

OPTIMISATION OF AIR-HANDLING UNITS USING NEW FANS



Since the end of 2017, our company has included in its standardised production new fan types which feature lower sound power and greater efficiency. Thanks to this, it is possible to reduce the sound power spread through connections and into the surroundings as well as reduce the energy consumption of the air-handling unit.

These new types of fans are available with impellers 710 to 1120 mm in diameter, which is the condition for using them in the AeroMaster XP 22 to AeroMaster Cirrus 98 Remak air-handling unit ranges (for air flow rates of 15,000 to 90,000 m³/h at static pressure of 1,000 Pa). You can find these fans in our AeroCAD design application in XPAP resp. CRVAE chambers by selecting the *IE3-Zabluefin* option from the Efficiency Class selection field.

The above-stated parameters are achieved thanks to the new geometry of the impeller and blades of the fan. This results in more even air speed distribution after the fan and thus in lower air turbulence, see Fig. 1. The slightly diagonal direction of air flow is also advantageous for the components after the fan which are thus streamlined by air more smoothly than existing types of fans.



FIGURE 1 – DISTRIBUTION OF AIR SPEED AFTER THE FAN

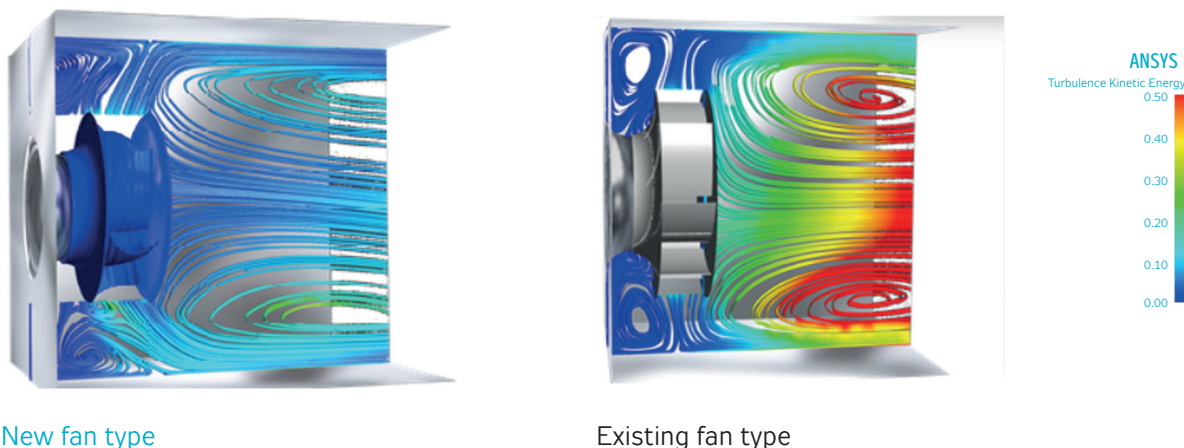
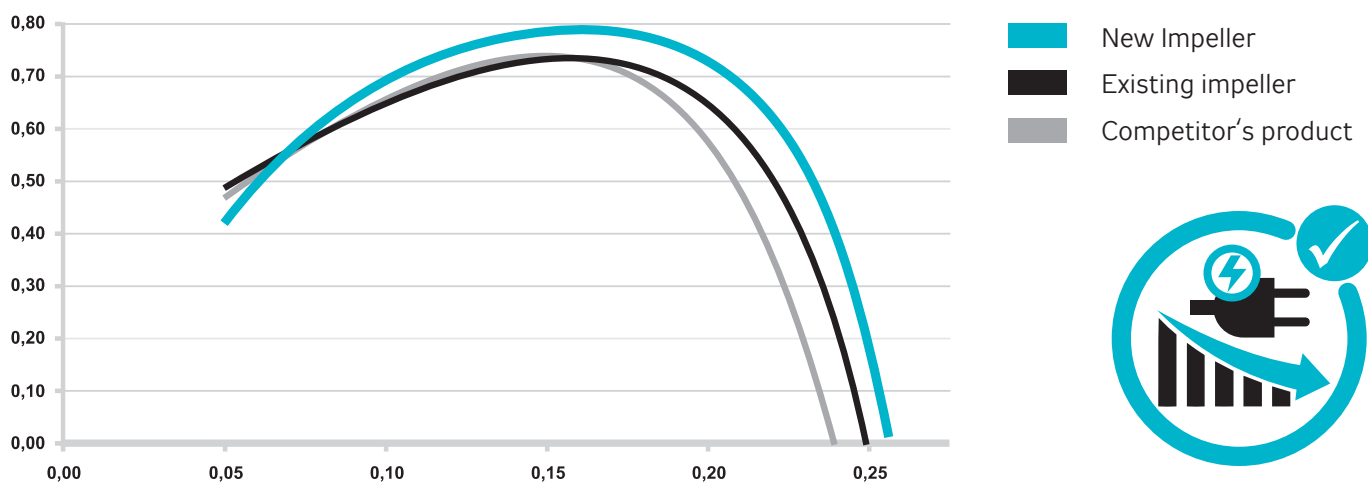
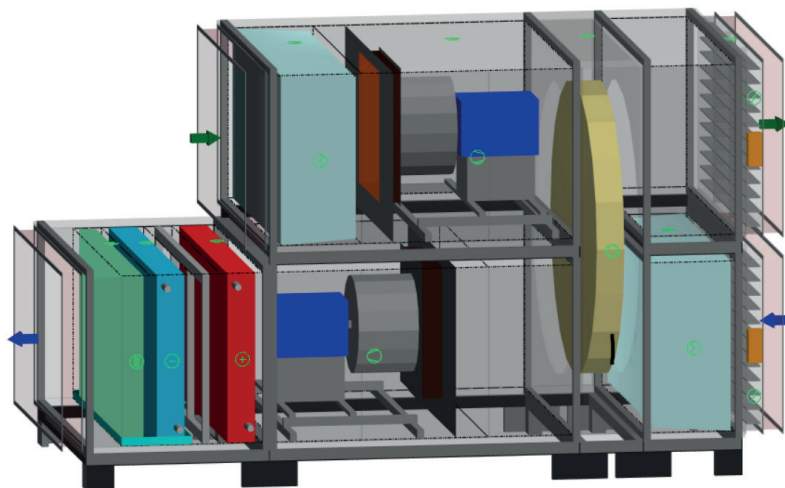


