tech.mag

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NEW IDEAS AT A GLANCE

ebmpapst

Editorial

“We focus on innovation, quality and service”

Dear customers, partners and friends of ebm-papst:

Over the past year, the European markets for heating have been predominantly characterised by regressive trends. We were only able to observe positive growth through renewal on the German and Dutch markets. It is pleasing to note that condensing appliance technology has become established as an energy-efficient form of heating, not only in many European countries, but also in the United States.

Despite the financial crisis and fears of recession, we at ebm-papst are looking optimistically to the future, for the current developments are both a challenge and an opportunity for us. Environmentally compatible heating technologies are an investment in a clean future, so we have quickly picked up on current trends for the trade fair ISH in Frankfurt and developed a range of innovative products that are now ready for series production.

By extending the NRG range for greater heat output, the optional integration of venturi in our blowers, the NRG with mass flow sensor and last but not least the market-ready LambdaConstant System for modern upper heating value burners, ebm-papst has its fingers on the pulse of the times, with energy savings and at the same time emissions reductions.

With the new gas blower for heat output up to 1 MW, ebm-papst has extended this range upwards. This will create new markets, in particular in the industrial environment, markets that can now be serviced with this new blower. The HyBlade® range of axial fans in air/water heat pumps with EC technology sets new standards with respect to energy efficiency and noise behaviour, as does the aerodynamically optimised plastic centrifugal fan. For pellet-fired heating systems, ebm-papst offers centrifugal blowers and induced draft fans for the fresh air and exhaust air. For such applications, these satisfy the strictest standards with respect to service life, noise and cost-effectiveness. Completely new is the plastic gearbox for the pellet feed, which is characterised by its very high standard of refinement. These are only a few examples.

As you can see, we at ebm-papst are continuing to focus on innovation, quality and service. We look forward to presenting our latest developments to you at the ISH or in a personal meeting at your offices.

I hope that you will enjoy reading our new magazine, tech.mag, and that it will provide you with many new and interesting ideas.

Stefan Brandl
Managing Director
ebm-papst Landshut GmbH

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Saving energy with air-conditioning and ventilation systems

ebm-past meets increasingly stringent environmental and economic requirements!

Today, saving energy is more important than ever. Large potential savings can be attained with fans used in ventilation and air-conditioning technology, as these are often operated with high duty cycles. If the right technology is used, not only energy, but great deal of money can be saved. Meanwhile, lawmakers have also come around to ensuring that the job is done correctly. Starting in January 2011, motors will have minimum efficiency classes that are established at present in the eco-design directive (based on the framework directive 2005/32/EC - Energy using products directive). Responsible manufacturers have already reacted to this and offer corresponding energy saving fans – fans that will not only fulfil the specified requirements in the future, but significantly exceed them even now.

The motor and fan specialist ebm-papst Mulfingen has completely revised the so-called plug fan series, which was designed especially for operation in ventilation and air-conditioning technology, to meet increasingly stringent environmental and economic requirements (Image 1). Available in eight sizes with impeller diameters of 250 to 560 mm and drive outputs of 400 watts to 6 kilowatts, the new designs cover all conceivable applications in the field of ventilation and air-conditioning technology or in climate control systems (so-called HVAC systems). The feasible air flows lie between 300 and 10,000 m³/h with a corresponding pressure increase of up to 1,000 Pa. On one hand, the overall efficiency of the fans was optimised with respect to the expected minimum efficiency requirements, on the other, the acoustic behaviour was significantly improved. This was made possible by the selection of materials used, the well thought-out design details and the state-of-the-art EC technology used with the drives.

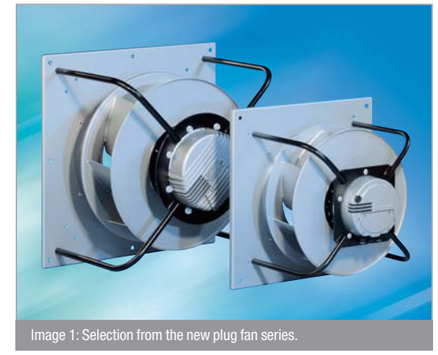

Image 1: Selection from the new plug fan series.

ebm-papst EC technology brings advantages

In connection with energy-saving measures, it is no longer possible for anyone to get around the subject of EC technology. By means of the integrated electronic control system, EC motors can change speed continuously to adapt to the requirements and operate at a high efficiency; therefore, they consume significantly less energy with the same air performance as AC drives (Image 2, see page 6). However, the potential energy savings are realised not only when operated under full load, but also primarily when operated under partial load. This is a distinctive feature of EC motors. When operating under partial load, they lose

*“The new plug fans:
quiet, compact and energy saving!”*

far less efficiency than asynchronous motors of the same output.

Likewise very important in connection with ventilation and air-conditioning technology devices is the noise level. Here too, EC drives are the better choice, because they do not produce any motor noise when regulated. In contrast, asynchronous motors driven by a frequency inverter, primarily under partial load, produce resonance noise that results in the typical unpleasant motor hum.

Another advantage is that the new plug fans are very compact. The electronically commutated external rotor motor is directly integrated into the impeller, which reduces the installation dimensions. The belt drive otherwise commonly used between the motor and the fan is no longer necessary (Image 3). This reduces not only the required installation volume – always desirable for ventilation and air-conditioning technology – but also the associated installation effort. Of course, this also means that there is less wear and tear which keeps service costs low over the long term. With respect to hygiene requirements, it makes sense to use direct-drive EC fans instead of belt-drive fans, because the inevitable belt abrasion can have a negative impact on the air quality.

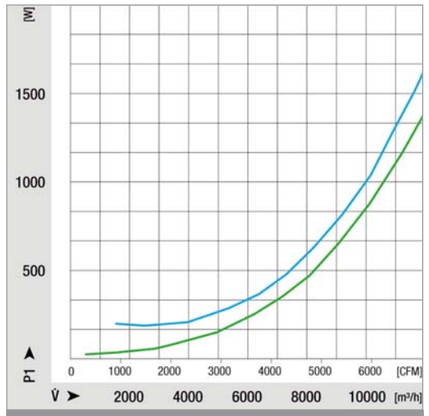

Image 2: Energy consumption of an EC fan compared to an AC fan.

