mag°

all about ebm-papst

01° 2008

Quiet & airy

Eighty fans. Zero noise. That is how the German meteorological service cools its data centre

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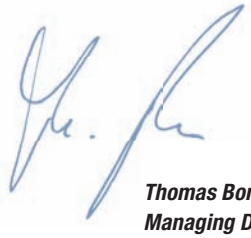
More EC, less energy costs



Thomas Borst
Managing Director Sales
Group Management

Dear readers, as the trend of ever-increasing energy costs continues, it has brought the issue of energy efficiency to the centre of public attention. Our company, too, with its wide variety of products for air technology and drive engineering, finds itself in the midst of these developments. This is confirmed by the many discussions we have had with our customers about energy-efficient fans and drives. To further encourage these exchanges on central issues for the future — and beyond — we present to you our new customer magazine.

Thanks to our forward-looking R&D strategy to develop the EC motor range, we found answers to questions that are fuelling today's energy debate years ago. With our comprehensive line of energy-efficient EC products, we are ready to offer the most advanced technical solutions in the world. ebm-papst is an innovation driver, so we are not satisfied by just offering the best EC solutions, but determined to introduce innovations to the market through our entire product range. The innovation roadmap, which has been created earlier this year and contains plans for ebm-papst to relaunch roughly 60 products this fiscal year, leads the way for realising this goal. Representative of the entire product range, let us highlight our axial fans with the new HyBlade® blades as an example. The revolutionary idea of combining aluminium and plastic materials in the axial blade construction has prompted exceptional feedback from customers like you.

In addition, ebm-papst is actively involved in political debates pertaining to legal regulations and requirements in the European Union. These include, for example, the definition of new energy efficiency ratings for electric motors, which play an important role for future EU directives. The bottom line: ebm-papst is committed to deliver solutions for future challenges on many levels. Further information on this and other topics are provided on the following pages. We hope that reading our magazine will provide you with new insights and we look forward to exchanging ideas with you!

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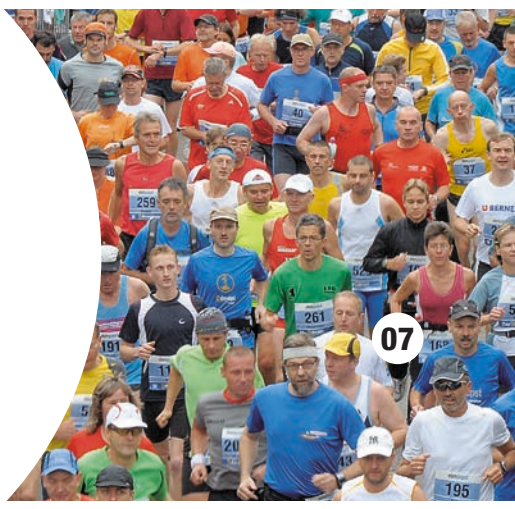

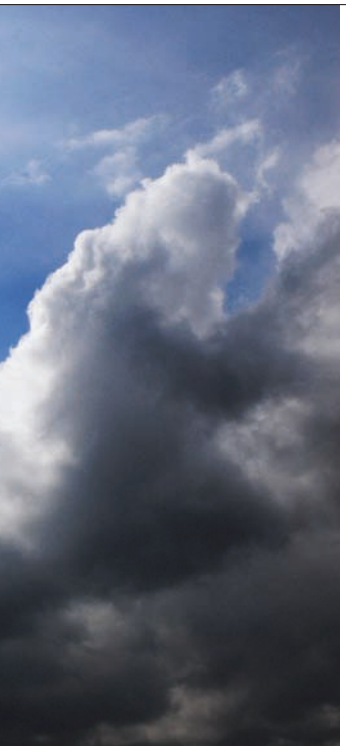

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360°

Columns

Taking over the role of Commercial Director: Hans Peter Fuchs.

New at ebm-papst

Hans Peter Fuchs is new Managing Director

On October 1, Hans Peter Fuchs will assume the role of Commercial Director at ebm-papst in Mulfingen. 47-year-old Fuchs comes to ebm-papst from the Atmel Corporation, a manufacturer of semiconductors based in Heilbronn, Germany, where he has held various managing positions at home and abroad since 1994. The graduate in Economics was most recently the Managing Director in charge of Corporate Finance. Fuchs is intimately familiar with the region, but also possesses a great deal of international experience.

max-e gets wheelchair users to places others only dream of.

It keeps on rolling

Wheelchair drives powered by EC motors

Wheelchairs help people with restricted mobility to regain their freedom — but they have their limits. Therefore, AAT Alber Antriebstechnik, a company that specialises in transport and rehabilitation technology, developed the "max-e", a universal electric drive that can be retrofitted onto almost all manual wheelchair types. The key element is the energy-saving and maintenance-free EC motor — one for each wheel. With an effective power of 90 watts, the motor can handle a weight of up to 200 kilograms and move it uphill with 20 percent slope. It has a range of about 15 kilometres at a speed of six kilometres per hour.

News in brief

40 million people in the Arab world have been introduced to EC technology. In a science programme, the news channel Al Jazeera broadcasted a report about ebm-papst's innovative technology.

The Lahrer workshops for the handicapped were given an order worth 135,000 EUR by ebm-papst St. Georgen. The contract involves reworking fan housings and will run over a period of one year. A total of about 450,000 housing parts will be remilled and drilled by the Lahrer workshops.

In order to secure qualified employees in the future, it is best to begin building relationships even prior to training. At numerous recruiting fairs students can learn about job and career opportunities at ebm-papst. Our Human Resources Department will represent the company at the IKOM, hosted by the Aalen University, on October 22.

In the market for VGA cooling fans where it has become very difficult to predict success, the Thermalright HR03 GT with 3412N / 2GLLE fan by ebm-papst has prevailed over seven competitors in a test carried out by the magazine PC Games. The trade journal deemed the graphics card fan to be "the new standard" and had only praise for the versatile and quiet unit.

This year's ebm-papst Marathon again produced winners off the course. The sponsored run this year brought in 5,550.50 EUR which benefits the Sonnenhof Schwäbisch Hall (www.sonnenhof-sha.de). The Sonnenhof supports schools, living groups and public aid organisations to help mentally disabled people live as independently as possible.

"You want to know!" This is how "Youth research" invites young people to participate in its 44th competition. The Heilbronn-Franken regional competition, sponsored by ebm-papst, takes place on 5 – 7 March 2009. Interested young scientists can register at www.jugend-forscht.de and contact Bernd Ludwig (phone +49 7938 81–157) with any questions.

EC inside: Customers will now have the option to mark their products that are equipped with EC-motors with this new EC emblem to promote its outstanding energy efficiency.

Running in and for the community.

Going the distance

Hosting the world at the ebm-papst Marathon

Over 3,000 participants overcame their inner couch potato and superstitious notions at the ebm-papst Marathon. After all, the runners, inline skaters and wheelchair users were neither discouraged by the long distance nor by the fact that this was the thirteenth year of the event. Sixty employees from eleven international locations and over 200 employees from German locations as well as sports enthusiasts from all over Germany participated in the marathon, half marathon, 10 k run and Ironkid with perfect running weather and were watched by 10,000 spirited spectators. Company sports activities are a part of everyday life at ebm-papst. More than 450 employees now take advantage of programs such as fitness training, dancing, skiing, football, volleyball, tennis and, of course, running. They are a great way to stay in shape while creating a stronger sense of community.

www.ebmpapst-marathon.de

Green excellence

Two Coolworld Awards for ebm-papst

At Australia's largest trade show for refrigeration and air-conditioning technology, the Air Conditioning, Refrigeration & Building Services (ARBS) in Melbourne, ebm-papst's commitment to energy-efficient technology has been rewarded with two of the ten Coolworld Awards. The inventor of the EC fan was awarded the environmental prize "Green Innovator of the Year." With this prize, the representatives of the Australian refrigeration and air-conditioning industry honoured the contributions made by EC projects such as the "green supermarket" and retrofitting government buildings and banks to reduce carbon dioxide emissions. In addition, Gert Häussermann, Technical Director of EC systems, also received the "Excellence Award" for best performance among all prize-winners.

