



Breakthrough in higher efficiency at lower operating noise

Fans with diffuser reduce their discharge losses

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 such fans, there are various design and configuration options to make them especially efficient, quiet and to increase their service life. A new, passive component, the so-called diffuser, makes for 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.

As we all know, a medium can only absorb a certain amount of heat energy for each degree Kelvin. Therefore, possible temperature difference and the amount of heat to be dissipated both define the volume of the cooling air flow that is required. This is the air any such fan has to force through the heat exchanger under consideration. Because refrigeration systems are usually operated with long duty cycles, it is all the more important to make economic use of the input power, as every additional watt increases your costs. Using a suitable fan impeller design creates your required air flow. Naturally, flow separations and backflows need to be avoided as they cause energy losses and additional bad noise. Not surprisingly, all fan manufacturers are aware of this and offer more or less suitable solutions. Now, however, ebm-papst as the leading manufacturer of motors and fans, has decided to take this one decisive step further: Using a diffuser substantially reduces the losses normally experienced once the impeller has discharged the air.

Expertise and know-how

To make air flow through a heat exchanger, a pressure differential of sufficient size is needed to overcome the flow resistance of the exchanger. Normally, the generated air flow 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 no longer be technically utilised. In our case, however, a suitable diffuser slows down this flow and allows us to convert a large proportion of the dynamic kinetic energy into static pressure. This reverse-conversion boosts the pressure increase of the impeller. With all components aerodynamically optimised, this improves efficiency significantly, while also making it possible to bring down the fan speed and thus greatly reduce noise.

More adaptation options

In practical terms, using a diffuser not only reduces energy consumption; it also offers more creative freedom to users and development engineers. The diffuser configuration can be optimised with respect to various and different characteristics, depending on the application. At identical energy input, you can increase fan output, or have identical air

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24/04/12- Page 1 of 2



performance 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).

The scale of possible energy savings - or efficiency enhancement and noise reduction - that can be achieved with an optimal diffuser and a commercially available heat exchanger is substantial. By simply replacing a standard fan with guard grille for one with support grille, guard grille and diffuser, savings of up to 20% can be achieved in terms of power consumption, while operating noise is reduced by 4 dB(A). Alternatively, just going for the greater efficiency of the fan with diffuser, air flow increases by about 7% at the same input power, with noise emission being reduced by about 3 dB(A) as well. 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.

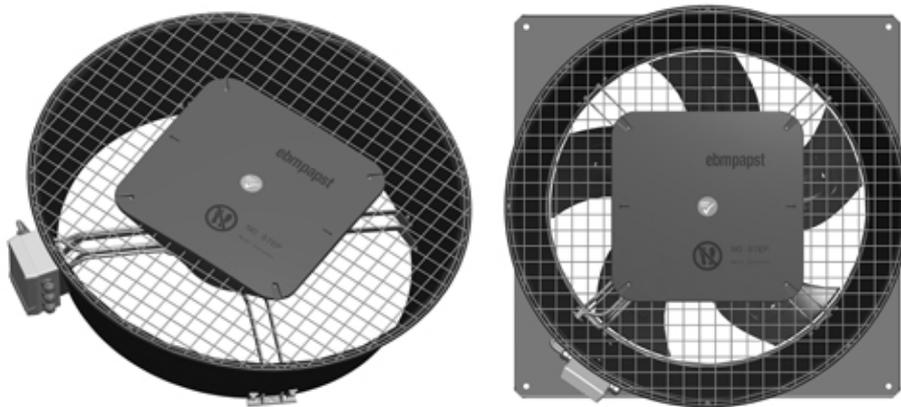


Figure 1: Using a diffuser greatly reduces the losses experienced once the impeller has discharged the air

About ebm-papst

We are the leading global manufacturer and supplier of fans, blowers and air moving products. We provide a unique range of air movement or specialist drives products. Our motor technology, engineering and logistics expertise will add value to your business.