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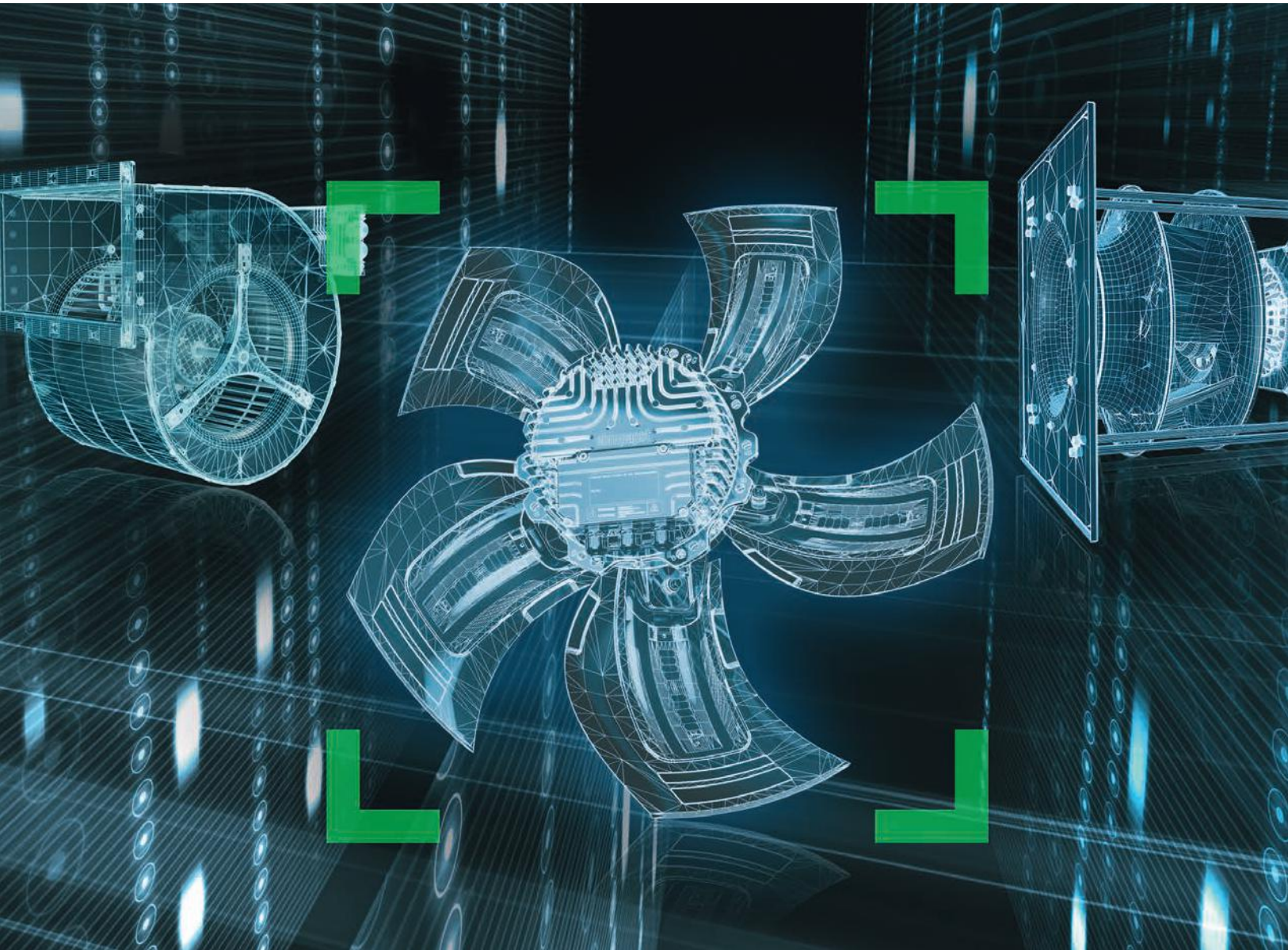
Technology by ebm-papst



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“Integrated approaches help to develop even more reserves of efficiency”

Karsten Fuchs, Director Market Segment Ventilation and Air Conditioning, ebm-papst Mulfingen GmbH & Co. KG

Dear Customers, Partners and Friends of ebm-papst,

Every fan is a system that consists of a motor, control electronics and a flow machine. As a system provider that combines the three core competencies of motor technology, aerodynamics and control technology in one product, ebm-papst continually improves this system, achieving new, previously unmatched top values in the process. No matter that these top values are attained the laboratory – ebm-papst is successful at developing the technology in a way that ensures it functions optimally in customer applications, allowing the available power to be deployed on the street, as it were.

FanScout, the software for selecting the right fan, supports ebm-papst customers. It not only allows them to select standard products, but to also simulate how the installation situation and use profile will impact the results expected in the field, for example. The goal of achieving maximum energy efficiency and minimum noise in the field is supported by maximum precision – independently certified by TÜV SÜD.

The installation situation in the user device also played a key role in the new development of the AxiBlade axial fans. Unmatched efficiency and noise values can now be achieved without having to change the available installation space. A modular concept allows various motors and aerodynamic features to be combined easily and intelligently, depending on the required operating point. They can also be tailored to meet the special requirements of customer applications.

Following the motto “1+1=3,” the same concept appears to have overridden the mathematics in drive engineering. Here as well, ebm-papst customers benefit from modular elements that make it easy to match up motors with a wide variety of drives. The mechanical components are precisely harmonized to allow reduced installation effort in combination with simplified electrical connection.

All in all, our integrated approaches generate even more benefits for ebm-papst customers. I hope you enjoy discovering how ebm-papst can also support you in the effort to make your application even better.

You can always be sure of making the right choice!

ebm-papst FanScout simplifies the search for the ideal fan

Choosing the best fan solution for a particular application is crucial to the performance and efficiency of the system as a whole. If the fan selected is not powerful enough it will not provide the required volume of air. If it is over-dimensioned, the fan will use an unnecessary amount of energy. The FanScout from ebm-papst helps planners and users find just the right fan for the specific application involved.

Choosing the wrong fan for a computing center can prove to be a costly business, as cooling accounts for around 37 per cent of the energy costs in such cases. It is therefore imperative to ensure that fans operated in parallel, so-called FanGrids, are of optimum design (Fig. 1, page 6). The parallel operation of multiple small fans has huge advantages over large individual fans in ventilation technology. The more uniform flow through

Figure 1: The FanScout selection program from ebm-papst enables the most economical fan combination to be identified, including FanGrids.

