



Smart retrofit of a ventilation system with sensors

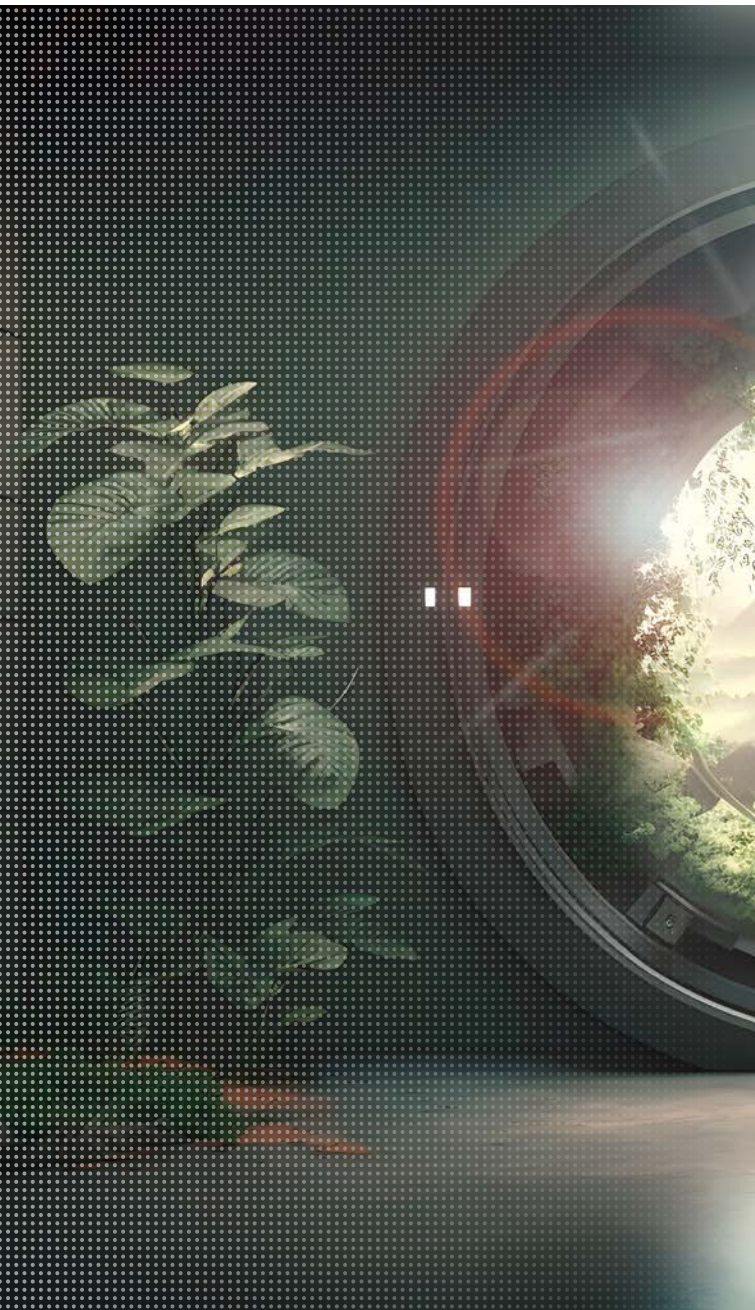
Celebrating better – thanks to good air

Until now, the event rooms in the monastery cellar in Beutelsbach were ventilated by old, belt-driven fans, but, at some point, they reached their limits. After a retrofit, the air is not only distributed more efficiently, the ventilation system also focuses on air quality using sensors.



prompt:

a view into a sustainable future out of a dark club room, natural light,
photorealistic



The monastery cellar is located in the middle of the old city center in Beutelsbach, Germany. It includes a gym with showers and changing rooms, which are used by the nearby school, a small cinema, and a large vaulted cellar where events take place. These four rooms were supplied with fresh air by a ventilation system located in a narrow cellar room, using belt-driven fans. They could be controlled in just two stages. However, as the rooms were often used to varying extents, for example the cinema room often went from empty to full of people, this is a key area where more efficiency can be gained. Therefore, the city of Weinstadt commissioned an engineering firm and Pfänder GmbH to find an energy-saving and economical solution (Fig. 1).