Design improvements to the impeller

To optimise a fan, however, it is not sufficient to only improve the motor technology. The impeller also plays an important role. Aerodynamic improvements contribute to increased efficiency and reduced noise emissions. Even

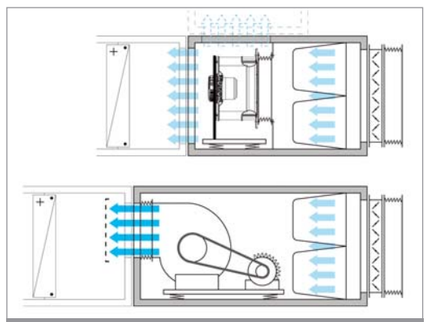

Image 3: Space savings by using EC fans (top) versus systems with an AC fan and belt drive (bottom).

New EC centrifugal fans with backward curved blades:
Saving energy with air-conditioning and ventilation systems

Image 4: The impeller was optimised again for the new series; compare before (left) and after (right).

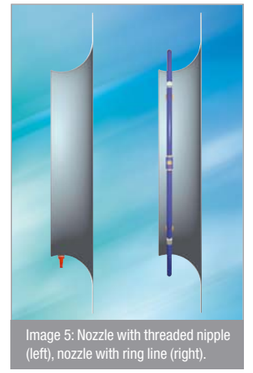

Image 5: Nozzle with threaded nipple (left), nozzle with ring line (right).

small details can have a large effect. The optimised blade geometry with a diagonal trailing edge, for example, improves the aerodynamic behaviour as well as the running smoothness (Image 4). The same is true for the nozzle contour implemented in the new series. Previously a pressure tap was integrated here to regulate differential pressure via a threaded nipple (Image 5). A ring line is also possible on request. The position of the impeller on the external rotor motor is selected to yield aerodynamic as well as installation-related advantages.

The new fan series can also score points in terms of life expectancy. To achieve a low motor bearing load and withstand the long-term high circumferential speeds, the impellers with their seven backward curved blades are made completely of aluminium. The material is beneficial for the weight of the fans and at the same time offers a high measure of stability. The individual blades are welded on, which likewise adds to stability and service life. The fans are designed for a service life of more than 40,000 operating hours. That corresponds to a continuous operation of more than 4.5 years, operating under full load and at the maximum permitted ambient temperature. When operating under partial load or at lower ambient temperatures, the value is significantly higher.

Analogue and digital control

As you would expect, practical control options are built into the modern fans. The electronics integrated into the drives are not only perfectly tuned to the EC motors used, but can also be controlled via an analogue 0-10 V signal or digitally via an RS485 ebmBus interface (for size 310 and up). In particular, if multiple fans are used, the bus networking offers big advantages. From making configurations during commissioning to performing service, alarm diagnosis and maintenance, dealing with the technology

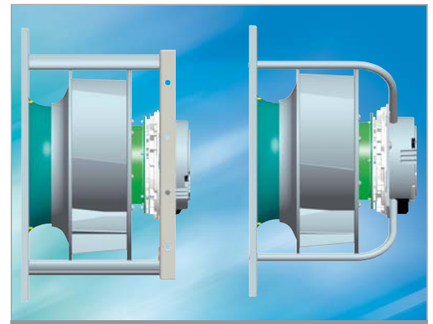

Image 6: Plug-and-play solutions for easy assembly (left with mounting plate, right with spider).

Control fans remotely now via Bluetooth

becomes substantially easier if the technician can use a central computer to access the fans. Aside from the corresponding PC software, a PDA and smartphone-capable version is now available with which the networked fans can be configured, monitored and controlled remotely via a Bluetooth interface without a cable connection. But even those who rely on analogue technology need not forego comfort. With a compact EC control device, up to 30 EC fans can be controlled by a 0-10 V analogue line, or their operating data can be monitored on the display of the control device.

The electronics integrated can also be controlled analog or digital.

The new plug fans are available in different installation variants (Image 6), such as with a “mounting spider” or installed mounting plate for a simple anti-vibration mount, which is usually implemented during design-in. The power electronics integrated in the EC motors are compatible with all common supply voltages; depending on the motor type, either from 200 V to 277 V for single-phase AC or 380 V to 480 V for three-phase current supply. The frequencies lie at 50 or 60 Hz, respectively. The air performance and efficiency are unaffected by frequency changes. This means that the same fan type can be operated on different power systems without further ado. Selection of the fan suited to the respective application is facilitated by a (likewise improved) selection program, which is available either as independent software or as a DLL module for integration in user-specific device configuration programs. In addition, therefore, the life cycle costs of the respective fan can be calculated. This enables the user to see in advance which potential savings the new plug fans will bring them in practical operation. With this new EC plug fan series, highly efficient, easily regulated and high-performance fans for ventilation and air-conditioning technology are easily accessible.

Dipl.-Ing. Ralf Mühleck (left)
Project Engineer / Domestic Sales
Dipl.-Ing. (FH) Uwe Sigloch (right)
Head of Project Management / Sales Europe
ebm-papst Mulfingen GmbH & Co. KG

Image 1: When many fans are used, networking and communication via a bus system like ebmBusV3 or ModBUS is indispensable.

“The networking over a bus system brings a lot of advantages”

By the end of the 1990s, Bluetooth had already become an industry standard for remote networking of devices over short distances and is now an indispensable part of everyday life. Bluetooth forms the interface over which small mobile devices like mobile telephones and PDAs as well as computers and peripheral devices can communicate with each other, without any elaborate or burdensome cable connections. Now the refrigeration and air-conditioning industry can enjoy this technology as fans can also be controlled remotely via Bluetooth.

Fans in ventilation and air-conditioning technology rarely go it alone, but usually work in teams. Typical examples of this are found in greenhouses, multi-storey building facades or the numerous ceiling fans without which clean room technology would be inconceivable. Often several hundred, sometimes even several thousand fans, perform their duties in such applications. But even smaller facilities, such as supermarkets, usually use multiple fans. In all of these cases, networking over a bus system brings advantages (Image 1). From making configurations during commissioning to performing service, alarm diagnosis and maintenance, dealing with the technology becomes substantially easier if the technician can use a central computer to access the fans, which are usually installed in places that are difficult to reach, e.g. on the ceiling, on the roof or directly in the facade.