Figure 2: Air flow through a heat exchanger with a FanGrid solution (top) and an individual fan solution (bottom). The latter exhibits non-uniform flow through the heat exchanger and thus poorer heat transfer values.

the heat exchangers or filters leads to better heat transfer performance and more efficient filtering of the air (Fig. 2). In addition, several small fans require much less space, which reduces the costs of the system.

Real measured values as a basis To avoid the negative consequences of using inappropriate products, ebm-papst has created reliable fan selection software known as the ebm-papst FanScout. This provides air conditioning and ventilation system planners and manufacturers with a quick and easy means of finding the ideal product for a particular application. The software takes up to five different operating points into consideration and works with real measured values. The discrepancy between the calculated operating data and the actual measured data is so slight that the TÜV SÜD certification body has confirmed the top accuracy rating of the software. This means users receive absolutely reliable and above all extremely precise data. The program does not simply measure the performance of the individual fan components, but rather assesses the fan system as a whole, made up of the fan impeller, EC drive motor and integrated control electronics, based on the "Wire-to-Air" principle (from electrical hookup to the available air performance).

High-precision selection procedure The selection process outlined below shows just how easy it is to design a FanGrid, for example, using the FanScout. Following initial consultations, ebm-papst first narrows down the number of potentially suitable fans and produces a so-called FanScout collection. Users can already pick out

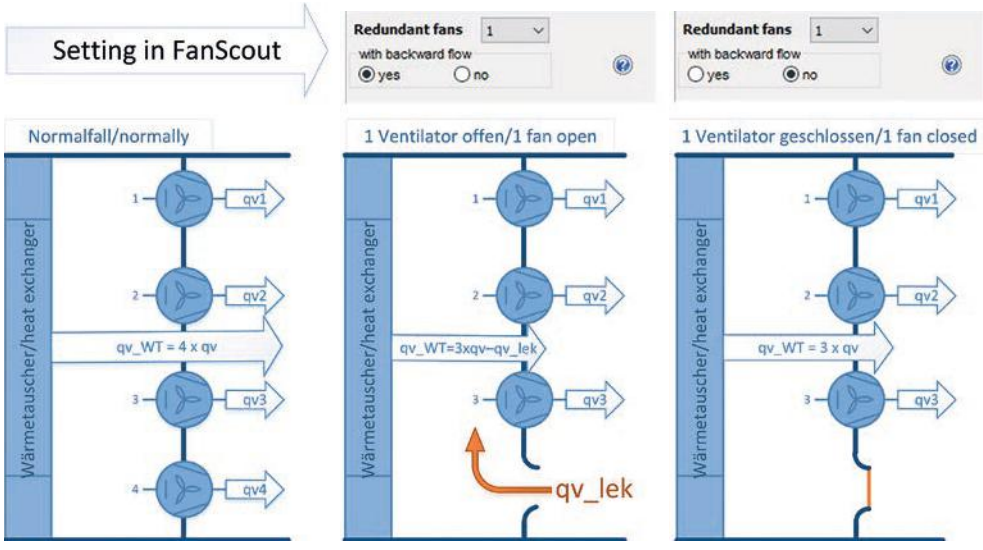


Figure 3: Three FanGrid operating situations: Normal operation with all fans, redundant operation (here n+1) with backward flow and redundant operation (here n+1) without backward flow.

fans at this stage with the help of the actual software. Up to five different operating points can be entered. The operating times at each of these operating points viewed over the course of the year yield the usage profile which then serves as a basis for calculation. This method provides a reliable indication of the annual energy consumption and thus of the expected operating costs. Such an approach is far more accurate than the commonly employed method of performing calculation on the basis of the rarely attained maximum operating point.

Redundancy provides operational reliability

FanGrids for air handling systems are designed with some level of redundancy to guarantee the required air can be delivered to the building at all times.This parameter specifies how many fans can be switched off without dropping below the required air flow. Two important aspects have to be considered. Firstly, the reserve capacity of the remaining fans must be sufficient to make up the amount of air not being supplied by the non-functioning fans. Secondly, it must also be possible to provide compensation for the amount of air flow-

FanGrids for air handling systems are designed with some level of redundancy to guarantee the required air can be delivered to the building at all times.

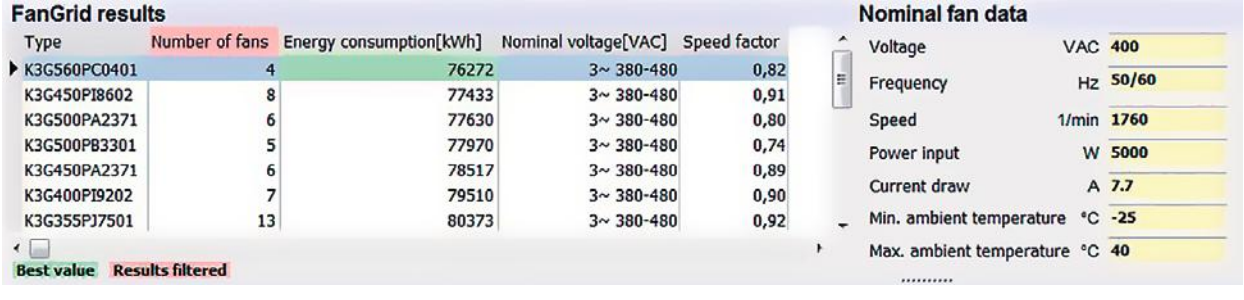


Figure 4: The results list provides an overview of various FanGrid combinations and their energy consumption.

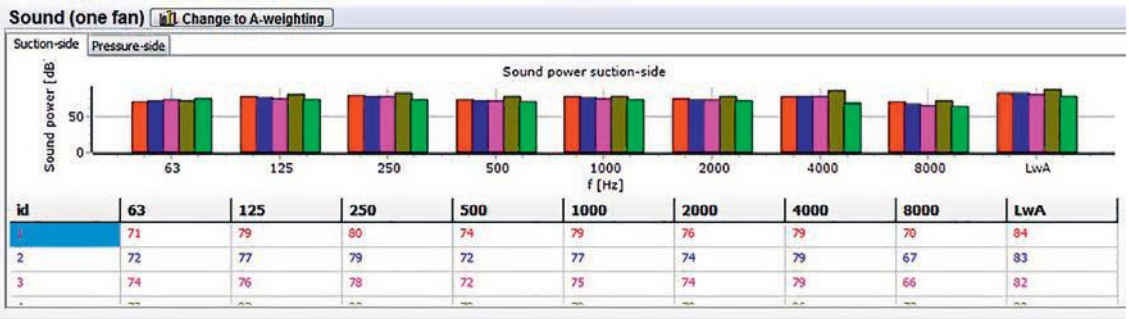


Figure 5: The sound power of the individual fans can be shown for either the intake or the outlet side.