Award prizes go to deserving recipients: Gert Häussermann (left) is excited to accept the Excellence Award, presented by Michael Baxter, Marketing Director of Daikin Australia.

295 employees
of ebm-papst St. Georgen participate in the health promotion programme pilot project.

65 %
of participants in the health promotion programme are determined to lose their extra padding.

Phone extension of sports scientist Kristin Krämer, who is in charge of the health promotion programme in St. Georgen:
-1707

236 billion euros
were spent on medical expenses in Germany in 2006.

Several health insurance companies reimburse the full amount for the extensive examination of blood, cardiovascular system, risk of stroke and diabetes, spine, lung function and state of nutrition. For participating employees a check-up costs **130 €**

Sources: ebm-papst; Statistisches Bundesamt: Krankheitskosten, dated 5 August 2008

The place where new ideas are forged is now under a new roof.

A home for innovation

The new Innovation Centre (eplZ) in Landshut, Germany

"Setting trends and being in the vanguard is important for the ebm-papst group." That is the directive Hans-Jochen Beilke, CEO, set forth at the opening of the new Innovation Centre (eplZ) in Landshut, Germany. The company invested 6.6 million EUR to create a new building covering 3,600 square metres groundbreaking infrastructure, in just two years.

The innovation centre comprises a glass-covered production area, a modern training workshop and laboratory facilities with gas test rigs, climate chambers and cabinets and additional high-tech research facilities. Presently, just under 60 of over 500 development engineers in the company work at the location in Landshut, Germany. Amongst other things, they are currently testing the new LambdaConstant blower (see page 21) for gas condensing boiler heating systems, which automatically adjusts to provide optimum combustion for different gas types. ebm-papst plans to further cement the market and technological leadership of the location in Landshut in the area of blowers for gas-fired heating systems. However, the investment in the Innovation Centre should not only be understood as a commitment to the Landshut branch, but also to Germany as a business location. "A recently published study dictates that the key functions that are critical to competitiveness and usually require a high level of skill and knowledge, stay in Germany," Beilke explains. These include design, marketing, high-value production and, most notably, research and development.

Samba in São Paulo

ebm-papst Brazil moves office

In the past six years, the number of ebm-papst Brazil's employees has almost doubled. For this reason, the team's 21 staff members have now moved to a larger building in São Paulo. It is conveniently located in a more prestigious setting and features a large office of more than 400 square metres and a large warehouse with 1,500 square metres. Adriana Belmiro da Silva, 34, who has managed the sales department since 2003 and the entire subsidiary since 2007, has played a crucial role in the Brazilian subsidiary's growth.

Life starts at 55

Employees aged 50 plus are in demand

Following the trend set in the federal state of Baden-Wuerttemberg, ebm-papst now also employs more and more employees who are 50 or older at the company headquarters in Mulfingen. The reasons include the lack of skilled personnel, but also the appreciation of experienced employees. "These people often are more flexible and mobile than their younger counterparts," emphasises Hans Jochen Beilke, CEO at ebm-papst. ebm-papst has always valued having a good mix of younger and older employees in work teams because the more experienced employees can often be assigned mentoring tasks.

No Chance for Germs

Antibacterial coating for fans

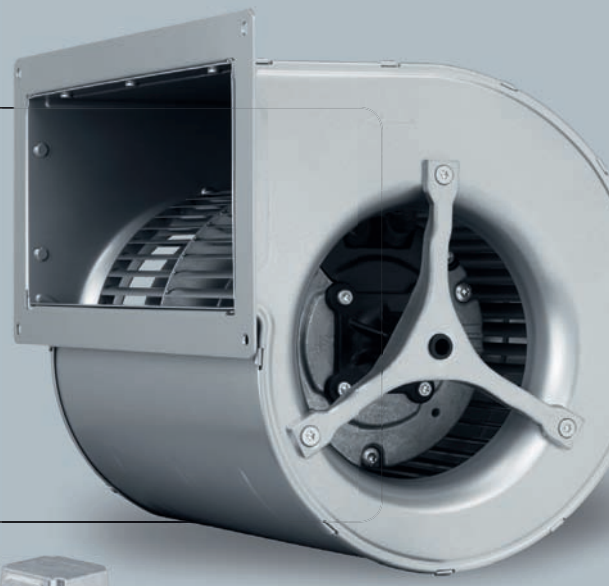
Axial fans generate sterile air.

The fresh air must be reliably free from pathogenic agents in operating theatres. This is why an axial fans line was developed from materials doped with silver ions for use in medical engineering and food technology — so that germs, bacteria and fungi no longer stand a chance. Advantages of the antimicrobial coating include both its long-term effect as well as the fact that it only becomes active when it is actually needed, when moisture or micro-organisms come into contact with the material. Silver ions eliminate simple cell structures in two ways: they block the oxygen feed and also prevent cell propagation by joining to the DNA. This line will make its debut at the Chillventa Trade Fair in October 2008.

For more information please go to: www.ebmpapst.com/product-news

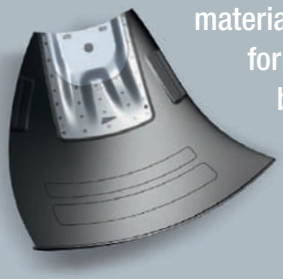
ENERGY-SAVING THERMAL BARRIER

As if flitting through an invisible wall, people walk through the open entrance areas of most department stores to find comfort in the air-conditioned space. The secret is an air curtain. The air curtain's air stream divides two thermally different zones. This way, the room air is maintained at a relatively constant level and draughts are reduced, resulting **in substantial energy savings — up to 40 percent.** Three to seven fans generate the air flow that creates the thermal barrier. Dual inlet EC centrifugal blowers especially developed for this application can further reduce power consumption by an additional 40 percent. The key to happy savings: the EC motor.



Revolutionary combination

Hybrid systems — the best of two worlds. The characteristics of two materials come together in HyBlade® blades to form a perfect symbiosis: HyBlade® combines the stability of high-strength aluminium alloy with the light weight and unrestricted mouldability of fiberglass-reinforced plastic.



COOL OUTSIDER

Robust, flexible, absolutely dustproof, water jet-proof, certified — those are the attributes of the new **motor forced air ventilation** of the IP 66 protection system in internal rotor design. Customer-specific requests can be made available within two weeks.

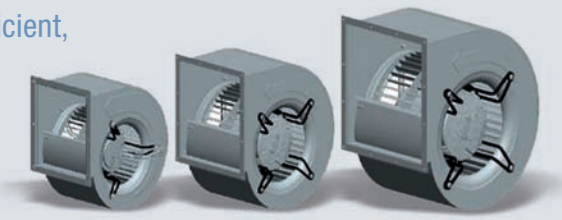
Nanotechnology

Use of nanotechnology reduces the contamination in fans that are subjected to increased ambient stress, such as dust, textile particles etc. Improved surface structures bring the advantage of longer cleaning intervals and constant air performance curves. This technology can be transferred to all fan types as required, but will initially be introduced in centrifugal fans (R2E 146, R2E 175, R2E 220, R2E 280) at the Chillventa trade fair.