Wireless communication

The motor and fan specialist ebm-papst Mulfingen has recognised this need and offers bus-compatible as well as energy-saving EC fans for the most diverse application areas. But since it is not always worth using a computer with smaller solutions, or because people in larger facilities may also use a more mobile communication option, there is now a PDA and smartphone-capable version in addition to computer software with “Fan Control 3.1”. It can be used to configure, monitor and remotely control all fans networked over the ebmBus via Bluetooth (Figure 2) without any cable connections. This will also be possible for those who use the Modbus, which is particularly widespread in the industrial sector; then, even mixed operation with other devices on the same bus is possible. Both the ebmBus and the Modbus are physically based on an RS485 two-wire connection; they work in half duplex mode and permit a transfer rate of 9600 (ebmBus) or 19200 Baud (Modbus) with line lengths up to 1200 m.

Technology that is easy to work with

The technology is simple to use. For example to communicate with the fans wirelessly, the Bluetooth adapter (Image 3, page 11) needs only to be installed within signal range of the operator, so that the corresponding data can

Bluetooth™

Image 2: Bluetooth is a trademark owned by Bluetooth SIG and is used by ebm-papst under licence.

An intuitively usable software solution for PDA and smartphone:
Control fans remotely now via Bluetooth

be transferred over the interface of the PDA or smartphone. The adapter converts the Bluetooth signal into an RS485 bus signal and vice versa. The connected fans provide it with a current supply, so it does not need its own. The wireless data transfer uses the public-domain 2.4 GHz ISM frequency band; distances of up to about 20 m can be bridged.

The “Fan Control 3.1” control software runs on PDAs and smartphones that work with the Windows Mobile 2003 operating system or higher. It can be operated intuitively, so that configuration and diagnostics tasks can be carried out very easily with up to 255 fan groups, each with a maximum of 30 fans. The main screen allows the most important information to be available immediately. After the user logs in, the fan icons for the selected group are displayed on the screen. The software automatically searches all fans installed on the bus and displays them in

Image 3: To communicate with the fans wirelessly, the Bluetooth adapter needs only to be connected to the bus and installed within signal range of the operator. It converts the Bluetooth signal into an RS485 bus signal and vice versa.

Image 4: Important information appears on the main screen right away. After the user logs in, the fans are detected and displayed. The colour of each symbol indicates the operating state.

the order in which they were found (Image 4). The device address appears below the respective symbol. The colour of the icon provides information on the current operating state. Green stands for perfect function, yellow indicates a communication problem and a red symbol signals that an alarm mode was identified for this fan.

If you go further into the menu, you can take a closer look at each of the fans. In addition, all current values can be displayed for the motor temperature, the current operation mode, all programmed set and actual values, and the last errors of each fan. The error messages are saved in the fan's electronics, so they are kept even if no PDA or smartphone is connected. The production date of the fan or its electronics and the operating time are further items of information that can be called up in this way and often

“Fan settings can quite simply called up via PDA”

provide the service technician with important information. Also shown here is the current value of the operating hour meter that is integrated in the electronics.

Fan settings can not only be called up via PDA, they can also be modified. It is possible, for example, to assign a different network address to a fan, to switch between various operation modes (closed loop speed control, PWM control, sensor control) or to adjust the programmed set values, such as for speed or direction of rotation (Image 5). This is possible either with numerical entries, or one can work here with clear, graphic representations (Image 6) and then simply move the colour-coded set value points or the limit lines on the screen accordingly. The software is offered in numerous languages and therefore can be used worldwide.

Reading out data and transferring it to other fans

The software also supports the service technician if a ventilation or refrigeration system is set up with multiple fans. With the “Fan Clone” expansion, once you have configured settings, you can transfer them to as many other devices as desired without any trouble and very quickly. You need only to read out the values of the one fan and copy it to the others. At the same time, you can change the network address of the fan. The copied data can also be saved in a file, e.g. for archiving or support, and then be transferred from there to a fan at a given time. If a fan is replaced, for example, all settings can be copied quickly and reliably to the replacement device.

These software products open up versatile configuration possibilities for bus-compatible EC fans, which can be operated easily using handy smartphones. Controlling fans via the Bluetooth interface will make work substantially easier for service technicians globally.

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Development of computer-based control software
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An intuitively usable software solution for PDA and smartphone:
Control fans remotely now via Bluetooth

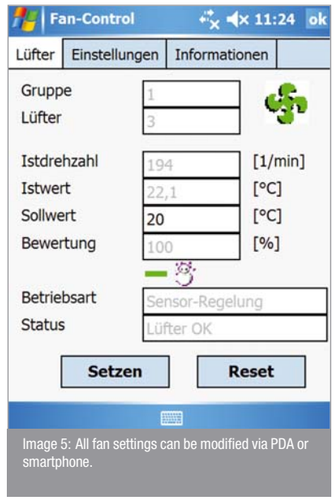


Image 5: All fan settings can be modified via PDA or smartphone.

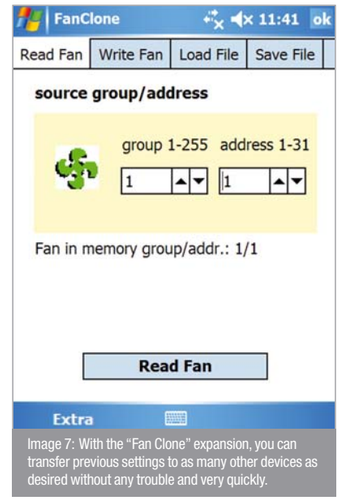


Image 7: With the “Fan Clone” expansion, you can transfer previous settings to as many other devices as desired without any trouble and very quickly.