The city's wish was initially only to modernize the control system. "That wouldn't have been a problem either – the system's control cabinet was in very good condition. However, the energy-saving potential would have been limited due to the old belt-driven fans," says Lukas Pfänder, Managing Director of Pfänder GmbH. As Lukas Pfänder had already implemented several successful retrofit projects in cooperation with the ebm-papst Breuell & Hilgenfeldt service center, he also suggested a retrofit for the monastery cellar. The lack of space meant that a plug-and-play solution was the only way to modernize the ventilation system's intake and exhaust air economically and to reduce the power consumption of the fans.

Retrofit with a focus on air quality

Dieter Hildebrandt, Sales Manager at Breuell & Hilgenfeldt, calculated the required performance and suggested eight RadiFit EC centrifugal fans as a replacement. However, the monastery cellar's special requirements – the fast change in the level of utilization of the space and the resulting changing demand for fresh air – gave Hildebrandt and Pfänder the idea of equipping the ventilation system with sensors and gateways in order to

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FIGURE 1: Lukas Pfänder, Managing Director Pfänder GmbH and Ralf Braun, Sales Director Germany, inspect the ventilation system in Beutelsbach monastery cellar.

constantly monitor the requirements and regulate the system to them accordingly (Fig. 2, p. 32). They approached Ralf Braun, Sales Director Germany and contact person for ebm-papst neo, with this suggestion. The start-up of the fan specialist ebm-papst offers intelligent solutions for data-based buildings. Braun was immediately convinced by the idea, as demand-based, sensor-based closed-loop control would open up more energy-saving potential, alongside the efficient fans.

The RadiFit – the compact solution for ventilation technology

The main aim of the retrofit was to save energy, which is why the RadiFit EC centrifugal fan was chosen, the new system solution for ventilation technology from ebm-papst. Due to its compact dimensions, it was suitable for the installation dimensions of the old fans, enabling space to be saved and the installation to be quick and easy. As it was supplied as a plug-and-play design, it was also easy to connect the

electronics. The RadiFit features a scroll housing and backward-curved blades, which enables a high pressure increase and ensures a high level of efficiency. The RadiFit is also maintenance-free and durable, which further reduces the operational and life cycle costs. The maintenance supervisor and the city benefit from this equally. Thanks to their high efficiency, the retrofit also pays for itself very quickly. Dieter Hildebrandt and Lukas Pfänder estimated energy savings of 60 percent with the eight new RadiFit.

Energy saving thanks to EC motor

This value comes primarily from the RadiFit's GreenTech EC motor. Such high savings are possible thanks to the efficiency level of over 90 percent alone. Because the old belt-driven AC fans could only be switched on or off, regardless of the actual capacity utilization of the different rooms, the system always ran at too high a power, even if a lower air flow would have been sufficient for the actual fresh

air requirement. By contrast, the new EC fan can communicate and can be continuously controlled between 0 and 100 percent. The new RadiFit can take on every speed as required and work with the lowest possible power consumption at every operating point. This results in significant potential for savings, as the power consumption increases or falls in line with the speed to the power of three ($P \sim n^3$). So if the speed is reduced by half compared to the nominal speed, the power consumption is reduced by a factor of 8 and is therefore only 12.5 percent of the rated output, saving over 80 percent. To compare, if, on the contrary, half of the old AC fans are switched off and the other half are still operated at full load, only 50 percent of the power consumption can be saved.

Demand-based control with sensors

The second part of the retrofit involved reworking the control system. After all, it becomes even more efficient if the demand for fresh air is precisely determined and controlled automatically accordingly. The changing conditions of the monastery cellar provided the perfect case for this. “The gym is not used for half of the day. However, if a school class has a sports class, the CO₂ content rises and the ventilation system has to supply more fresh air. After the lesson, the showers and changing rooms are used, which suddenly increases the temperature and humidity there,” explains Pfänder. For this reason, sensors for CO₂ content, humidity, temperature and fine dust concentration have been installed in the monastery cellar. The measured values are sent to the IntelliGate Air Gateways from ebm-papst neo, which forward them to the ventilation system's control system. The closed-loop control has been individually adapted and programmed for the monastery cellar. Specially defined limit values now specify when the system increases its power by how much and when it reduces the power once again, with infinite variations and efficiently. Individual functions such as a warning e-mail to the caretaker, have also been set up if a certain value is exceeded.