Clear favourite

ebm-papst has developed a line of dual-inlet, direct-driven cylindrical rotor fans with efficient EC technology. It pays to convert: The installation dimensions are reduced, because the external rotor motor is in the cylindrical rotor.
The EC motor is energy-efficient, quiet and durable.

...



EC technology

Wherever EC is on the label, EC is inside. Anyone who uses the EC technology from ebm-papst can now show this with the EC seal. Ask your sales contact.

ebmpapst
The ultimate EC-Technology

POWERFUL AIR INTAKE

The new dual inlet **blower D2E 160** is designed for range hoods, but can also be used for other applications in the ventilation or air-conditioning industry. Its outstanding features include high air performance, noise performance improved by up to 8 dB(A) and the particularly durable ball bearings. The blower is powered by a size 68 or 74 external rotor motor which has been tried and tested in millions of units.

The head of the German Meteorological Computer Centre, Michael Jonas, will make around 50 teraflops of computing power available to its users by 2012. This equates approximately to the power of 400,000 PCs, and it generates a thermal load of around two megawatts.

Stay

Computing generates heat.
for the new Computer

80 large EC fans on the roof deliver the required heat exchange.

cool

But computers prefer to stay cool. A climatic solution Centre of the Deutscher Wetterdienst in Offenbach

22 degrees Celsius, 55 percent air humidity; and that, preferably without any deviations, round the clock, 365 days per year. The supercomputers in the brand new Computer Centre of the German Weather Service have clear ideas on their own "comfortable climate". When it is only a few degrees too warm for the computing components, they stop working. To avoid this happening, Michael Jonas, head of the German Meteorological Computer Centre (DMRZ), is relying upon a cleverly devised climatic concept. The visible icing on the cake of this cooling system sits enthroned at the very top, on the roof of the newly built weather headquarters: Eight mighty heat exchangers with a total capacity of 2,600 kilowatts absorb the concentrated thermal load from the computer centre, in which 80 large EC axial fans move an air volume of nearly one million cubic metres per hour, to allow the weather computers to stay cool and continue their computing. Neighbours in the surrounding residential area can nevertheless sleep soundly: thanks to the infinitely variable and whisper-quiet EC motors the sound pressure level at a 50-metre distance is only 19 dB(A), it therefore lies far below the legal requirement for residential areas.

And now for the weather For a good weather forecast the modern meteorologist needs a lot of experience and a great deal of measured data, as well as one thing above all: computing power! Numeric weather models cover the globe with a finely meshed mathematical grid. The finer this digital fishnet stocking, the more realistic the results — and the greater the hunger for power. A hunger, however, that Michael Jonas can not quench without limits. As he is not only responsible for the technology, but also for the budget, he must keep an eye on the cost-effectiveness of the computer centre. This also applies to the cooling for the two computer centre rooms. In fact, the computers would prefer to be a few degrees cooler; the value of 22 degrees is a compromise between the current drain and the availability and

The German Weather Service (DWD)

Since its inception in 1952 the German Weather Service (DWD) has operated as the national meteorological service. As a government agency it works for the German Federal Ministry of Transport, Building and Urban Affairs. The DWD operates the largest German network for weather measurement with over 2,000 weather stations throughout the country. Its main tasks are to monitor and document the climate and also to issue warnings for weather-related dangers. The public service function is established in the Act regarding the German National Weather Service. In addition to numerous private customers from the commerce and industry sectors, the DWD supplies up-to-date weather data to federal and state ministries as well as local authorities. Approximately 2,400 employees in the headquarters at Offenbach am Main, the regional centres in Hamburg, Potsdam, Leipzig, Essen, Stuttgart and Munich and the weather stations provide approximately 90,000 weather forecasts every year in addition to numerous other services associated with weather. For instance, heat warnings and a pollen count calendar are published on the Internet. The DWD also runs the National Climate Archive of the Federal Republic of Germany and the German Meteorological Library, one of the largest libraries specialising in weather worldwide.

Weather Forecast: From the Frog to the Computer

Tree frogs issued forecasts on the weather in earlier times. Today's "weather frogs" operate state-of-the-art computer and satellite technology. Meteorologists must closely study atmospheric conditions throughout the whole world so that they can produce their well-founded forecasts. Important parameters are, for instance, the air pressure, speed and direction, as well as the humidity. The weather researchers retrieve these data by using a full-coverage observation network comprising country stations, commercial aircraft and weather satellites. Complex mathematical equations combine the air pressure, precipitation and all the other data with each other. The meteorologists cover each forecast area with a mathematical grid, in which approximation formulae combine the physical parameters for each intersection point. The computer uses these results to supply a forecast for each point, for instance the temperature or wind values that will exist in a few hours or days. At the end of the chain of weather observation and weather simulation is the "operational weather forecast". As the numeric weather forecasts can possibly differ very much from current observations, the final decision upon the optimum forecast is always made by the "Duty Meteorologist", a person who possesses many years of training.

More weather information is at www.dwd.de

Heat Exchangers (Thermofin)
Type: TDD 089.1-25-L (EC) B5-4P

Cooling capacity: each 325 kW, total 2,600 kW // Medium: water-glycol 34 vol. % // Medium inlet temperature: 45 °C // Medium outlet temperature: 40 °C // Cooling surface: each 2,918 m² // Fans: each 10 EC fans size 800 mm, type S3G800 // **Daytime operation:** Air volume per device: each 122,500 m³/h // Air inlet temperature: 40 °C // Speed: 620 ¹/min // Power: 0.45 kW // Current draw: 0.72 A // Sound pressure level at 50 m distance: 37 dB(A) // **Night-time operation:** Air volume per device: each 50,000 m³/h // Air inlet temperature: 26 °C // Speed: 275 ¹/min // Power: 0.05 kW // Current draw: 0.07 A // Sound pressure level at 50 m distance: 19 dB(A)

Precision Cooling Systems (Stulz)

Type: ASD 960 CW // Cooling capacity: each 93.6 kW total 1,872 kW // Configuration: 24 °C / 50 rel.%, 7 °C / 12 °C Fans: each 2 x R3G560 // Air performance per fan: 9,050 m³/h // Speed per fan: 1,235 ¹/min // Power per fan: 1.4 kW // Current draw per fan: 2.33 A // Device sound pressure level: 60.5 dB(A) (2 m, free field)

reliability of the systems. On an area of over 1,000 square metres computers line up next to computers, racks to racks, cabinets to cabinets, and it is continuously expanding. As a comparison: in 2003 the DMRZ reached a computing capacity of 3,000 gigaflops — around 3,000 billion computing operations per second, equating approximately to the power of 20,000 PCs. In the final construction stage in 2012 Michael Jonas will make a power of 50 teraflops available to its users. This is around 50,000 billion computing operations per second — the performance of around 400,000 PCs. Whoever wants to compute so much also needs a lot of electricity to do this: even today the systems, including the required cooling, allow themselves a current draw of a good 600 kilowatts. A value that will increase to roughly 2,000 kilowatts by 2012.