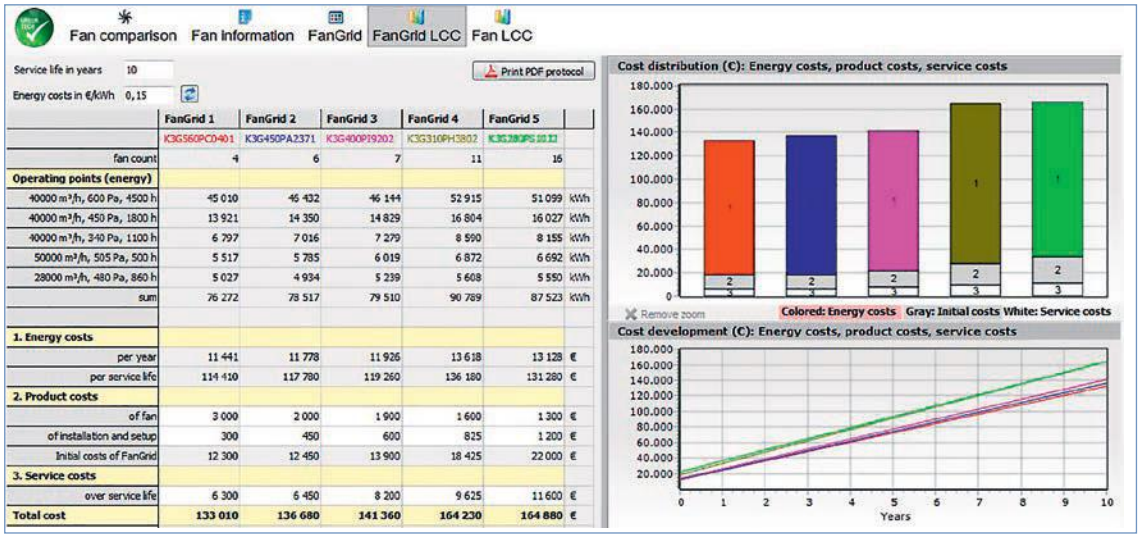
FanScout lists FanGrid combinations according to their energy efficiency.

ing back through the stationary fans. A distinction is made between the version with a back-flow flap, in other words with no backward flow, and the version without a back-flow flap. This is also presented in the FanScout (Fig. 3, page 7).

The space available for installation can also be specified. This option is particularly useful in cases where the installation space for the fans is extremely restricted, as the function takes into account the pressure losses which arise if fans are fitted too close to walls or other fans. A further option then makes it possible to narrow down the fan type required and the total number of fans to be fitted.

Detailed information on possible options

The FanScout calculates various possible FanGrid combinations on the basis of the parameters entered and lists them according to their energy efficiency (Fig. 4, page 7). In addition to energy consumption, the results table provides information on the recommended fan type, the number of fans operating in parallel and the speed factor. This factor indicates the difference between the operating speed of the selected fans and the nominal speed of the fans and is thus a measure of the "reserve capacity" of the chosen alternative. Air performance, power consumption and efficiency are presented in map form for each fan combination. The specified operating points are also entered in the maps and the operating time share of each is indicated by the size of the points. In addition, the FanScout provides information on noise for the possible fan combinations (Fig. 5). It shows the sound power of a fan – either on the



	FanGrid 1	FanGrid 2	FanGrid 3	FanGrid 4	FanGrid 5	
	K3G560PC04-01	K3G450PA2371	K3G400PI9202	K3G310PH3802	K3G280PS1012	
fan count	4	6	7	11	16	
Operating points (energy)						
40000 m³/h, 600 Pa, 4500 h	45 010	46 432	46 144	52 915	51 099	kWh
40000 m³/h, 450 Pa, 1800 h	13 921	14 350	14 829	16 804	16 027	kWh
40000 m³/h, 340 Pa, 1100 h	6 797	7 016	7 279	8 590	8 155	kWh
50000 m³/h, 505 Pa, 500 h	5 517	5 785	6 019	6 872	6 692	kWh
28000 m³/h, 480 Pa, 860 h	5 027	4 934	5 239	5 608	5 550	kWh
sum	76 272	78 517	79 510	90 789	87 523	kWh
1. Energy costs						
per year	11 441	11 778	11 926	13 618	13 128	€
per service life	114 410	117 780	119 260	136 180	131 280	€
2. Product costs						
of fan	3 000	2 000	1 900	1 600	1 300	€
of installation and setup	300	450	600	825	1 200	€
Initial costs of FanGrid	12 300	12 450	13 900	18 425	22 000	€
3. Service costs						
over service life	6 300	6 450	8 200	9 625	11 600	€
Total cost	**133 010**	**136 680**	**141 360**	**164 230**	**164 880**	€

Figure 6: Calculation of the lifecycle costs provides a solid foundation for investment decisions.

intake or the outlet side – for each operating point. This feature is particularly useful if a FanGrid is to be used in noise-sensitive environments such as offices or residential areas.

Lifecycle costs in focus To add further weight to the assessment of the various options for the user, the FanScout offers a function for determining the lifecycle costs of the combination under consideration (Fig. 6). This involves multiplying the power consumption of the fans at the respective operating points by the operating time and the electricity costs and adding up the total. The result represents the pure operating costs of the installation over a specified period. If the costs for purchase, installation and service are also entered, the overall costs of the FanGrid over time will be displayed. This provides the user with a realistic cost assessment and forms a reliable basis for investment decisions. ○

Author is Uwe Sigloch, Head of Market Management, Ventilation and Air Conditioning Technology division at ebm-papst Mulfingen

You would like more information on this topic? Please address your question to: Uwe.Sigloch@de.ebmpapst.com

GAS BLOWER VG 100

Efficient, quiet gas blowers ring in a new era

High modulation rates and compact dimensions for the gas condensing technology market up to 50 kW

Modern buildings require less and less heating energy. For more efficient operation and depending on the building size, heating systems can be designed smaller than ever before. When outdoor temperatures change or extra service water requires heating, higher power is temporarily necessary. In these cases, gas heating system deliver fast energy input with few environmental consequences. To ensure ideal combustion with top consumption and contaminant values in all possible scenarios, a gas blower with as wide a power range as possible is the best solution. Power modulation allows boiler manufacturers to cover a broad application spectrum with only one blower model. And end users have greater comfort because a more efficient device whose high modulation level delivers lower heating and cooling losses covers their higher performance requirements. Both save time and money, reducing their carbon footprints for building heating.

