Breakthrough in higher efficiency at lower operating noise

Fans with diffuser reduce their discharge losses

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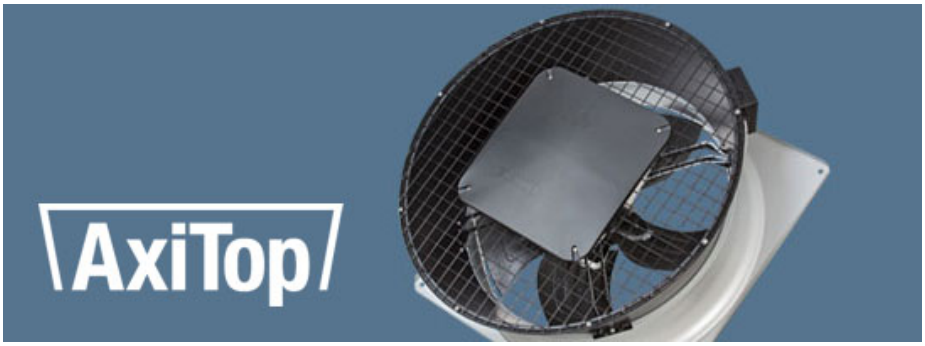
In refrigeration and cooling installations, heat exchangers are used to dissipate the waste heat that is generated into the surrounding air. To improve their dissipation capacity, fans force cooling air through the heat exchanger. For these fans, there are various design and configuration options available to make them especially efficient, quiet and to increase their service life. A new, passive component, the so-called diffuser, achieves a substantial improvement in efficiency and noise.

Its pressure-boosting effect minimises these discharge losses and makes it easier to adjust the fan to commercially available heat exchangers.



A medium can only absorb a certain amount of heat energy for each degree Kelvin. Therefore both possible temperature difference and the amount of heat to be dissipated define the volume of the cooling airflow that is required. This is the air any such fan has to force through the heat exchanger. Because refrigeration systems are usually operated with long duty cycles, it is even more important to make use of the input power, as every additional watt increases operating costs.

Using a suitable fan impeller design creates your required airflow. Flow separations and backflows need to be avoided, as they cause energy losses and additional noise. Not surprisingly, all fan manufacturers are aware of this and offer more or less suitable solutions. Now ebm-papst, the leading manufacturer of motors and fans, has decided to take this one decisive step further: using a diffuser substantially reduces the losses usually experienced once the impeller has discharged the air.

Expertise and know-how

To generate airflow through a heat exchanger, a pressure differential of sufficient size is needed to overcome the flow resistance of the exchanger. Normally, the generated airflow exits the fan at high speed and dissipates into the surrounding air. Dissipation

means that the kinetic energy of the flow is converted into heat that can technically no longer be utilised. In the case of the AxiTop, however, this flow is decreased and allows for conversion of a large proportion of the dynamic kinetic energy into static pressure. This reverse-conversion boosts the pressure increase of the impeller. All components are aerodynamically optimised, which significantly improves efficiency. It also requires a lower fan speed and thus greatly reduces noise.

More adaptation options

In practical terms, using a diffuser not only reduces energy consumption; it also offers more creative freedom to manufacturers and development engineers. The diffuser configuration can be optimised with respect to various characteristics, depending on the application. Using the same energy input, you can increase the airflow, or generating identical air performance is possible at reduced energy consumption. Acoustic behaviour, too, can be greatly improved using the diffuser. This is especially important in noise-sensitive applications (e.g. in cooling or air conditioning units operating at night).
It can easily be retrofitted on existing installations without redesigning the customer's application.

The possible energy savings - or efficiency enhancement and noise reduction - that can be achieved with an optimal diffuser and a commercially available heat exchanger are substantial. By simply replacing a standard fan with guard grille with a fan with support grille, guard grille and diffuser, power savings of up to 20% can be achieved, while operating noise is reduced by 4 dB(A).
Alternatively, airflow can be increased by about 7% using the same input power, with a noise reduction of about 3 dB(A). And these are just the average values.
Depending on the individual configuration, optimisation in efficiency can be used to either reduce power input or to increase air performance.

Sample calculation

Using the 250-mm tall AxiTop diffuser, it is possible to reduce the operating noise level by 7.2 dB(A) with the same connected load as well as to achieve energy consumption savings of up to 27%. At the same time, a fan equipped like this can also generate a up to 9% higher flow rate, with noise reduction of approx. 4.9 dB(A).

About ebm-papst

The ebm-papst Group is the world's leading manufacturer of fans and motors and is a pioneer and pacesetter for ultra-efficient EC technology. ebm-papst fans and motors are represented in many industries, including ventilation, air-conditioning and refrigeration technology, household appliances, heating engineering, in IT/telecommunications, in medical technology and in applications in automotive and commercial vehicles engineering. ebm-papst EC motor technology, and the market leader's engineering and logistics expertise will add value to your business.

Find out more about ebm-papst A&NZ on www.ebmpapst.com.au

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