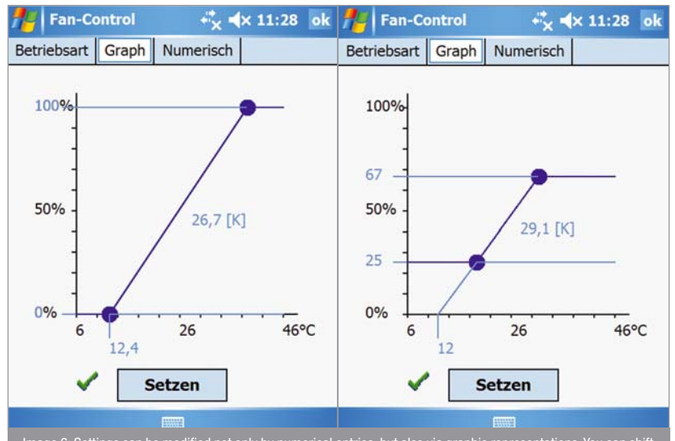


Image 6: Settings can be modified not only by numerical entries, but also via graphic representations. You can shift the colour-coded set value points (a) or the limit lines (b) on the screen.

LED headlights require special fans

Image 1: Full LED headlight by Hella for the Cadillac Escalade Platinum.

Modern technology enables a new approach to solutions in the automobile industry:
LED headlights require special fans

Thanks to the brighter more powerful light, LED chips can now also be used for vehicle headlights. With their long service life and compact size, they are increasingly becoming an interesting alternative to halogen or gas-discharge lamps especially as they are mechanically extremely robust. The high degree of efficiency also saves energy and thus fuel. However, as the active chip surface is extremely small, it must be well cooled. In particular, fans specially optimized for the requirements of vehicle headlights enhance the required airflow and thus support active cooling. High reliability and long service life are compulsory for all headlight components.

Modern materials and production methods allow a variety of applications.

Extremely bright LEDs operate highly efficiently. In comparison they require less space and thus open up new design possibilities for headlights and the front fascia of vehicles. This is one reason why the premium manufacturer Cadillac is now relying on a full LED headlight for a high-beam, low-beam and daytime running light manufactured by Hella in its Escalade Platinum model. The light specialists cooperated with the fan specialists ebm-papst from St. Georgen in the Black Forest to provide the indispensable active cooling. Thus, a completely new type of headlight emerged with interesting technical innovations with regard to electronics, optics and cooling air supply (Image 1).

Sophisticated motor vehicle application

All components in automobiles constantly suffer from vibration, acceleration and oscillation, e.g. due to potholes. There is also an extremely wide temperature range in which all components are required to function reliably.

The Escalade is fitted with a headlight package, comprising the casing and an array of 7 LEDs, a corresponding projection lens of optical glass as well as the air leading insert that is so important for the cooling and the actual fan itself. The colour temperature of the LEDs is approx. 5.500 Kelvin and is thus considerably closer to daylight with approx. 6.000 K than light produced by Xenon bulbs with approx. 4.000 K and they are not as strainful on the eye. As the headlight is designed as a unit, the optical values must not alter before, during and after assembly. This requires special handling during the manufacture and installation of the components.

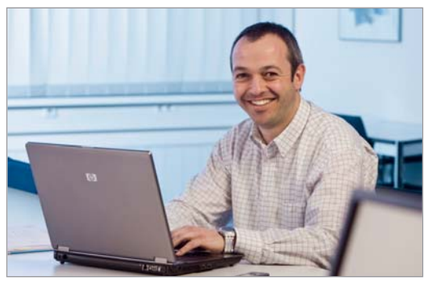
Tailor-made fans

Special plastics were chosen to avoid degassing. The fan components are manufactured in the usual manner by injection moulding, however, the melting point of the resistant material is considerably higher, so that the injection moulding system had to be converted from water cooling to oil cooling and the cycle times adapted accordingly. Even minor details that are important after successful test runs for series production, had to be kept in mind. According to Michael Weißer, member of the development team: “Attention must be paid even to the most trivial things, i.e. marking the fans to ensure the high reliability of the entire system. Individual components must be traceable, yet the standard solution of a label with numbers or barcode was not practicable. The direct marking of the fans solved the problem.”

The heat source LED is mounted on heat sinks, the cooling airflow is directed onto the heat sink from behind via guide vanes. The chip temperature of the LED is thus lowered considerably and the service life increases drastically. Special ball bearings with optimized lubrication were used to provide a long operating time and the temperature range that is usually found in vehicles. This ensures that extreme temperature fluctuations and high impacts during operation do not affect either the lubrication or the optimum running clearance of rotor and stator. The PCB and the drive electronics mounted in the fan, are protected by a special insulation lacquer (Image 2). The speed can be regulated if required. The fan propeller itself has a sickle blade profile with winglets to ensure a high flow rate and high static pressure at minimum power input and low operating noise.

Modern materials and production methods allow fans today to be tailor-made for a variety of applications. The earlier the fan specialist with his know-how is incorporated in the project planning, the sooner the specifications can be fulfilled. The user can then concentrate on his core competence and the specialist on the optimization of the fan within the scope of the specifications. This type of interaction saves development time, money and enables both state of the art cooling and application solutions.

Image 2: Axial fan with and without soft suspension (decoupling).



Michael Weißer
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ebm-papst St. Georgen GmbH & Co. KG

ebmpapst

Energy-efficient EC fans for air/water heat pumps

Source: Stiebel Eltron GmbH & Co KG

“EC motors: energy-efficiently, durable, extremely quiet and simple to control”

Heating supplies today require concepts that use renewable energies instead of fossil fuels. It is becoming ever more apparent how much heating potential we have in our immediate environment. For example, air/water heat pumps make use of the heat energy contained in the external air for heating and for preparing hot water. That even works in the winter time. Fans provide for the necessary air exchange via the pump evaporator. Here, the best results are achieved when the fans are driven by modern EC motors. They work energy-efficiently, are durable and extremely quiet.

Today, air/water heat pumps are available on the market in two versions, configured for use in either indoor or outdoor installations (Image 1). Each places different requirements on the fans used. With the indoor configuration, the external air is drawn in through one duct and blown out through another. Pressure is lost in these air ducts. For this reason, centrifugal fans are especially well suited for this application as they are generally superior in generating a high pressure. The fact that they are very compact is also beneficial for air/water heat pumps configured for indoor installation, as there is usually limited space available. Space requirements are usually less of a problem for outdoor

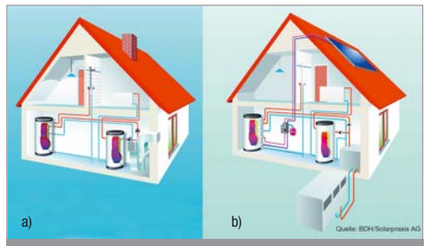

Image 1: Air/water heat pumps are available either for inside installation (a) or for outside installation (b).

configurations. Here, the evaporator is attached as an offset exterior unit with a refrigerant pipe leading inwards. Another possibility is to exchange the heat outside using a brine heat exchanger and to integrate the refrigerant circuit completely on the inside. Such installations usually use axial fans. Pressure losses due to long intake and outlet ducts are eliminated here, allowing the axial fans to be operated at low speeds.