Today, heating systems must adapt to the available space in buildings. Especially in the smaller power range, end users are no longer willing to devote an entire room to the heating system. Condensing hot water heater and gas boiler manufacturers have responded to customer needs with models that provide high comfort with minimum dimensions – and are environmentally friendly as well. Individual variety has only one disadvantage: the gas blower requirements. Manufacturers either rely on a wide spectrum of gas blowers to cover the heating power range – one for each of the many hot water heater concepts – or forgo the opportunity for hot water heater optimization and make do with one or two gas blowers. With a new gas blower that can adapt to a

Figure 1: The new VG 100 gas blower functions with a modulation of over 1:10 in the 3-50 kW range.

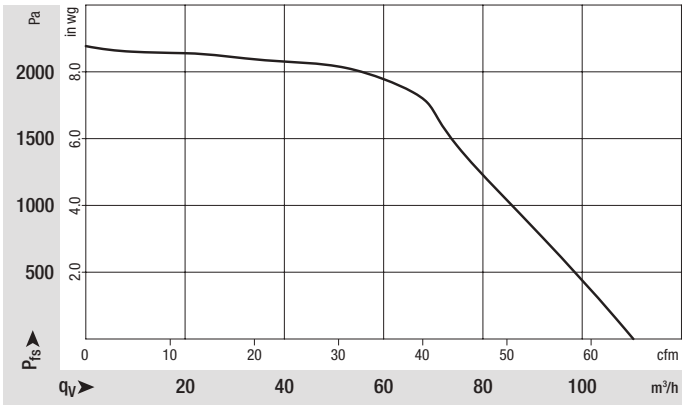


Figure 3: Aerodynamic and motor-related optimization improve the delivery rate despite compact dimensions.

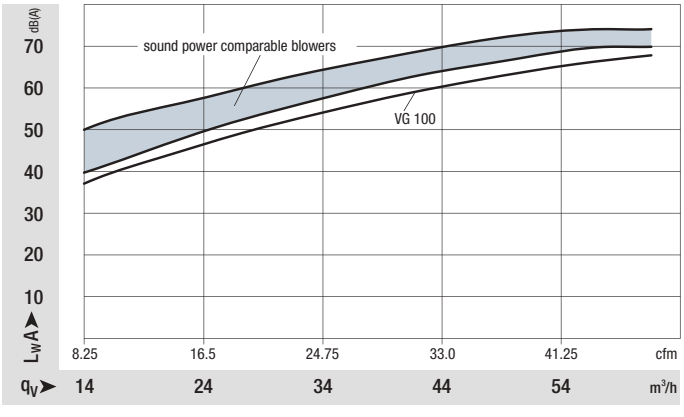


Figure 4: Noise output is significantly lower than in comparable blowers. This saves extra noise insulation in the hot water heater.

wide range of installation scenarios and heating outputs more easily, hot water heater manufacturers can cut costs significantly.

Variable, compact design As an environmentally friendly fuel variant that does not require space for its fuel supply, natural gas is in demand the world over. To adjust to the multi-faceted requirements of today's modern buildings, ebm-papst Landshut is offering a newly developed premix gas blower for instantaneous water heaters. The VG 100 blower is the first of a new blower generation. It covers a power range of 1.5-150 kW (Fig. 1). It functions with a modulation of more than 1:10 in the 3-50 kW range and in comparison to the previous model, has other benefits such as around 5% more efficiency. This gas blower is predestined for use in modern, efficient warmth generation.

The new blower's side part is made from sheet instead of the usual die cast aluminum. The new solution enables optimal plug positioning according to the customers' requirements. The venturi element and side part are separate in order to easily realize customer-specific solutions on the building side (Fig. 2). And the aerodynamics

Figure 2: The modular system makes it easier to realize customer-specific solutions on the housing side.

were improved in the process, resulting in a more compact blower that provides significantly more options for integration into instantaneous water heaters. Despite its smaller dimensions, the new blower achieves a higher delivery rate than its predecessor (Fig. 3).

Compact, high performance motor At the same time, a new motor has been developed for the blower platform. The development improves efficiency and reduces the amount of material used at the same time. The motor with zero maintenance ball bearings provides increased power for air delivery adapted to the higher power range – packed into more compact dimensions. New solenoid material and improved stator geometry also make their contributions to performance.

Another focus of the development work was noise reduction. In addition to reducing the airborne sound, the developers focused on reducing the vibrations (structure-borne sound) using state-of-the-art development tools.

They optimized isolation from vibration and improved the motor's reaction to vibration in general. As a result, the new blower's sound power is significantly lower than that of its predecessor (Fig. 4). End consumers are now even more likely to respond positively to a gas-condensing heating system.

The electronics were also completely revised and the blower has optional bus interfaces for easy integration into digital systems. In this way, operating states such as power, service state, temperatures, operating voltage and other data that are saved in the blower's control system can be opened to enable preventive maintenance or (remote) troubleshooting and integration into the hot water heater controls. The new version requires much less (PCB) material. By using the cooling concept proven in other products, the electronics are located in the cooling airflow to increase the blower's service life and reliability. A motor protection cap connected to the housing encloses all drive components. The stable motor cover design decouples the blower from the motor for lower noise levels and can withstand any rough handling in the downstream assembly process.

Conclusion As the first representative of a new generation of efficient gas blowers, VG 100 features high modulation rates and extremely compact dimensions. It reduces gas blower variance. With significantly improved efficiency and reduced noise emission, the gas blower is the answer to the requirements of today's gas-condensing technology market in the power range of up to 50 kW. ○

Author is Dr. Jan Dannemann, Head of Pre-Development Function at ebm-papst Landshut

You would like more information on this topic? Please address your question to: Jan.Dannemann@de.ebmpapst.com

More power, less noise

Axial fans do their best at every operating point

Besides the required air flow, noise emission and energy efficiency are key characteristics for axial fans used in the evaporators, condensers and heat exchangers in ventilation, refrigeration and air conditioning systems. These two characteristics are becoming increasingly important for users, due to both legal regulations such as the ErP (Energy-related Products) Directive and higher energy prices and increasing environmental awareness. This trend will gain in importance in the future. For example, further restrictions in the ErP Directive are already looming; the next steps are planned for 2020.