Current in, heat out What comes in a current, must then go out as heat, according to a rule of thumb. Different factors must therefore be taken into account when planning the air conditioning for the computer centre: in addition to room size, current draw, redundancy and thermodynamics, the energy efficiency plays a growing role. The DMRZ relies on a cold-water pump circuit system (5,000-litre reservoir in the cellar) as well as forced cooling with Stulz CyberAir precision air-condition systems. In the cold months external air is fed in for cooling. As the external temperature sinks, the load for the compressors in the air-conditioning systems also sinks. Intelligent standby management reduces this load even further. It distributes the stored reserve capacities equally to all systems which then run in the partial load range and thus very economically. Further savings potentials are provided by the fans in the CyberAir air-conditioning systems. Just like their big "colleagues" on the roof, they are also powered by electronically controlled EC direct current motors and deliver precisely the air flow that is used. Not less, but also no more. They adapt without variation to all power requirements and run very efficiently in the partial load range.

The thermal load generated by the German Meteorological Computer Centre will increase to over two megawatts by 2012.

Controlled Air Traffic The cold air generated by the air-conditioning systems is directed down into the raised floor and then along to racks and computer cabinets. The "cold-aisle/hot-aisle containment" principle provides an optimum cooling circuit. In a cold-aisle the cool air from the air-conditioners is passed through the perforated floor plates and drawn-in by the computer fans. The heated air then flows into the opposite hot-aisle, rises to the ceiling and flows back to the air-conditioner. A water-glycol mixture absorbs the excess heat and transfers it to the heat exchangers on the building roof. In the cool months the heat exchangers don't have much to do, the amount of waste heat is nearly zero. The reason: the heat is extracted from the coolant by a heat pump and is then used for heating the German Weather Service office areas totalling over 22,000 square metres. The computers therefore not only supply the much longed-for computing power to the meteorologists and scientists, they also simultaneously provide a cosy atmospheric environment. ○

The newly constructed DWD headquarters lies in a residential area in Offenbach. The heat exchanger system on the roof must therefore fulfil strict noise requirements in addition to ultimate demands on operating reliability and energy efficiency.

Energy diet

Continuously operated cooling equipment does not have to be an energy hog

In groceries, freshness is the most dominant advertising promise. “Fresh” means healthy, crisp and rich in vitamins. To keep groceries fresh, the cooling units available on the market continuously get better, bigger and more powerful. But freshness does not come cheap. In Europe, the power consumption of plug-in refrigerated cases in commercial stores account for three percent of the total power consumption. A large supermarket uses approximately ten times as much electricity as an office building of the same size and more than half of that energy is used for food refrigeration. Currently, there are about 55,000 food businesses of various sizes in Germany — not including countless petrol station shops, where chilled beverages, frozen pizza, ice cream, deli meats and cheese await customers. These numbers explain why energy efficiency and environmental performance have become a hot topic for manufacturers of refrigerated cases and refrigeration systems. A few years ago, acquisition costs were the predominant factor in the decision to purchase refrigerated cases, but today, the awareness of higher energy prices and the demand for environmentally-friendly products are playing a crucial role. “Invest today, save tomorrow” is an argument that can no longer be ignored in the face of today’s electricity prices and expected future trends — and it presents an opportunity for the energy-saving motor (ESM) with EC technology.

The concept of using the ESM in refrigeration systems had already been conceived several years ago. The higher price of the drive compared to the conventional shaded-pole motor had been slowing down sales. However, technical advances and the increased awareness of follow-up costs now give ESM sales a steady boost. By comparison, an energy-saving motor in continuous operation at 360 cubic metres per hour uses approx. 440 kWh in five years. The shaded-pole motor “eats up” 1,400 kWh under the same conditions. Refrigeration systems have to be up and running 24 hours a day — 8,760 hours per year. Especially for devices that are in continuous operation, even the smallest potential for energy savings is naturally appealing. Moreover, at the current price level today, it is realistic to assume the cost for devices with ESM will be amortised in under two years.

The crux of the matter is not really the continuous improvements in the field of energy technology for new systems. Fast and easy-to-implement solutions are needed for the machines already installed at the customer’s location, which have an average service life of ten years. To address this specific task, ebm-papst offers the iQ motors. The motors are completely interchangeable, so older equipment can be retrofitted with hardly any effort and customers can immediately begin saving money. Jan Kröger, Area Sales & Marketing Manager of the EPTA Deutschland GmbH, also looks favourably upon this opportunity to provide a real service to their customers. The EPTA Group, headquartered in Milan, Italy, is the industry leader in designing, manufacturing and installing refrigerated

Fresh food, high costs? EC technology helps save energy, emissions and money.

cases, multicompressor cooling systems and cold storage cells for self-service stores, supermarkets and discount stores. It installs between 60,000 and 80,000 motors and fans made by ebm-papst Mulfingen per year. As part of a large-scale project, EPTA is currently informing its customers about the option of making their machines more energy-efficient by replacing the motors with energy-saving motors by ebm-papst Mulfingen. "We are determined to convince our customers of the advantages," explains Jan Kröger, "and that has become increasingly easier for us since our customers, primarily supermarket operators, make their calculations based on relatively low earnings and margins. Retrofitting the existing equipment pays for itself in three years. This manageable time horizon makes sense to our customers."

How come the energy-saving motor with EC technology is so efficient? Thanks to a maximum motor efficiency of more than 65 percent, power consumption is reduced to approximately a third of commercially available shaded-pole motors. One of the main reasons for the lower energy consumption is that the EC motor is equipped with permanent magnets which create a continuous magnetic field. For the shaded-pole motor, the magnetic field must first be generated, requiring high energy input. Due to the higher efficiency, less waste heat is given off into the surrounding area, which in turn means that less cooling output is required. In addition, a second working speed for night mode is possible via an adjustable input. This, too, has a positive effect on energy consumption. Energy-saving motors produce between five and 22 watts output power and, combined with the corresponding housings and impellers, the motors can be installed in various positions. They are insensitive to dust deposits and splash water, and permitted ambient temperatures may range between –30 °C and +50 °C. ESMs are robust and practically maintenance-free. With a life expectancy of more than 40,000 hours, which corresponds to at least 4.5 years in continuous operation, they are exceptionally durable.

At current energy prices, EC technology pays for itself in energy savings after just about two years.

And the development continues. Fans powered by EC drives now offer the ideal solution even for applications that require high output, such as those in cold storage areas and condensers. The electronically commutated three-phase motors work with up to 90 percent efficiency and thus attain higher values than the conventional asynchronous motors that are used in centrifugal or axial fans. An additional advantage is the integrated control and power electronics which makes controlling the EC fans easier. An external sensor measures the ambient values and continuously adjusts the set speed values of the fans. In this way, the fans produce only the air volume that is actually required.

The growing importance of environmental protection and the awareness of responsible and cost-conscious energy use are the forces that have driven innovations such as the energy-saving motor and will continue to do so. Experts believe that the ESM will become the standard within the next three years, considering the EU Energy Directive which will come into effect in 2009. The ability to convert existing installations into more energy-efficient ones with relatively little effort represents a way to make an active contribution to climate and environmental protection. This is a start, but by no means the end of the road. ○

THE RACING MACHINE

Every cubic centimetre of space that is taken up by a fan in server racks or telecommunication base stations is wasted space. A new generation of high-performance fans gets moving — to make more room

Faster than all the others: The S-Force fan even borrows from aviation technology to keep up the speed.

Multiplying the output in the same installation space was the goal of Thomas Brodbek, Sales and Marketing Manager.