FIGURE 2: The system's control cabinet was still well maintained and could therefore be supplemented with sensors and ebm-papst neo gateway without great effort.

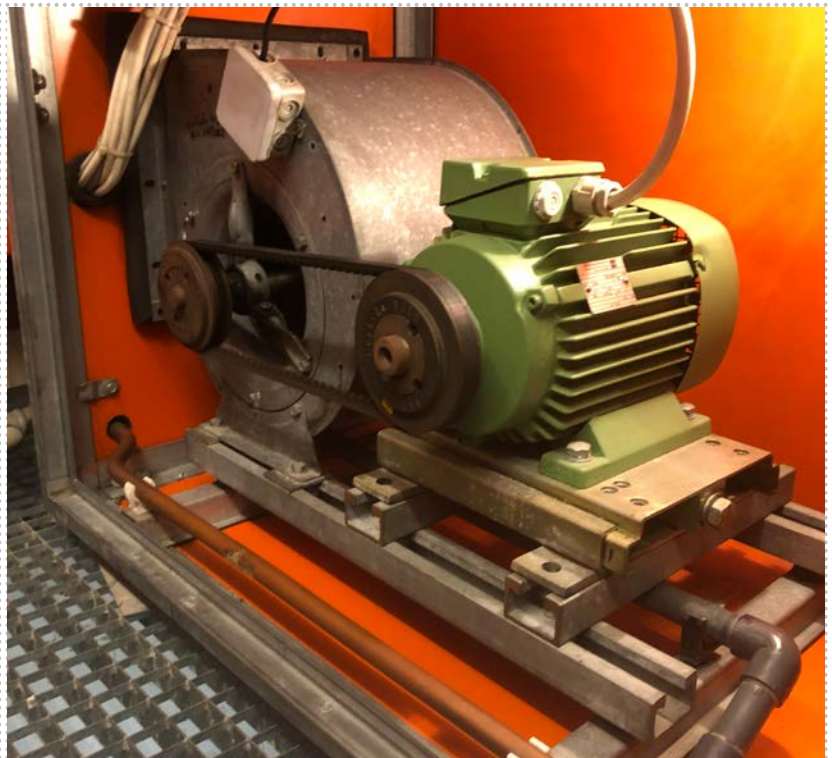


FIGURE 3: The old, belt-driven fans used too much electricity and could only be controlled in two stages.



FIGURE 4: Thanks to EC motors, the new RadiFit is much more economical and could be replaced quickly and easily.

