).
- Monitor the indoor air temperature in rooms with high, fluctuating occupancy (e.g. multi-purpose halls).
- Adapt the times on the time switch.

Setting the volume flow

The volume flow (m^3/h) is the airflow that is fed to the room. Depending on the ventilation system, either fresh air only or fresh air with a percentage of recirculated air is blown in. The volume flow can be changed as follows:

- Change the levels on the relevant fans (e.g. levels 1 and 2)
- Adjust the speed of fans with a frequency converter (e.g. continuous control based on limit values such as CO_2 and temperature)
- Adjust the speed on fans with EC (electronically commutated) motors (using the integrated motor electronics)
- Have the fan's transmission ratio adjusted by a ventilation specialist (change the pulley)
- Cycle the system (switch on/off) over the operating times for an average/moderate volume flow
- Reduce the required volume flow with intermittent operation so that the airflow per person is only 30 m^3/h
- Define seasonal operating times or levels

Consider replacing the motor

For large ventilation systems that operate for more than 4000 hours per year, it is often worth replacing an inefficient motor that is 15 to 20 years old with a new and efficient model.

Highly fluctuating occupancy

If there are major fluctuations in occupancy, the airflow must be adapted to the effective demand insofar as possible.

- If the room is unused throughout the day (works holidays, semester breaks, rest days, etc.), switch the ventilation off entirely and "flush" it for 30 minutes once a day.
- For "medium" occupancy, operate the ventilation system at level I (or airflow of 50 percent) instead of level II (100 percent).
- For "high" occupancy, let the ventilation system run at a higher level (level 2 or airflow of 100 percent).

How to determine the default values

The theoretically required volume flow can be calculated on the basis of the number of occupants, the usage or the room type. The following table provides guidance values for the calculation:

Room type	Outside air volume flow (m^3/h/person)	Targeted CO_2 concentration (ppm)	Requirements for room air (category)
Open-plan office	36	800–1000	IDA 2 – medium
Meeting room	36	800–1000	IDA 2 – medium
Retail shop	30	800–1000	IDA 2 – medium
Restaurant	36	800–1000	IDA 2 – medium
Warehouse hall	36	1000–1400	IDA 3 – moderate
Classroom	25	800–1000	IDA 2 – medium

Example of calculation: default values for outside air supply

- Restaurant with 100 persons
  100 persons x 36 m^3/h person = 3600 m^3/h
- Set the CO_2 control to constant regulation at 1000 ppm.
- For CO_2 controllers with a hysteresis: switch the ventilation on at 1000 ppm and switch it off at 800 ppm.
- With dynamic CO_2 controllers that can map a setpoint ramp, set the frequency converter so that the airflow increases continuously from 800 ppm, and 100 percent of the airflow is delivered at 1200 ppm.

Additional information

- "Room usage data for energy and building technology", SIA fact sheet 2024 (charge payable)
- The IDA (indoor air) values are described in standard EN 13779.

SwissEnergy
Federal Office of Energy (SFOE)
Pulverstrasse 13
CH-3063 Ittigen
Postal address: CH-3003 Bern

Infoline 0848 444 444
infoline.energieschweiz.ch
energieschweiz.ch
energieschweiz@bfe.admin.ch
twitter.com/energieschweiz

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