It takes five microseconds for the blade to complete one round. The tip cuts through the air at a speed of 228 kilometres per hour. The high-performance fan is called the S-Force, and it runs almost twice as fast as others its size. It uses something known as Moore's Law. In doing so, it regains something extremely precious: installation space. At least every two years, the computing power of computer and memory chips doubles. This was predicted by Intel co-founder Gordon Moore back in 1965. Back then, chips were almost big enough to be cooled by placing one's hand on them, mainframes filled ballrooms and the small room required for the climate control system was relatively unimportant. To this day, Moore has been proven right. Today, chip manufacturers pack the "ballrooms" into a couple of square centimetres of silicon, which, when uncooled, reaches the temperature of a hotplate at the highest setting. To prevent this, the cooling systems are becoming proportionately more complex. For example, the base station that belongs to each antenna mast in the wireless network is often no larger than the rolling drawer unit under an office desk. Inside, it is tightly packed with interchangeable IT modules. However, between ten and twenty percent of the space is reserved for the ventilation system and air circulation. The exact amount depends primarily on its maximum efficiency.

With the S-Force, ebm-papst's engineers have followed Moore's philosophy: pack more power into the same space. In this case, it means a massive increase in speed. This can be attained only with a special fan. The aerodynamics of a fan is tuned to a defined speed range. Anything over a certain point only causes turbulence of the air. The running power does not convert into the volumetric flow rate, and the fan "gasps", so to speak. Moreover, the energy consumption and mechanical loads increase disproportionately. The material fatigues, the bearings overheat. A device that only rotates faster will not attain a long service life. The S-Force fan in the middle of the five speeds, however, reaches 11,000 rpm. In doing so, it pushes 570 cubic metres per hour of fresh air through its housing — approximately the amount of air in a four-room apartment in an old building with high ceilings. Its output is three times that of a normal fan of this size, and it maintains this air flow for a good 60,000 operating hours, during which it moves 34 million cubic metres of air.

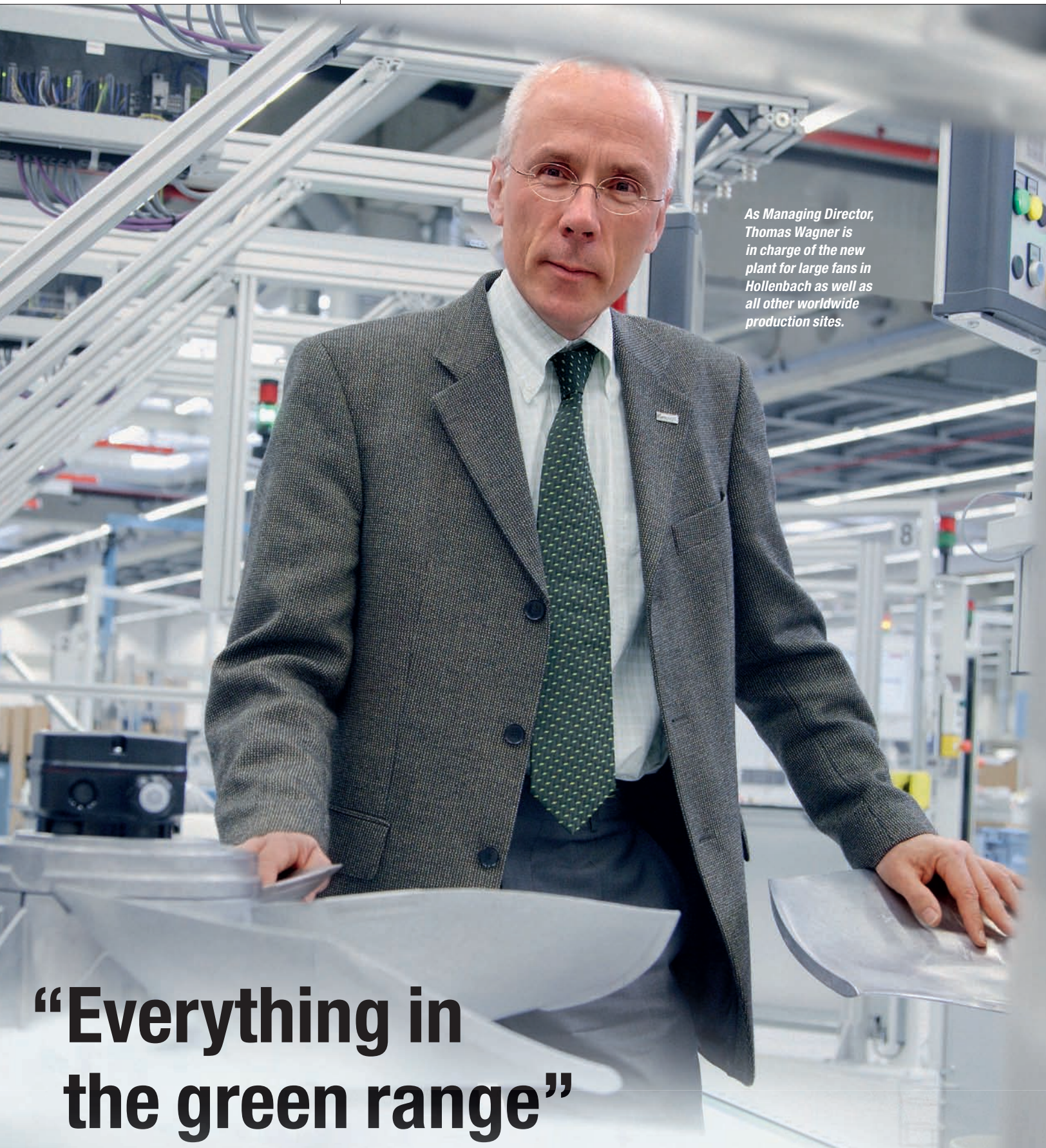
To give the fan the necessary endurance, its creators have designed it from the beginning for maximum performance. Instead of the usual single-phase motor, it has a three-phase motor, rare earth magnets in a resin bond, a twelve-pin rather than a four-pin magnetised rotor, and a robust rotor bearing with ball bearings and special lubricants. This means a performance increase of about 500 percent compared to similar motor sizes. The motor electronics of the controllable, sensorless EC motor received new integrated circuits, which, along with all of the other measures taken, increase the motor efficiency up to 85 percent. Efficiency of 65 – 70 percent is common. The sickle-shaped blades were given "winglets" on the tips to prevent vortex generation — which not only causes noise, it also brakes the impeller. As another safeguard against vibrations, eight fixed links, rather than the usual three reinforce the housing. These not only strengthen the design, they also lower the noise level while actually increasing the blower output. So that this marathon runner does not overheat at its fast pace, the developers also refined the air conduction through the motor. This keeps the bearing and motor at temperatures conducive to a long service life, even at full speed.

Winglets on the blades prevent vortices that cause resistance.