FIGURE 2 – COMPARISON OF EFFICIENCY OF IMPELLERS



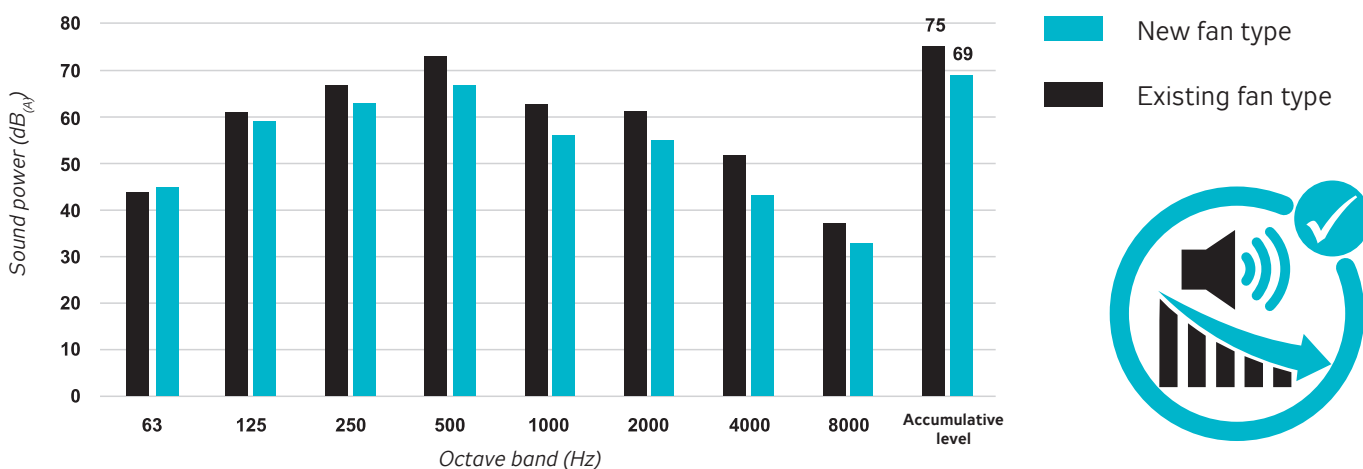
Thanks to the above-mentioned facts, these fans achieve greater efficiency of up to 15% compared with existing fans, see figure 2. The advantages of using these fans are demonstrated in an example of the air-handling unit arrangement according to figure 3.

FIGURE 3 – AIR-HANDLING UNIT ARRANGEMENT FOR THE EXAMPLE BELOW



Parameters of the assessed air-handling unit: air output 22,000 m³/h, external static pressure 500 Pa, inlet air temperature in winter 20 °C, in summer 24 °C. Using the new type of impeller results in reduced electrical power consumption to drive the fans of 10 % and reduced sound power spread into the surroundings, see figure 1. A similar reduction of 4 to 6 dB is achieved in the unit's connections, which can result in attenuators being able to be shortened by approx. 4x500 mm. When using the new more effective fans, the price of the air-handling unit increases by approx. 3 %. The return on increased price of the air-handling unit (due to electrical energy savings) is 1.5 years for a building with a daily operation time of 16 hours, excluding holidays and weekends. When the other effects mentioned in the conclusion are included, a reduction in total investment costs of the building can be achieved.

GRAPH 1 - COMPARISON OF SOUND POWER SPREAD INTO THE SURROUNDINGS $L_{w(A)}$ DEPENDING ON THE USED FAN



ADVANTAGES OF USING THE NEW FAN TYPES

- **Lower electrical power consumption** = lower operating costs
- **Lower sound power of the unit** = lower costs for consequential requirements for solutions for building acoustics, e.g., shortening of attenuators and smaller acoustic barriers
- **Larger range of air flow rates**, enabling the unit to comply with Ecodesign requirements (EU Council Directive No. 1253/2014) = smaller air-handling plant and larger commercially usable area of the building, lower loading of the roof and thus lower costs for the supporting structure, lower purchase price of the air-handling unit
- **Lower rated motor powers** = lower costs for associated M&C equipment and electrical installations
- **IE3 efficiency class motors**