Modern axial fans showed impressive gains in efficiency and quietness in the last few years. Their development has been characterized by continuous improvement. For example, while overall static efficiency was around 35% in 2004, it increased over the following eight years to approximately 45% even as noise levels decreased by as much as 7.2 dB(A) compared to previous models. For the motors, there is currently

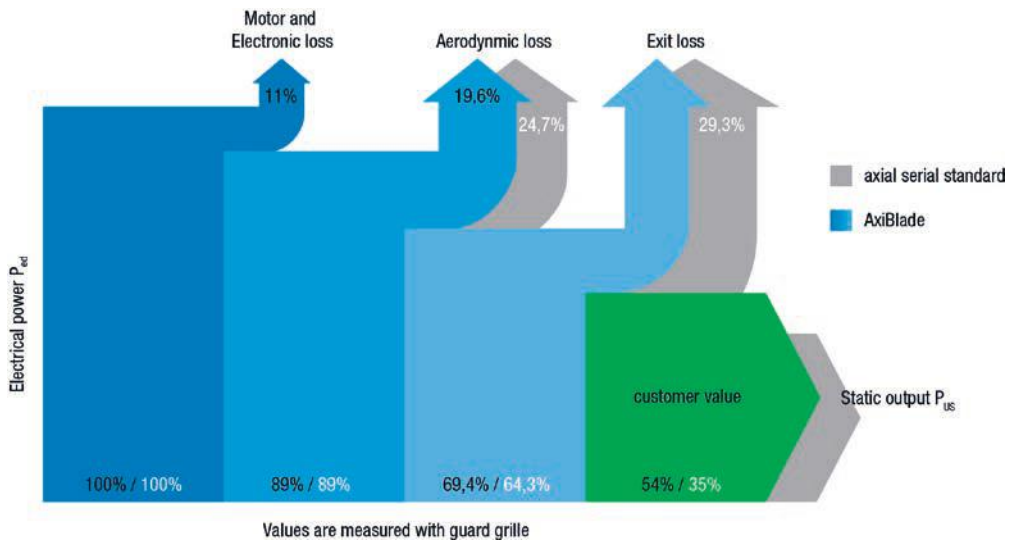


Figure 1: Losses in a free-blowing axial fan, measured with guard grille.

With their modular design, the AxiBlade axial fans are very flexible.

little room left for improvement; for example, GreenTech EC motors with efficiencies well over 90% already considerably exceed the values known from the IE4 efficiency class.

Making the most of potential improvements For further improvements, fan manufacturers have to do a lot of "tweaking." While doing so, they need to consider the fan as a complete system consisting of impeller, motor, housing and control electronics in order to maximize the potential for improvement. All components, and even the circumstances of installation in the user device, have to be considered in the improvement process (Fig. 1). Today, efficiency increases can only be achieved with improvements in aerodynamics. Application-specific operating points have to be taken into account during aerodynamic optimization to ensure that the fans really do operate at the best possible level of efficiency when actually installed.

Now the motor and fan specialist ebm-papst has put this approach to work in developing the new AxiBlade axial fans (Fig. 2). With their modular design, they can work in a wide range of applications with an efficiency optimum of up to 54% while reaching a noise reduction of up to 8 dB(A) when compared with the standard program. Besides the especially energy-efficient GreenTech EC motors, the new models are also available with the AC motors that are still widely used. Sizes 800 and 910 are currently available; an expansion of the series to include sizes 630 and 710 is planned.

Modular design – the right solution for every pressure range With fans, different back pressures have to be taken into consideration depending on the application and conditions of installation. There is no fan that will work with the same efficiency or noise level under all conditions; any search for an all-purpose unit will be

futile. However, with their modular design, the AxiBlade axial fans are very flexible in this regard. Components can be combined depending on the pressure ranges required and the fans can be produced accordingly, making optimized plug & play system solutions available for the conditions expected for an application. The complete modular system consists of fan housings in different heights with an aerodynamically optimized inlet ring and with or without an integrated diffuser. The pressure-raising effect of the diffuser minimizes the outlet losses. In addition, there are impellers with special blade geometry and winglets for maximum efficiency; they are designed for the different motors they can be combined with. This, too, increases efficiency and reduces noise. The user can have GreenTech EC motors with integrated control electronics or conventional AC motors installed as drives. Guide vanes can also be integrated in the fans. They minimize exhaust turbulence and the resulting dynamic losses, thus

Figure 2: The AxiBlade system with integrated diffuser and guide vanes.

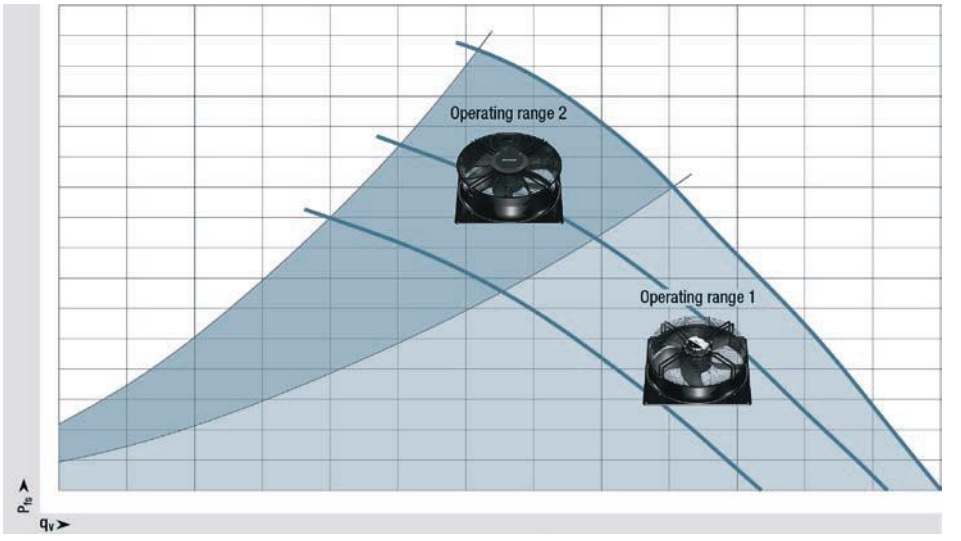


Figure 3: AxiBlade operating points for typical applications. The dark areas represent high back pressures up to 290 Pa, where the complete system can make the most of its strengths. The light areas represent low to medium back pressures (up to approx. 200 Pa) – the range for the standard fan housing.

The new axial fans can be optimally configured for a given application.

also contributing to improved energy use. And the guard grilles, which are matched to the various combinations, are also aerodynamically optimized. Not only do they protect against accidental contact, they also contribute to the high overall efficiency of the axial fans.

In this fashion, the new axial fans can be optimally configured for a given application. For example, the standard fan housing with a height of 190 mm and no guide vanes is suited to low to medium pressures up to 200 Pa. In this case, the benefits of the guide vanes do not come into play. Even without them, the efficiency and operating noise are much better than the current industry standard. The guide vanes become interesting with the approx. 300-millimeter-high fan housing (depending on the size category) with integrated diffuser for high back pressures up to 290 Pa; here the guide vanes are essential to reaching high efficiency (Fig. 3).