Axial and centrifugal fans in all sizes

To enable the right fan solution to be found for every air/water heat pump, the motor and fan specialist ebm-papst Mulfingen offers both axial and centrifugal fans in different sizes (Image 2 and 3). Centrifugal fans with a diameter of up to 630 mm and axial fans with a diameter of up to 910 mm are predominantly used in the field of heat pumps. These can achieve an air performance of up to 30,000 m³/h. These fans are powered by modern EC motors, which are available in various sizes, depending on the power output required. Depending on the amount of air required and the desired dimensions, the motor sizes may be combined with different impellers. In each case, the user will benefit from the advantages of EC technology, and will do so in several respects.

Extremely quiet across the entire speed range:
Energy-efficient EC fans for air/water heat pumps

Image 2: HyBlade® axial fan in EC technology with 800 mm impeller radius.

Image 3: Plastic centrifugal fan in EC technology with 450 mm impeller radius.

To employ air/water heat pumps, you must tackle the issue of noise development. Besides the compressor, the fan used is the second relevant source of noise, and so should work as quietly as possible. This is particularly important during the quiet hours of the night, when the approved limit values of DIN 18005 and noise abatement guidelines must be complied with inside, and more importantly, outside the building. Whenever possible, large fans should operate at low speeds to keep noise emissions low. The simple controllability of the EC motor then brings natural advantages as the speed can be reduced further at night without any problem. This eliminates the need to switch off the heat pump to avoid trouble with the neighbours.

Speed control, sound pressure level and operating noise

Reducing the speed of the fan in the example by just 100 rpm will reduce the sound pressure level by 4 dB(A), meaning a reduction in noise level of more than one half (Image 4). By contrast, such an adjustment on an AC fan, e.g. for a night-time reduction, would not be possible without additional measures. Moreover, EC motors are much quieter in operation than other types of motor, and are so over the entire speed range. The typical resonance levels associated with motors operated with a frequency inverter, and “phase noise” have been eliminated, since a different operating principle is involved (Image 5, page 20).

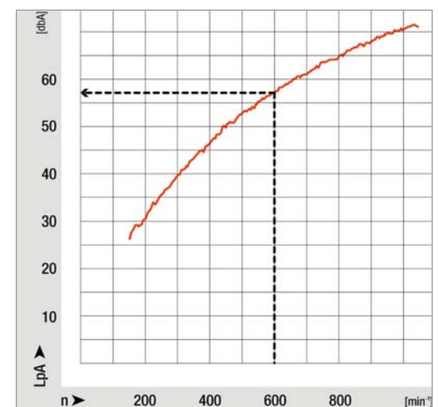

Image 4: Relationship between sound pressure and speed on a size 630 centrifugal fan. Reducing the speed by just 100 rpm effects a 4 dB(A) reduction in the sound pressure level.

“The optimised impeller vanes contibute to low noise emissions”

While switchable AC motors do work quietly, it is only possible to control their speed in two levels (Y/Δ).

The freely controllable EC fans also make regular defrosting of the evaporator easier. During the defrosting process, the fan continues to run at low speed without pumping large volumes of air. This rules out the possibility of the fan freezing, and may eliminate the need for vent heating, depending on the design and construction of the heat pump. If defrosting is not conducted regularly, but rather according to requirements, the current speed value of the fan can be used for monitoring. A drop in speed indicates a possibility of icing.

Optimised according to aerodynamic criteria

Impeller vanes optimised according to aerodynamic criteria also contribute to low noise emissions. The impellers on the centrifugal fans are made of a high-strength plastic material, as are the nozzles. The injection moulding process makes it possible to adapt the geometry to suit the requirements of the application concerned.

On the axial fans, the HyBlade® blades (Image 6) redefine standards with respect to noise behaviour and efficiency.

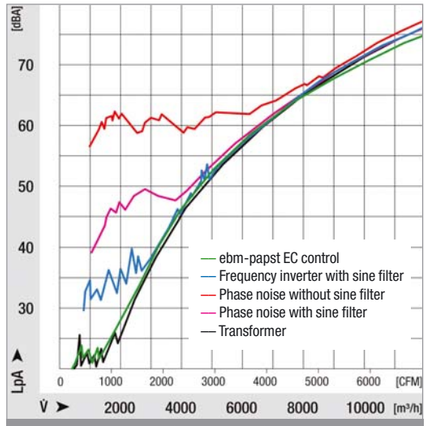

Image 5: Noise behaviour of various types of motor in comparison (green: ebm-papst EC motor, rest: AC motors with various control systems).

Extensive testing has confirmed the benefits that can be attained by using various materials in a compound. The aluminium inlet absorbs the mechanical forces and ensures a durable connection to the rotor, while the plastic

Image 6: HyBlade® blades: The aluminium inlet absorbs the mechanical forces, ensuring a durable connection to the rotor, while the plastic encapsulates the carrier structure, giving the blade its optimised aerodynamic shape.

Extremely quiet across the entire speed range:
Energy-efficient EC fans for air/water heat pumps

encapsulates the carrier structure, giving the blade its optimised aerodynamic shape. Winglets, familiar from aeroplane technology, can also be realised. This also has a positive effect on noise behaviour. At the same time, the overall weight of the fans is reduced by the use of plastic. This is an advantage that cannot be underestimated for the craftsman installing and servicing the device.

Energy-efficient and ready for use worldwide

Heat pumps are designed to use as little primary energy as possible to generate the required heat output. It is true that the compressor is a much larger consumer of electrical energy than the fan. However, it still pays for itself if the fan works with maximum efficiency. Here again, EC technology has become established. Image 7 shows the input capacity of two identical fans with different motors.