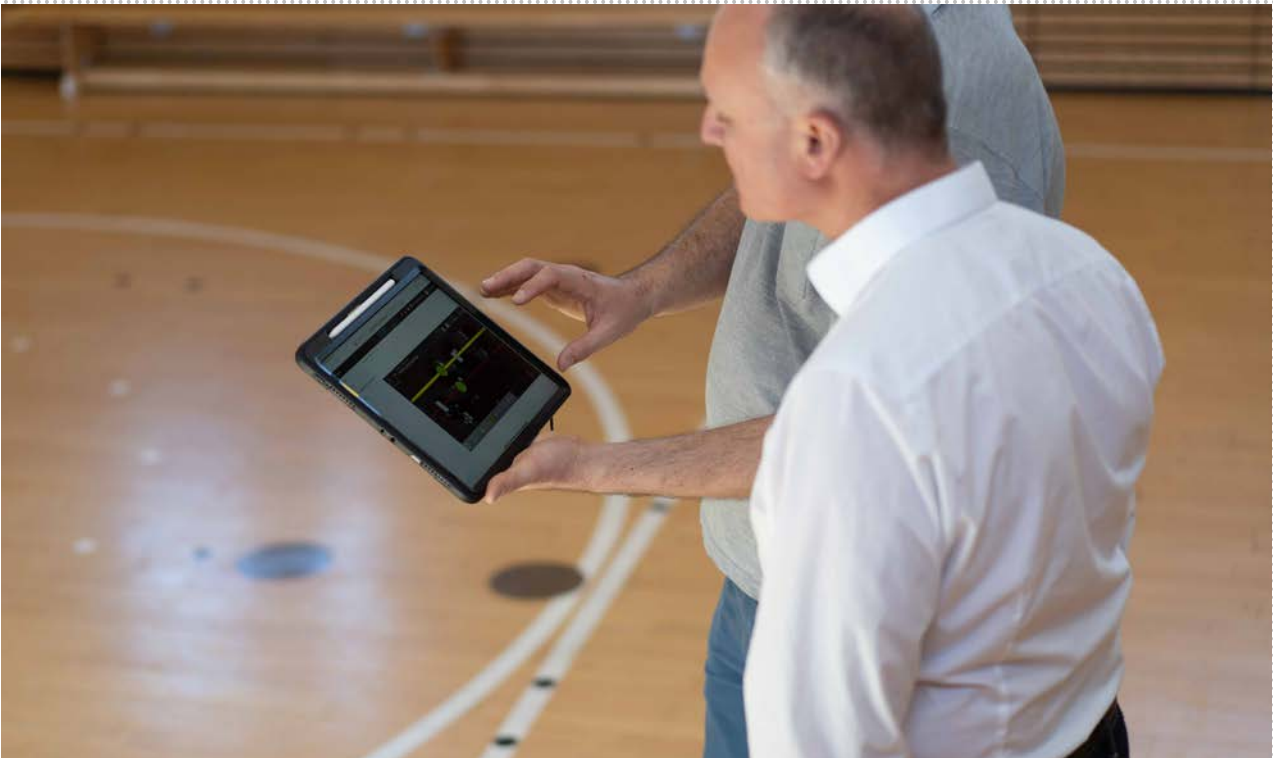


FIGURE 5: Thanks to ebm-papst neo gateway, the ventilation system data can be displayed in real time and adjusted manually if required.

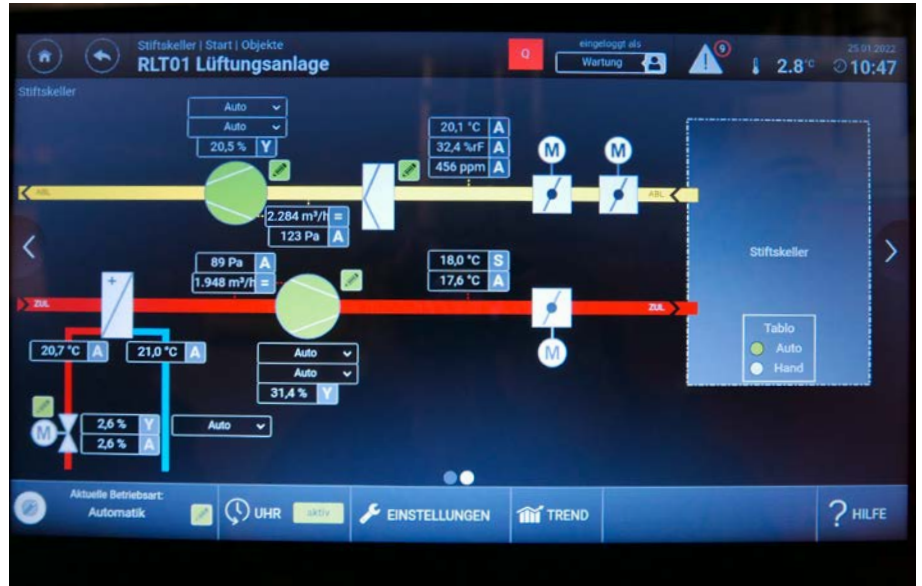


FIGURE 6a,b: The maintenance supervisor can use an operating panel to read out the data from the ventilation system at any time and adjust it manually if necessary.