Same footprint as industry standard Since the new axial fan's footprint corresponds to the current industry standard, virtually no design changes in the end unit are necessary (Fig. 4). And the fans are lower than the usual models. The height is likely to play a minor role for most applications, but not for transport. Every centimeter counts when the fans have to be loaded onto pallets or into containers.

The benefits of the EC versions of the fans are obvious. They include speed control via the integrated electronics, enabling the speed to always be adjusted to match the current requirements. This pays off quickly for the user since EC motors also excel with their high efficiency in partial-load operation and are extremely quiet compared to speed-controlled asynchronous motors, whose triac or variable frequency drive control systems inevitably generate noise. Further benefits include high power density, compact size and constant monitoring of operational data and status information.

The latest EC motor, which is also used in the new modular system, also features programmable interfaces and can be used around the world

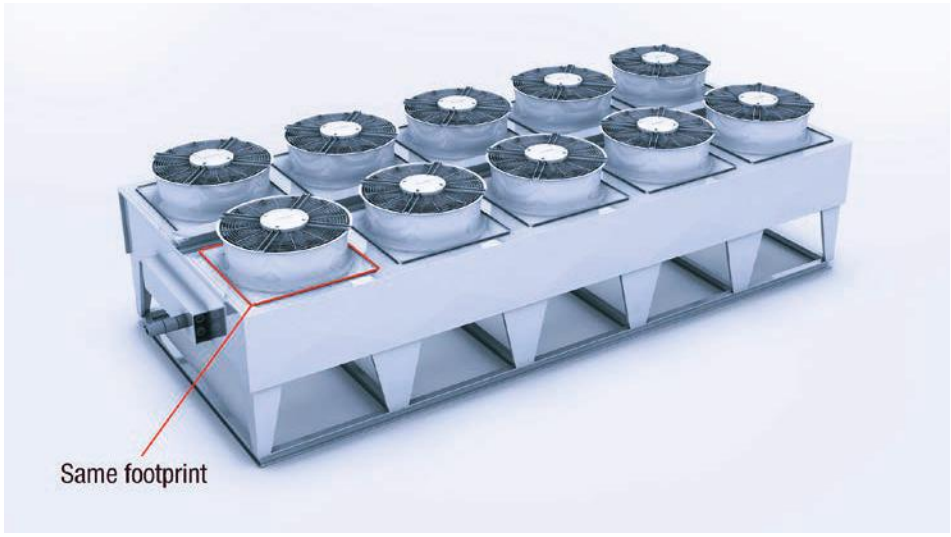


Figure 4: Same installation area: More cooling performance with the same footprint as previous fans. Pictured here is a condenser for refrigeration with ten axial fans.

since it works with all voltage variants and power systems. Wireless configuration is possible using RFID (radio frequency identification) and a status LED shows the operating modes. All in all, AxiBlade fans for evaporators, condensers and heat exchangers, designed as a modular system and preconfigured to user requirements in the factory, are ideal for satisfying the increasingly exacting requirements for energy efficiency, quietness, low operating costs and convenience, today and in the future. ○

Author is Patrick Stern, Market Manager, Refrigeration Technology Division at ebm-papst Mulfingen

You would like more information on this topic? Please address your question to: Patrick.Stern@de.ebmpapst.com

Drive in and find out

Complete drive solutions from modular construction kit

01.01.2016 was the third anniversary of the take-over of ZEITLAUF GmbH antriebstechnik by the ebm-papst Group. The integration is still on-going, the effects of bundling the individual competences are already positively noticeable in many places. Good functionality will be specifically optimized. Following the motto 1 + 1 = 3, potentials within the meaning of optimal drive solutions will be made significantly more effective.

In this way, existing customers and potential new customers can, as usual, choose the best solution for your application from more than 4,000 drive combinations in the ebm-papst ZEITLAUF online-portal. This is based on the proven gear technologies (planetary transmission, spur gears and miter gears) which are combined with suitable motors (primarily brushed DC and EC motors).

This offer will be supplemented with other BLDC internal and external rotor motors with integrated electronics from ebm-papst. The result for the customer is an even more complete drive solution than before. A number of logic and power electronics with different control functions integrated into the drive are new to the range. The integrated electronics module K3 offers an integrated revolutions control function as standard. With electronics module K4, it is also possible to control the torque and position of the drive unit. Typical advantages appear in a compact solution made up of construction kit modules technically coordinated with one another, and which can be integrated in machine concepts to save space. Lower installation expenses on the basis of the reduced number of mechanical components combined with a significantly simplified electrical connection reduces the total assembly and operation expenses. In addition to the purely technical advantages, there are other benefits which come about through handling a reduced number of unit parts and dealing with fewer suppliers (Fig. 1, page 22).

Figure 1: Production line for the modular drive system products.

Related to the concept, motors of this kind offer a very high overload capacity.

Positive effects resulting from bundling development expertise also appear in the new products, which will be gradually presented on the market.

An example of this is the new motor ECI 80. Based on the concept of a brushless internal rotor motor, this BLDC motor offers a power output of up to 754 Watts. Compared with the outputs of the previously available drives, this is more than double the possible power outputs. Related to the concept, motors of this kind offer a very high overload capacity. In the short-term, peak torque can be offered, which exceeds the specified continuous torque by 4 times. This overload capacity leads to increased requirements for a fitted gear. With the gear series Optimax, also new, ebm-papst ZEITLAUF will meet these requirements for the robustness of gears. Beyond the interfaces of the motor and gear, requirements for a drive solution are also defined (Fig. 2). In a second stage, these will be broken down with clear technical and commercial requirements for the individual components. In the case of the new gear Optimax 63, the required overload capacity is a material technical requirement. In realizing the gear, this requirement could be met on the one hand by the large effective diameter compared to the external size of the gear. A large engaged toothed area, characterized by the use of four longer, spur-toothed planetary gears, also makes a positive contribution. The careful selection of high quality materials, in particular for the hollow gear and the planetary gears, round off the features. The small number of individual parts and the optimal design of the mechanical interfaces on the fitted motor guarantee a competitive price-performance ratio.

It is not only for new developments that the competences of the two drive specialists are applied in a result-oriented way. The synergy effects also have a positive effect on the range of even more complete drive solutions when the portfolios are combined. Within a comprehensive modular construction kit, it will be possible to offer technical solutions optimized in terms of time and costs for the most varied drive tasks.

Within the framework of the construction kit, there are several motor technologies for different applications with discharge lines of 5 to 750

Figure 2: Motor-gear combination ECI 80 and Optimax 63

Watts available. The motors of the ECI series, realized using the principle of brushless internal rotor motors, are distinguished by a high power density thanks to a very good dynamic response. The motors for the VD/ VDC series (motors using the principle of brushless external rotor motors) offer very good synchronization characteristics in an extremely compact construction. The BCI series (motors using the principle of brushed internal rotor motors) is distinguished by economic motors with high starting torques (Fig. 3, page 24).