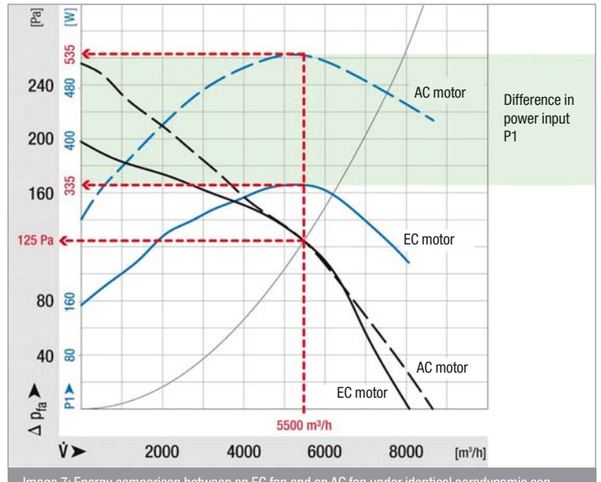

Image 7: Energy comparison between an EC fan and an AC fan under identical aerodynamic conditions (centrifugal, 630 mm diameter). Power input is 200 W less with EC technology than it is with AC technology.

The fan with the EC motor requires approx. 200 W less power than the one with the AC motor. If we assume a working time of 2,000 hours per year and energy costs of 0.17 euro per kilowatt-hour, the saving is almost 70 euro. The low energy consumption of EC technology means that it also makes an important contribution to reducing carbon dioxide emissions.

There are additional arguments in favour of EC technology, because the external rotor design places the motor in the impeller, the fans are very compact and can be easily integrated in tight spaces. Moreover, EC drives can be used with any power supply, without the need for modification, in single-phase operation from 200 to 277 V (50 Hz and 60 Hz) and with three-phase AC between 380 and 480 V (also 50 Hz and 60 Hz). This has the logical advantage that the same fans can be employed anywhere in the world. Also, just a few fans in the range are enough to cover practically all requirements for new equipment, service and replacement.

Durable and reliable

At the same time, EC motors are highly durable. Because they work with such great efficiency, the motor warming is less than that of AC motors, significantly prolonging the service life of the ball bearings. In addition, it is not possible to overload the EC motors used. If the impeller should be blocked, the integrated electronics will switch the motor off and will periodically attempt to restart it. Just some of

the reasons to explain why EC fans are increasingly being used in air/water heat pumps. A trend that will surely grow in the future.

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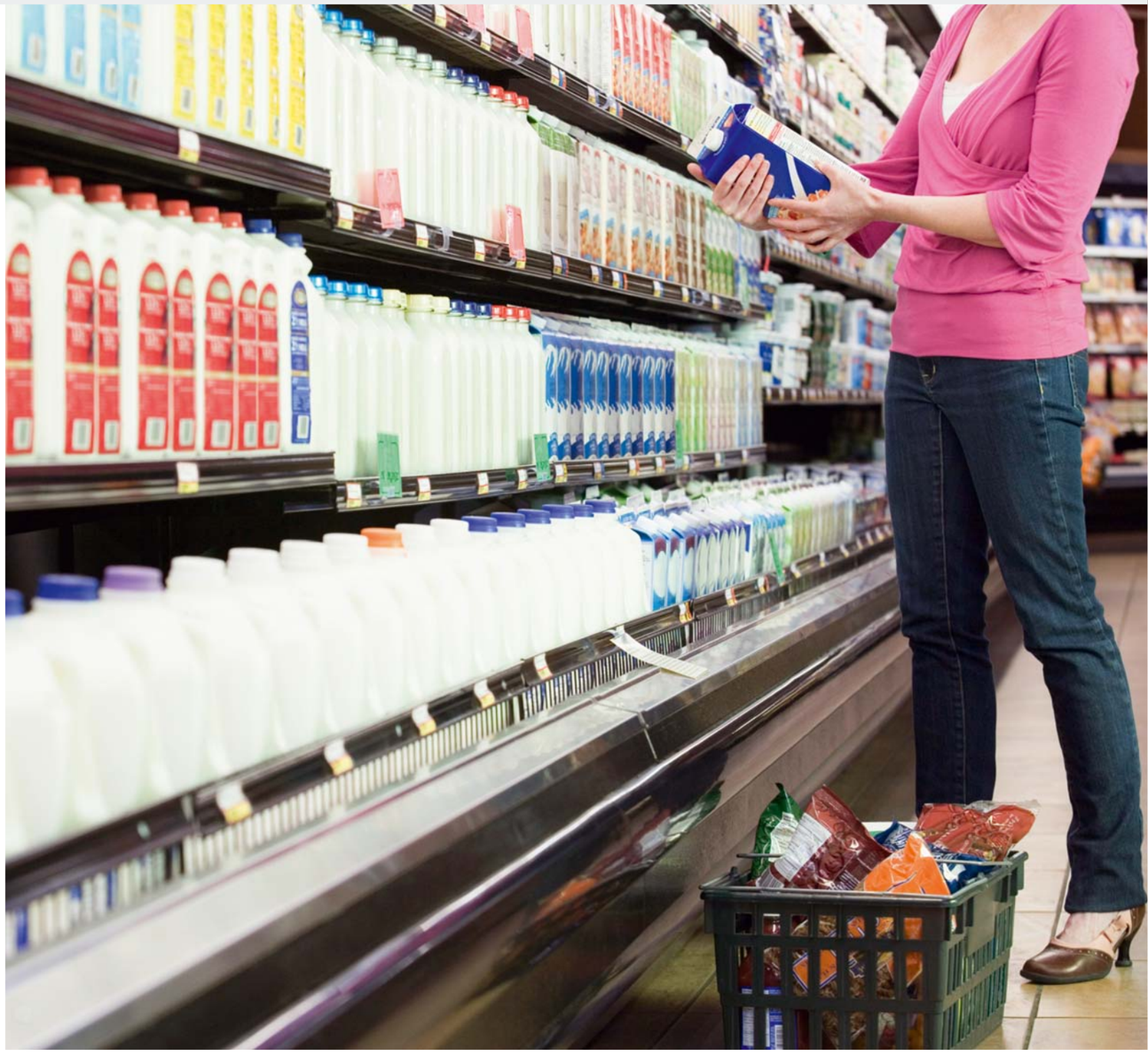
First fan series with antibacterial action



“The new line of antibacterial axial fans: antibacterial and energy-saving”

Hygiene is a top priority, both in the field of medicine and in food technology. If germs or bacteria accumulate on different surfaces, this could be critical for certain applications, for the surface serves as the transfer medium for microorganisms through contact with hands, tools or other objects. At the same time, there is the problem of colonisation: surfaces serve as concentrators, “multipliers” and disseminators of microorganisms. These microorganisms can be killed by cleaning with common disinfectants. However, conventional cleaning agents have no long-term effect. It may then happen that just a short time after being disinfected, the treated surface may again shows signs of colonisation with the potential for cross-contamination – that is transmission to other objects. Specially treated coatings or materials are today able to sustainably keep microorganisms clear from surfaces.