Goal achieved – the city saves money

The interaction between sensors and systems is reliable and economical. This will enable more than the planned and achieved energy savings of 60 percent. The city not only saves on costs but can also guarantee high air quality for all visitors at large events, festivals or concerts (Fig. 6a, b). ○



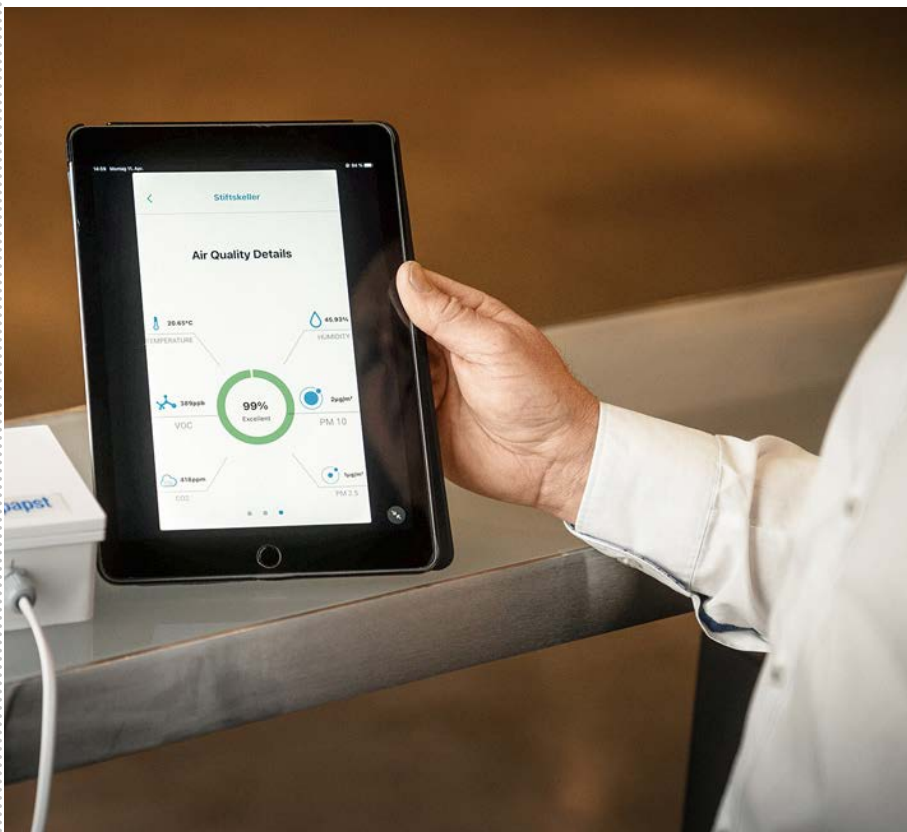
AUTHORS ARE RALF BRAUN, SALES DIRECTOR GERMANY AT EBM-PAPST MULFINGEN AND WALDEMAR WAGNER, PRODUCT MANAGER AT EBM-PAPST NEO.

YOU WOULD LIKE MORE INFORMATION ON THIS TOPIC? PLEASE ADDRESS YOUR QUESTION TO:

Ralf.Braun@de.ebmpapst.com

Ensuring air quality with the multi-IAQ sensor

With the Multi-IAQ sensor from ebm-papst neo, there is a simple and efficient way of ensuring consistently high air quality in event rooms. The sensor measures a total of five values, namely temperature, humidity, VOC (volatile, organic compounds that are harmful to health), CO₂ and fine dust in the air. The viral index is calculated using the five measured values and a complex mathematical equation. This indicates the quality of the air and the risk of virus transmission and can be read off from the freely accessible IAQ Connect app. The multi-IAQ sensor can be installed in flush-mounted sockets similar to a light switch.



The Multi-IAQ sensor can be used to read out detailed air quality data.

Imprint

ebm-papst Mulfingen
GmbH & Co. KG
Bachmühle 2
74673 Mulfingen
Phone +49 (0) 7938 81-0
Telefax +49 (0) 7938 81-110
info1@de.ebmpapst.com

ebm-papst St. Georgen
GmbH & Co. KG
Hermann-Papst-Straße 1
78112 St. Georgen
Phone +49 (0) 7724 81-0
Telefax +49 (0) 7724 81-1309
info2@de.ebmpapst.com

ebm-papst
Landshut GmbH
Hofmark-Aich-Straße 25
84030 Landshut
Phone +49 (0) 871 707-0
Telefax +49 (0) 871 707-465
info3@de.ebmpapst.com

www.ebmpapst.com

Responsible for content:
Kai Halter

Editor:
Corinna Schittenhelm

Layout and production:
Scanner GmbH, Künzelsau

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