Other drive system modules which can be flexibly combined with the motors of the ECI and VD/ VDC series are different electronics modules. Consumers can orientate themselves to a broad spectrum of control functions, again independent of your application's stated requirements. The motor can therefore be controlled in terms of the number of revolutions, torque or position. Both analog and digital nominal values or movement commands can be applied as the control over the bus (CANopen pursuant to DS 402). This drive type is rounded off and supported by a selection of encoder and brake modules.

An essential task for a drive solution is adapting the stated motor-specific performance parameters and measurements to the requirements of the particular application. Both the demands on the number of revolutions and torque as well as construction measurements are to be met. With the takeover of ZEITLAUF, gears are available as modular drive systems with various technologies and forms. (Fig. 4, page 25)

A comprehensive product range of planetary gears is available if an offset is not permitted in the application.

If a high degree of effectiveness is to be achieved with minimal noise, the planetary gear NoiselessPlus shows what it has got. The exemplary quietness is achieved using extraordinarily robust, low-wear plastic planetary gears in an aluminum housing with slotted helical gearing. Double output shafts fitted with ball bearings efficiently absorb the power which high radial loads place on the shafts. The output shafts of the NoiselessPlus gear are made from hardened and smoothed cementation steel and therefore have a particularly long lifespan.

Performax® is an innovative, patented concept for high-performance planetary gears. With its path-breaking alignment, the Performax® gear convinces with an outstanding power density, excellent quietness and unique breadth of reduction. Reductions of up to 17:1 in one stage allow one-stage gears to be used where competitor products must use two stages.

The series design features include helical toothed plastic gear wheels in the first stage, as well as a linear tooth profile with planetary gears made from case-hardened steel in the zinc die-cast housing in the second stage. Another feature of the Performax® gear is represented by the planetary gears of the second stage, equipped with needle bearings as standard - with this, the series clearly stands out from current marketable planetary gears.

EtaCrown® is the name of the innovative miter gears with crown wheel technology. The vision of making crown wheel gears stronger, smaller and more efficient and, above all, to produce them economically, is now reality. EtaCrown® sig-

Figure 3: Motor family from the VDC/ECI/BCI series

The synergy effects also have a positive effect on the range of even more complete drive solutions.

nificantly improves the energy efficiency and the economic efficiency of drive solutions. By applying the modular drive system principle, it is possible to make flexible adjustments to any drive task.

A very compact construction and space-saving geometry with a symmetrical structure with the highest power density are among its characteristics. Reductions of 4:1 to 113:1 are available as standard. Smooth running as a result of shifting tooth gripping is standard. Very quiet running thanks to intelligent toothing technology and gear design, and the highest radial load from double-sided bearing of the output shafts are also among the features of the equipment.

A particular feature of the miter gears is the lack of self-locking for technological reasons. Unlike other drive technologies, this offers optimal protection against vandalism.

The range of gears is rounded off with the helical gears from the Flatline and Compactline series. In the first gear stage, these have plastic skew gears which achieve optimal noise insulation. The following gear stages are optimally designed with regard to running noise and the torque to be transferred. Hardened and smoothed output shafts as well as hardened gear wheels are standard in all gears in the Flatline and Compactline series. Zinc diecasting is used as housing. Thanks to their construction, gears in the Flatline series can be used in particular in applications with limited installation lengths.

In the gears from the Compactline series, the gear widths have been dimensioned to optimize noise; in particular in the area of the first stage they are as large as possible, and ensure a good cover between the motor shaft and the combing gear wheel.

ebm-papst ZEITLAUF has optimized logistics internally in such a way that the preferences from the modular drive system can be shipped within 48 hours after receipt of the order (Fig. 5). Those interested can read the documentation on the drive components (technical data, drawings, 3D models) in the ebm-papst ZEITLAUF online-portal, and print or download them if necessary. The potential drive solutions are also presented

Figure 4: Gear family planetary gear/spur gear/miter gear

in a new product overview “Motors and drive systems”. Interested parties can therefore display and select suitable drives for their application, order them immediately and test them in the application after just a few days, all through the online-portal, and in the shortest time. Should you have any questions during this phase, the applications engineers from ebm-papst will be happy to help.

Figure 5: Preferences from the modular drive system are ready to ship by ebm-papst in 48 hours

Author is Patrick Schumacher, Head of Product Management Industrial Drive Technology

You would like more information on this topic? Please address your question to: Patrick.Schumacher@de.ebmpapst.com

DUCT FANS

Does more, consumes less

New EC fan for duct systems

Good indoor air is essential to health, productivity and well-being. Today's efficient ventilation systems provide the conditions for considerable improvements in indoor climate and reductions in contaminant levels. The fans responsible for conveying the air play a crucial role in building ventilation. Not only do they need to be energy-efficient and work quietly, they should also simplify installation and maintenance. A new EC fan for direct installation in air ducts is designed for exactly these requirements. It provides reliable ventilation, works quietly, saves energy and is easy to install thanks to its compact, space-saving design.

Centrifugal fans with backward-curved blades are often installed in air ducts to overcome high back pressure. But technology is also making rapid progress in ventilation and air

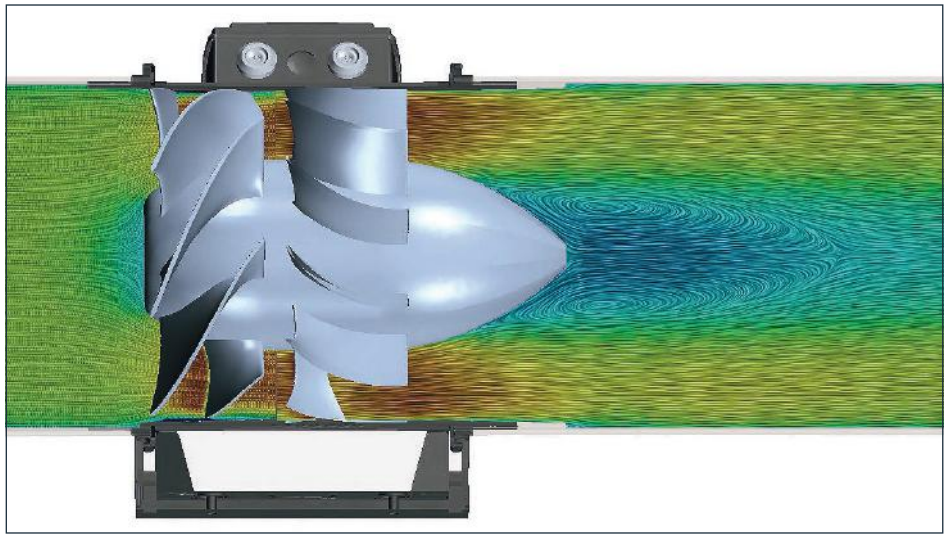


Figure 2: Aerodynamically optimized impeller and discharge vanes with diffuser to reduce air flow twisting and convert it to useful static pressure.