In the field of fans, a wide variety of uses are opening up in the medicine and food sectors. They supply laboratories and operating theatres with the necessary fresh air, extract warm air when it is not needed or even objectionable, and transfer both hot and cold air to where it is needed. As a rule they are integrated into systems or devices in such a way that they cannot normally be accessed, or can only be accessed with difficulty. During design and installation, conditions usually exclude the possibility of severe contamination within the fans. However, small dirt particles or microorganisms such as germs or bacteria can accumulate on the fans and from there they are transported in ventilation systems along with the fresh air or cooled air flow. This means that in some circumstances the actual fresh-air equipment can become the transmitter for germs and bacteria.

Exploiting the anti-microbial effect of silver

Various manufacturers in medicine and food technology thus demand that component manufacturers should produce more devices from anti-microbial materials or with appropriate coatings. This prompted the motor and fan specialist ebm-papst from Mulfingen, Germany to develop a whole line of antibacterial-treated axial fans. Here, ebm-papst has drawn on the expertise of Agion Technologies from Wakefield, Massachusetts to produce materials endowed with silver ions. The Americans have been working on the anti-microbial effect of silver for more than a decade and have conducted extensive tests on this, both in the laboratory and in various applications. A zeolite endowed with silver ions (Image 1) – both of these are naturally-occurring materials – is mixed into the base polymer providing continuous antimicrobial action to the surface as needed (Image 2). Here, it is beneficial that silver ions only have an effect on simple cell structures such as germs, bacteria or fungus. More complex cell structures such as plants, animals or human tissue are not attacked. All in all, the silver ions render microbes harmless in a number of different ways: catalytic oxidation is used to throttle the oxygen supply, a reaction with cell membranes prevents the absorption of nutrients, and effective sterilization to prevent multiplication. Not only do the materials endowed with silver ions inhibit and reduce unwanted germs and bacteria, they also have the desired long-term effect. Silver ions only become active when dampness or microorganisms come into contact with the material. This means the silver-ion reservoir is only activated when it is actually required.

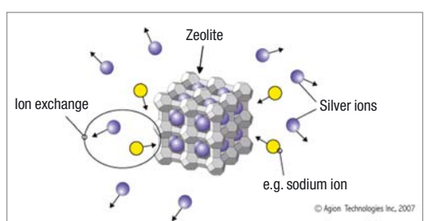


Image 1: The anti-microbial Agion system: Zeolite endowed with silver ions.

Presentation of fan series at the trade fair Chillventa in October 2008

The range of antibacterial-treated axial fans were presented to the public for the first time at the Chillventa. These fans are compelling with their low noise levels and maximum air flow. The line provides a total of five fans with a diameter of 172, 200, 230, 250 and 300 mm, which deliver an average air flow of 200 to 1,400 m³/h. The fans work in ambient temperatures ranging from -30°C to +50°C. They can easily be distinguished at a glance from conventional fans by the typical OP green colour of the endowed plastic material (Image 3). Apart from their antibacterial properties, the axial fans also have other benefits: the energy-saving motor (see box page 26) significantly reduces energy consumption and thus running costs. The fans have already demonstrated their reliability and function in numerous laboratory and field tests. The whole line has been available since late 2008. These fans will surely open up numerous applications in the fields of medicine and food technology (Image 4, page 26).

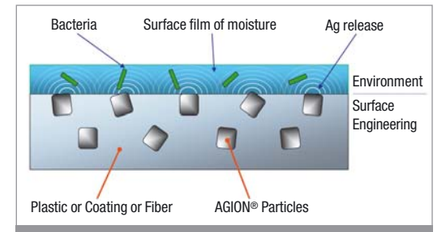


Image 2: Fighting bacteria at the interface. By endowing a polymer with Agion particles, it is possible to sustainably combat microorganisms on the surface.

Image 3: Antibacterial fans can easily be distinguished at a glance from conventional fans by the typical OP green colour of the endowed plastic material.

Energy-saving motor (ESM)

The energy-saving motor is based on the proven external-rotor motor principle, with the rotor turning around the stator within. Compared to the otherwise commonplace shaded-pole motor (Q-motor), a three-fold increase in efficiency is achieved. Higher efficiency also means that less waste heat is given off into the surrounding area. Resulting in even more energy savings, e.g. in refrigeration technology, as less energy is required from the outset for the cooling process. Axial fans with energy-saving motors have been developed principally for use in cooling and deep-freeze appliances, but increasing numbers of other applications are being found, particularly above all in the fields of aerodynamics and air-conditioning technology.

Image 4: Typical application in food technology, e.g. in a refrigeration unit.

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Centrifugal blower with mass flow sensor for exact air supply

Image 1a: Fireplace insert with river rock design.

Location-independent, ideal oxygen supply without adjustment effort:
Centrifugal blower with mass flow sensor for exact air supply

“The aerodynamic air conduction prevents unwanted vortex generation”

Fire can seem alive, and has been a popular item for home decor since time immemorial. Hearths or fireplaces with a glass window accentuate the ambience. Modern gas-powered fireplace inserts unite the pleasant atmosphere of open flames with the rather mundane purpose of heating the room. Like a living creature, fire needs food, i.e. fuel and atmospheric oxygen in an exact, chemically pre-determined ratio. This is the only way to ensure optimum, energy-saving operation of the fireplace, free of hazardous substances (no NO_X or CO). Conventional atmospheric “flame burners” always require exact adjustments on-site. However, temperature and air pressure fluctuations continuously change the fresh air volume that is aspirated. Today, a new fresh air blower with integrated mass flow sensor offers the perfect alternative. Independent of external influences, the fireplace is always supplied with exactly the atmospheric oxygen volume that is required for the corresponding fireplace output. Adjustments on-site are unnecessary.