Thus equipped, the example fan can run 39 billion rounds before passing on the baton. However, the owner of the telecommunications container is interested in something completely different: how much space will be gained? The answer: at the given output, approximately half the space taken up by cooling with standard fans. With the given space, what is gained is the assurance of being able to last through the next Moore cycle, when even hotter chips move in. ○

Types, numbers, facts

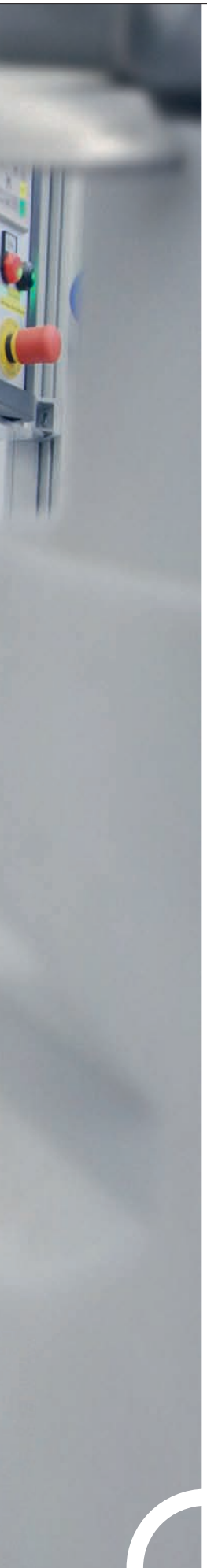
Type	Dimensions mm	Speed min^{-1}	Air flow m^3/h	Pressure increase Pa	Sound pressure dB(A)	Acoustic power bel
8200 JH	80 x 38	14,000	220	650	71	7.8
3200 JH	92 x 38	13,000	280	700	73	8.2
4100 NH	120 x 38	11,000	570	1,200	78	8.9
5300 H	140 x 51	9,200	670	1,300	79	8.8
6300 H	172 x 51	9,200	950	1,100	75	8.4



As Managing Director, Thomas Wagner is in charge of the new plant for large fans in Hollenbach as well as all other worldwide production sites.

“Everything in the green range”

Energy efficiency in construction: the new plant in Hollenbach in Germany sets benchmarks



Green plant: the primary energy consumption is about one-third of the legally mandated target.

Just a few kilometres north of the headquarters in Mulfingen, a new plant grew from the home soil of Germany's Hohenlohe region in just six months. Here, in Hollenbach, ebm-papst has produced the largest flagship models in its product range: fans with a blade diameter of up to one meter. Equipped with state-of-the-art technology and spanning over 13,000 square metres, the plant sets benchmarks — including those in energy efficiency. Managing Director Production Thomas Wagner explains the concept behind ebm-papst's newest location.

Mr Wagner, why is this plant located in Mulfingen-Hollenbach and not in Shanghai, Chennai or another low-wage location?

Thomas Wagner: Because all our data speaks in favour of the Hollenbach location. Refrigeration and air-conditioning technology, the industries for which we manufacture here, is a primarily European business with a high percentage of project business, in which speed and the ability to deliver are important. We cannot supply a customer in Vienna, Offenbach or Sheffield from China. With delivery times from eight to twelve weeks, that takes much too long.

Other than the geographical proximity to the markets, what else speaks in favour of Germany as a location or, more specifically, Hollenbach?

Wagner: For example, when looking at the costs, you have to remember logistics. Ocean freight for one large EC fan is a good 50 dollars! Much more important, however, is the fact that we produce high-tech products that need an appropriate development and production environment. In Hollenbach, we have that: highly skilled, experienced employees, longtime relationships with suppliers, short distances. All those involved in the project are close by and can make their contributions directly. If there is a problem, I can have all of the responsible colleagues sitting at a table in 15 minutes. We can easily produce simple "me-too" articles in cheaper foreign countries, but we manufacture premium products here, in the green Hollenbach countryside. This is supported by rational arguments like those I mentioned, but also, of course, by our close feeling of connection to the region.

The Hollenbach plant is not only located in the green countryside, it also has a lot of green technology built into it. What are you most proud of?

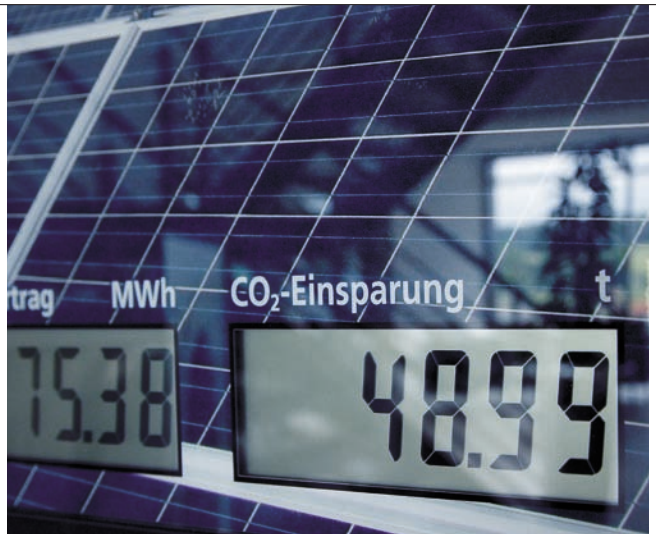
Wagner: The credit belongs primarily to the designers and specialists from a wide variety of trades. In an outstanding display of teamwork, they were able to complete the planning of this plant in just six months and build it in another six.

Which technologies are most noteworthy with regard to energy efficiency?

Wagner: A number of energy conservation measures have been implemented in the new plant. In addition to a photovoltaic system and the consistent use of components with the highest energy efficiency, the most outstanding feature is the intelligent use of waste heat. We attain a primary energy consumption level that is 80 percent less than the value required by the German Energy Savings Ordinance for new buildings.

How were you able to get the value so low?

Wagner: In industrial buildings, in addition to the energy demand for heating, factors such as the demand for cooling and ventilation are evaluated. Our technology gives us a home advantage in this area. After all, we produce energy-saving EC fans here, and of course we use them in our own ventilation and cooling systems. Thus we are in the green range, both in terms of the efficiency of the plant itself and the products produced here.



Left: Part of the ventilation system.

Right: Counters of the photovoltaic system in the foyer.

An essential success factor in Hollenbach is ebm-papst's own expertise in air-conditioning/HVAC technology. It enables CO_2 emissions to be decreased by 300 tons annually and reduces air-conditioning costs.

What is the "green range" for industrial buildings? Can you give concrete numbers?

Wagner: The primary energy consumption of the entire plant is about 210,000 kWh per year. Normally — if we used conventional technology — it would be a good million kWh. We keep over 300 tonnes of CO_2 per year out of the environment — and save 75,000 EUR relative to the annual operating costs for heating, ventilation and cooling. To attain these values, we have implemented a package of measures. The photovoltaic system on the roof supplies up to 153 kilowatts. To support the heating system, we use the temperature stratification in the buildings. This temperature stratification is specifically induced using displacement ventilation. We guide the warm air, which accumulates especially in the higher strata in the production area, through a distribution system and into the cooler areas, such as the warehouse or shipping department. Another noteworthy feature is the sprinkler reservoir, which we use as a heat accumulator.

"The warm air near the ceiling of the manufacturing department, for example, heats the warehouse and shipping department. This supports the heating system."

You use fire extinguishing water as a heat accumulator?

Wagner: Yes, due to the size and design of the hall, we were required to install a sprinkler system with a corresponding water reservoir. Thus the basement of the building has a concrete tank with over one million litres of fire extinguishing water. We use this water as a heat accumulator, for example for the heat given off by the compressor system, which, in turn, serves as the heat source for a heat pump. In summer, the heat pump is used for cooling as a chiller.

ebm-papst has invested about 15 million EUR into this plant. What business goals are being pursued with this investment?