Figure 1: Does more with less, has a compact design: the new EC fan for air duct systems.

conditioning. New designs and improvements in duct installation reduce the back pressure, requiring applications to adjust the operating range of the fans they use to these conditions. With existing fan systems, it is no often longer possible to ensure the efficiency expected by modern air conditioning solutions. As an internationally acknowledged specialist for efficient ventilation technology, the Systemair Group was quick to recognize this trend and the accompanying market requirements. In cooperation with ebm-papst Mulfingen, it developed a new EC duct fan (Fig. 1) that sets new standards in this area.

Reinventing the wheel is worth it The motor and fan specialists from Mulfingen came up with several ideas for making the prioAir a perfect fit to the requirements of present and future applications. They aerodynamically optimized the axial fan impeller so that its three-dimensional geometry cannot cause laminar separation or generate vortices. They used special discharge vanes designed so that the high dynamic pressure component is efficiently converted to static pressure immediately behind the impeller, more or less straightening out the swirling of the discharged air flow (Fig. 2). An additional diffuser near the hub also helps to increase the static pressure so that the fan can convey impressive amounts of air while consuming little energy, as documented by the low SFP (specific fan power) value and the high efficiency (Fig. 3),

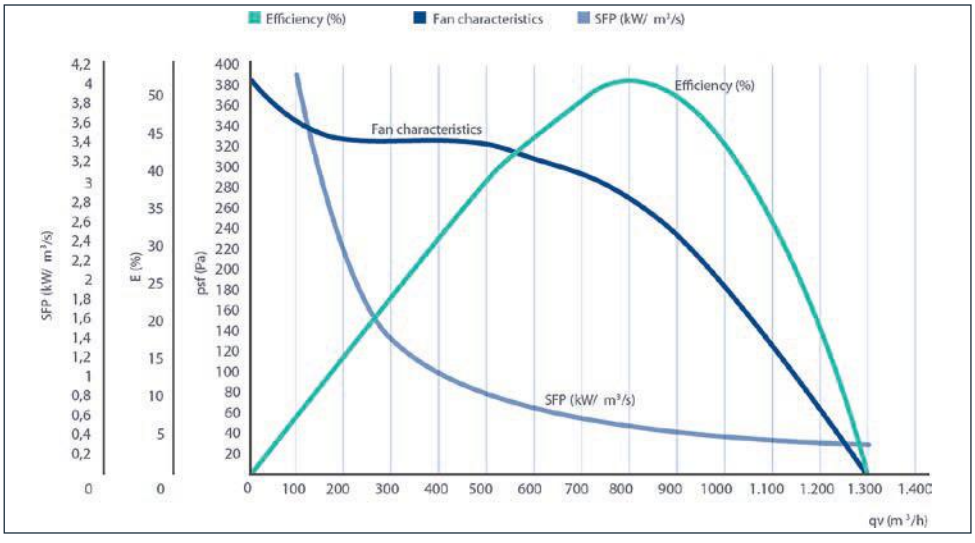


Figure 3: Convincing values in three areas: SFP, efficiency and flow quantity.

both of which currently qualify as unique selling propositions. The SFP is the ratio of the input power (cost) to the conveyed air flow (benefit). The lower the SFP, the less electrical energy is needed to transport a cubic meter of air.

At the same time, the aerodynamic optimization and the improved attenuation due to the plastics used in the mechanical design result in lower noise emissions. The new duct fans are much lighter than those whose impellers and housings are made of metals, which lowers transport costs and simplifies handling during installation.

Energy-efficient EC technology The high efficiency is not merely due to the aerodynamic improvements but also to the EC motors used. They are highly efficient, making them much more economical than conventional AC motors and resulting in lower operating expenses and reduced environmental impact.

Thanks to their high efficiency and their use of the fan's air flow to cool the drive motor, EC fans suffer considerably less from heat stress than do conventional AC designs. That reduces component wear and increases the fan's service life; no maintenance is required. The fan only needs cleaning in the event that significant amounts of dirt accumulate. In addition, the electronically commutated external rotor motor is integrated in the impeller, reducing the space required for installation. Thanks to suitable electronic measures,

Energy-efficient EC technology helps to lower operating expenses and reduces the environmental impact.

Figure 5: A clean, inline solution: The fan is outstandingly easy to install in air ducts.

Figure 4: Compact, airtight duct fan thanks to integration of both the EC fan and its electronics in the straight, one-piece housing.

the EC motor is thermally protected and well suited for continuous operation.

Compact in-line solution with convenient control But EC fans have even more advantages in everyday use, such as convenient regulation. Their integrated electronics are not only perfectly matched with their motors, they are also smoothly adjustable over the entire speed range while retaining their good efficiency in partial-load operation. For this purpose, the prioAir features a 0-10 V interface to which a potentiometer or an analog control device can be connected for the implementation of additional smart functionality.

EC fans also generate virtually no motor noise. In contrast, resonance noises can arise, especially during partial-load operation, when asynchronous motors are operated with variable frequency drives. They become perceptible as a characteristic and unpleasant motor noise. Pleasant working or living conditions would hardly be imaginable under such circumstances, but with the prioAir and its EC motor there are no such worries.

An important market requirement for the new duct fan was that it be not only quiet and energy-efficient but compact as well, so its straight, one-piece housing (Fig. 4), which forgoes large external parts and can be cleanly installed in ducts as an in-line solution (Fig. 5), is a further advantage of the prioAir series. The size 200 version of the prioAir is only 245 mm long. In addition, the housing is also airtight (tightness

class C according to EN 12237:2003) thanks to its structural design. No additional seals are needed; the completely closed, one-part housing prevents any leakage. Mounting collars 25 mm long and compliant with EN 1506:1997 ensure a secure fit in the duct.

The developers of the new duct fan also spared some thoughts for the installers. A mounting bracket permits attachment in the duct without tools. The fan can then be rotated through 360 degrees to position the terminal box and can be fastened circumferentially on the mounting flange. The new generation of duct fans in sizes 160, 200 and 250 is not only economical, quiet, compact and durable, it is also easy to install. ○

Author is Thomas Heli, Department Head Development at ebm-papst Mulfingen

You would like more information on this topic? Please address your question to: Uwe.Sigloch@de.ebmpapst.com

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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:
Katrin Lindner

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