Open fireplaces combine the useful with the beautiful. Closed fireplace inserts with a window provide better efficiency without having to give up the optical effect of the flames. Bodart & Gonay, the specialist for high-quality fireplace inserts, offers gas-fired versions in addition to the wood-burning types. With the atmospheric burner design, the gas burns with a beautiful, lively flame in the fireplace. The stove expert is collaborating with the motor and fan specialist, ebm-papst Landshut, Germany, to improve the effectiveness of combustion and the convenience of installation and operation. The result is a fresh air blower that is perfectly adapted to the requirements of state-of-the-art fireplace inserts.

Visual appeal and premium engineering

Many different fireplace inserts are available on the market. In each particular case, the material characteristics, manufacturing quality, safety and, not least, a suitable design are of great importance. High-quality fireplace inserts have always met these requirements. A variety of models, with variable widths and shapes, in the wood-burning design with realistic ceramic wood or the river rock fireplace design, fulfil many desires (Image 1a + b). The objective of a product revision was to ensure faster installation and easy, user-friendly operation. Stove manufacturers rely on modern technology to improve heating comfort and make installation and maintenance easier.

Image 1b: Fireplace insert with ceramic wood.

Understanding the nature of gas combustion is the background of all of their efforts. Theoretically, a defined quantity of oxygen is required in order to oxidise, or in other words, burn gas completely. If there is too little air (oxygen), carbon does not burn completely and highly toxic, suffocative carbon monoxide is produced, moreover, precious heat is lost. On the other hand, if more air is supplied than is required, the excess air is heated unnecessarily and the heat is discharged via the chimney or flue. In practice, minimal excess air was found to be the ideal value.

Warm gas expands, becomes lighter and rises up the chimney or flue. This creates suction that pulls fresh, cold air from below and keeps the fire going. On older fireplace inserts, a technician adjusts the exact air volume for optimum combustion using a restrictor. Since gases, such as air, are subject to temperature and air pressure fluctuations, these conditions inevitably change the mass flow rate of a fixed restrictor, which is adjusted only once. Thus, similar to the Lambda control system for cars with catalytic converters, an accurate mass determination of fresh air is required to optimise height and colour of the flames and heat output.

A blower with the right touch

Via a controlled blower (Image 2), the actual required air flow can now be controlled independent of technical and physical variables such as chimney or flue pipe length, intake system, air temperature and air pressure. Air mass per unit of time is used as the sole measured value. For example, when the air is cold and therefore more dense, a smaller air volume is conveyed than for less dense, warmer fresh air. The new blower operates with a restrictor on the intake side, which creates a laminar fresh air flow. Part of the aligned air current, which has a homogenous speed, is routed through a bypass and over a semiconductor element. The mass flow sensor then determines the actual aspirated air mass. The fan aspirates the air that has been combined into a single air flow again and transports it to the duct leading to the stove (Image 3). The rotor bearings are lubricated for life and allow maintenance-free operation; the aerodynamic air conduction prevents unwanted vortex generation and unwanted operating noise in the fresh air.

Image 2: NRG 118 gas blower with mass flow sensor.

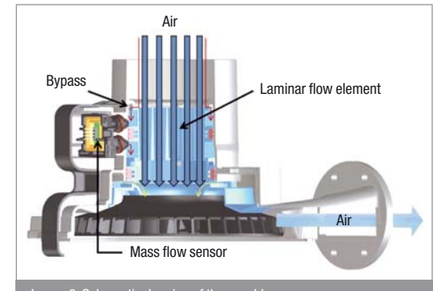

Image 3: Schematic drawing of the new blower.

Location-independent, ideal oxygen supply without adjustment effort:
Centrifugal blower with mass flow sensor for exact air supply

Due to its compact design, the blower can be installed vertically or horizontally in any position (Image 4). For pipe-in-pipe systems (fresh air is aspirated outside around the flue pipe), the new system makes it possible to readily bridge a chimney or flue length of up to 40 m compared to only approx. 3 to 4 m attainable up until now. Thanks to a built-in, industry-standard interface, the smooth-running blower can be installed at an easily accessible location in the exhaust gas system. The connection for data transmission to the burner controller may be up to 100 m. The blower controls and, upon request, transmits the mass flow actual value, speed and intake air temperature to the burner controller. The burner controller guarantees the safety of the entire system (Image 5). Depending on the heat output which is programmed via the software, the burner controller outputs the requirement for the corresponding mass flow to the fuel gas control valve and fresh air blower. An additional safety feature is the continuous plausibility comparison between the mass flow signal and the value calculated from the blower speed and air temperature based on the characteristic curve of the blower. This ensures optimum air flow within a range of approx. 3 – 17 g/s, which corresponds to usable heat output of approx. 7 to 15 kW. The robust blower is capable

Image 4: Mounting position of the blower.

of conveying fresh air of up to 70 °C; temperatures above 75 °C trigger the blower to send a warning signal to the burner controller. So, overheating can be counteracted in a timely manner by restricting the burner capacity.
The symbiosis of timeless design and modern technology allows new, better combustion characteristics for home heating systems as well. With the focus on the correct

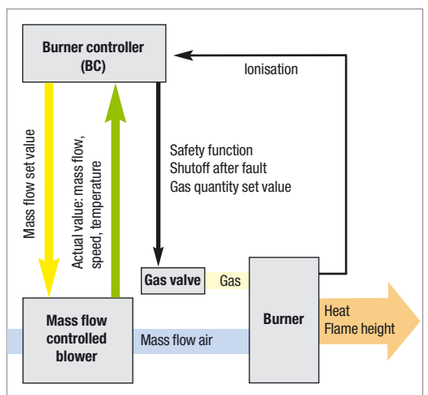

Image 5: Block diagram of the combustion control system.

chemical requirements, the mass flow controlled blower conveys just the air volume that is required. The settings are independent of external factors, saving installation and maintenance costs. Combined with the gas savings due to optimised combustion, the enjoyment of an open fire watching the leaping flames becomes a much more environmentally responsible activity.

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