Wagner: Planning for the new building began in Summer 2006. After the split from our sales partner for large fans, we initially added these products to the production in our Mulfingen plant. However, Mulfingen was never designed for these products; problems were caused by the sheer size of the fans with diameters of up to one metre. We were literally running out of space. The new building basically gave us the opportunity to build the plant around the production line, ensuring that production would be optimally suited to these fans. We see an excellent future, particularly for EC fans; the manufacturing plant is currently designed for approximately 800,000 units per year. If it should prove inadequate, we still have enough room to expand. Here, too, everything is going green. ○

The new Hollenbach plant: Ground-breaking: 16 April 2007 // Beginning of move: November 2007 // Employees: approx. 150 // Investments: approx. 15 million EUR // Production space: 13,500 square metres // Manufacturing capacity: 800,000 fans

Air-conditioning technology: Ventilation: 13 units with EC motors // Heating and cooling pumps with the highest efficiency class // Heating with displacement ventilation // Sprinkler reservoir as heat buffer: 1,100,000 litres // Photovoltaic system: 153 kW // Primary energy consumption: 210,000 kWh/a (approx. 1/5 of standard consumption)

Optimum burner temperature

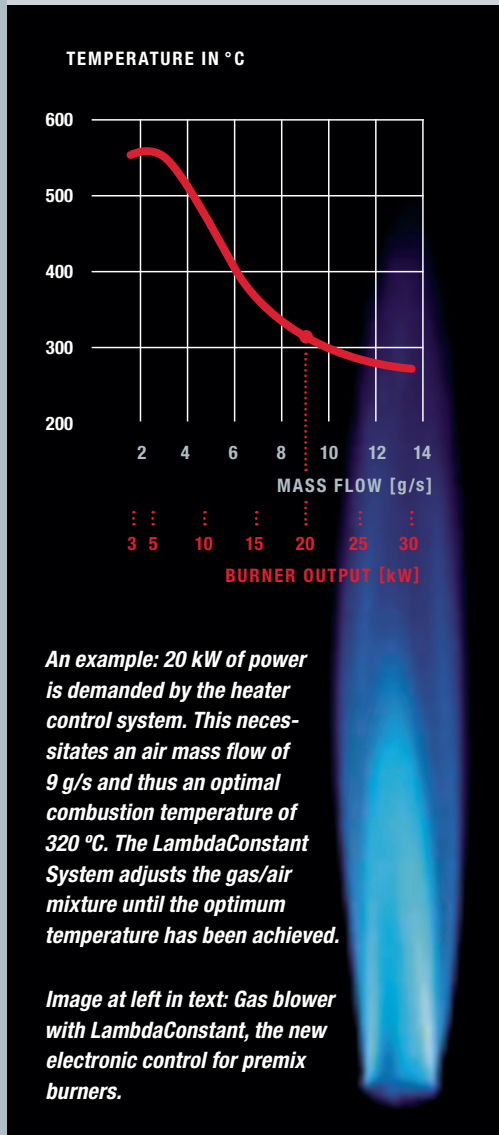
LambdaConstant: the future of gas condensing boiler controls

LambdaConstant is a newly designed control system for combustion in gas condensing boilers in which the combustion temperature is measured directly at the gas burner. The measurement uses thermocouples on the surface of the burner. Taking measurements in the oxidising flame, with highly stressed electrodes that require very accurate positioning, is now unnecessary. The programmed LambdaConstant curve allows the optimum burner temperature to be set accurately, without the usual safety margins for limiting gases. The operative ranges for commercially available gas burners can be extended significantly to a high modulation range of 1:10. This high modulation range cannot be attained currently with conventional gas condensing boilers.

The already high efficiency of gas condensing boilers can be increased even more in the partial load range, as energy losses in cyclic operation are minimised by pre- and post-flushing phases. This is referred to specifically by the draft of the European EuP environmental design directive. The great advantage of the LambdaConstant system is that the mass flow of the supply of combustion air is measured directly at the gas blower using a digital mass flow sensor. The specially developed laminar flow element with extremely low pressure drop ensures a stable sensor signal over the entire modulation range from 1:10, even with small mass flows and in dirty ambient conditions. The mass flow signal is transmitted via an intrinsically safe digital bus system from the blower directly to the burner controller, where it is processed. The blower also has a highly accurate built-in gas control valve that allows even small changes in the air-fuel ratio to be adjusted for quickly. The air mass flow and burner temperature are evaluated in the LambdaConstant burner controller by a dynamic target value regulation with adapted time constants and the gas control valve is adjusted according to the target values, even if the air mass flow changes quickly. The low pressure drop in the laminar flow element allows the same gas blowers to be used with higher air supply and exhaust pipe lengths; with the same pipe lengths, the gas blower power consumption is lower. The effects of different exhaust pipe lengths or wind for different pressure zones of a house are compensated for by the continuous measurement of the mass flow. The ignition mass flow for optimal ignition is adjusted automatically. Even at great installation heights, the unit output is kept consistent due to the mass flow measurement. The adaptation of minimum or maximum heat output commonly required in the Alpine regions or certain regions of the USA is not necessary.

A significant advantage of the LambdaConstant system is the independence of the gas type and gas family. Pure methane from Russia, North Sea gas with nitrogen or hydrogen admixtures and biogas with CO_2 content have virtually no effect on the burner curve. Even when switching to propane and butane mixtures, the system adapts exceptionally well. This allows the number of heating unit variants to be reduced significantly for manufacturers, wholesalers and heating contractors. In sum, the LambdaConstant combustion control system is another great improvement in today's generation of gas condensing boilers in terms of efficiency, deployment, robustness, and number of variants. ○

Dipl.-Ing. (Graduate Engineer) (FH) Jürgen Schwalme, Manager, Gas Laboratory ebm-papst Landshut GmbH.



An example: 20 kW of power is demanded by the heater control system. This necessitates an air mass flow of 9 g/s and thus an optimal combustion temperature of 320 °C. The LambdaConstant System adjusts the gas/air mixture until the optimum temperature has been achieved.

Image at left in text: Gas blower with LambdaConstant, the new electronic control for premix burners.

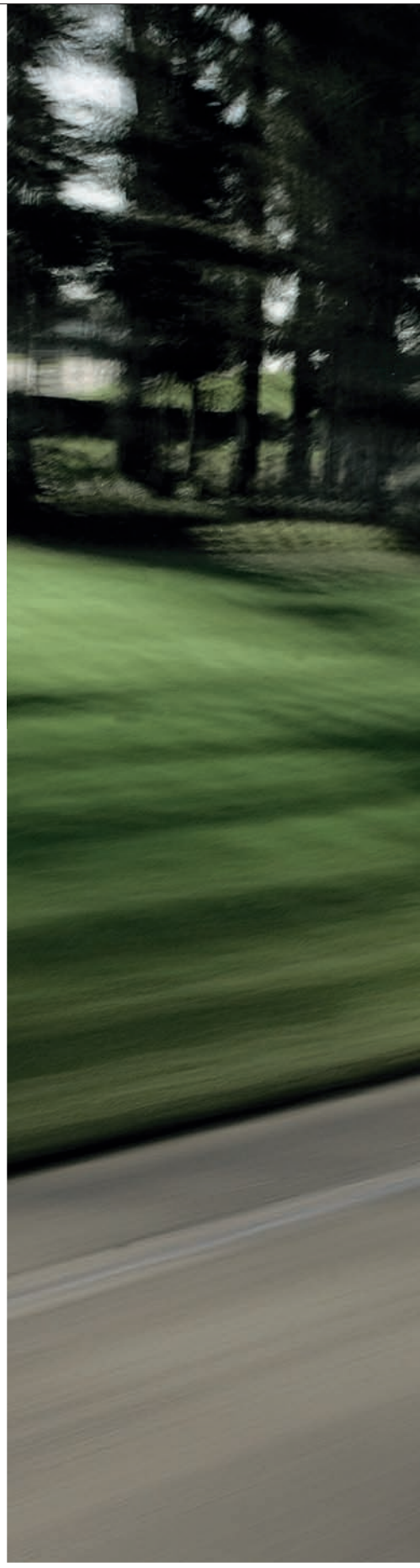
A perfect fit

Seating comfort in the sportscar; ideas from St. Georgen ensure a comfortable seat climate in the new Mercedes SL

SL. Few pairs of letters get car fans as excited as this one. Without a doubt, this is because the SL is more than just a status symbol to be shown off. The roadster is a driving machine whose design, sporty performance and high-end equipment are an irresistible temptation to get in, take off and keep on driving. An exceptional seat ventilation system ensures that even extended road trips are a pure pleasure. Peter Metzger, Automotive Sales Manager at ebm-papst in St. Georgen, is an expert on the inner workings of the SL's seating.

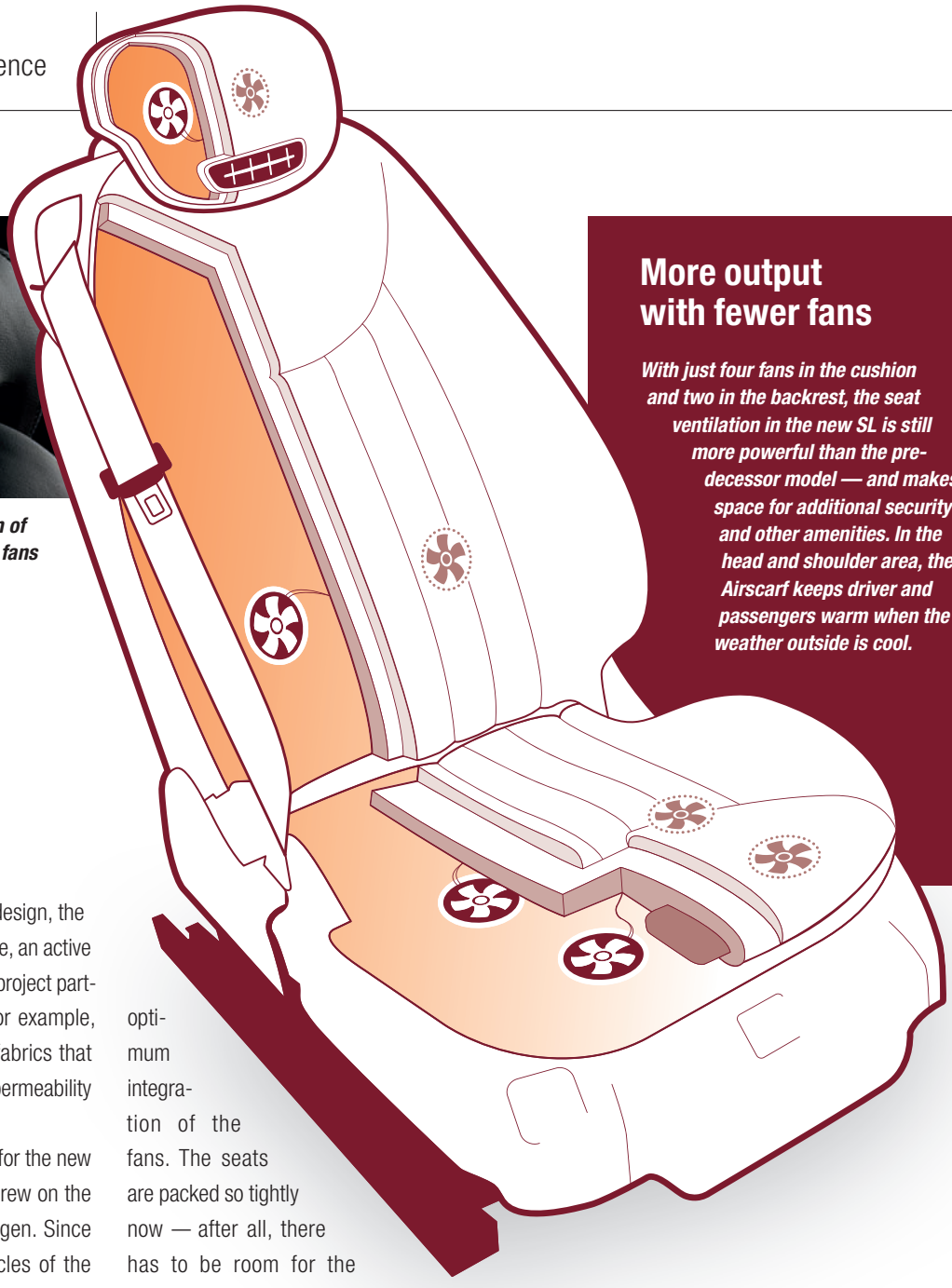
Seat climate control for the airy convertible? If you think that this is a useless luxury item on the back pages of the options list, you are wrong. Precisely while convertible drivers are exposed to the weather so directly, they benefit from an intelligent climate control solution. Says Metzger: "If it's hot, you stick to the leather seat. If it's cold, you get a stiff back in no time flat. The drafts make cold ears and neck and shoulder tension constant companions of convertible drivers." The last part is now a thing of the past for SL drivers and passengers. A feature known as the "Airscarf" extends the convertible season to the cooler months. Like a protective scarf, the airscarf wraps a layer of heated air around the head and shoulders, making the carefree roadster experience possible even in spring and autumn. Two axial fans take in air behind the headrest and guide it through an electric heating element before it flows out at a comfortable temperature at shoulder height. The Airscarf adapts to both the speed and the outside temperature. This concept is similar to that introduced back in 2004 in the SLK, with a centrifugal fan hidden in the lower area of the backrest. A duct system guides the heated air to the seat's integrated headrest. "For the SL, however, we had to redesign the Airscarf completely, as this model does not have an integrated headrest and a visible duct connecting the backrest and headrest was not desired", says Metzger of the evolution of this now extremely popular option. However, the fans are intended to be visible. "Here, the trend is currently changing; technology is definitely allowed to be visible and to be experienced."

Tight space in the seat The ventilation of the seat cushion and backrest is a real challenge to engineers. Conventional climate control systems ensure comfortable temperatures on the front side of the body only. They cannot do much about the seat and back. However, unpleasant trapped heat occurs precisely at the surfaces where the passenger contacts the seat. The driver sweats, has difficulty concentrating and his or her mood plummets. Because air cannot flow through the seat surface and only rear ventilation is possible, the right match of fan and seat material is critical. The key portion of the relevant air performance is determined by



Roadster feeling, even when it gets cool. The convertible season lasts longer in the new SL.

Innovation to be admired: the redesign of the Airscarf for the new SL makes the fans a real looker.



More output with fewer fans

With just four fans in the cushion and two in the backrest, the seat ventilation in the new SL is still more powerful than the predecessor model — and makes space for additional security and other amenities. In the head and shoulder area, the Airscarf keeps driver and passengers warm when the weather outside is cool.

the fan itself; the rest depends on the design, the material and the seam system. Therefore, an active exchange of ideas takes place with the project partners involved in seat development. For example, discussions take place about spacer fabrics that allow air flow, foam rubber covering or permeability of the leather to air.

To find an appropriate solution for the new SL, the designers at Mercedes-Benz drew on the entire store of experience at St. Georgen. Since 1997, ebm-papst has equipped vehicles of the world-famous Stuttgart-based marque with fans both large and small. To the present, 14 series have profited from the skill of the air moving experts from Germany's Black Forest region. The EC fans provide critical advantages: vibrations are no longer noticeable, and they are quiet, enormously powerful and equally energy-saving. Moreover, their service life is at least as long as the vehicle in which they turn. "Even in the smallest space, we have to ensure optimum integration of the fans. The seats are packed so tightly now — after all, there has to be room for the massage function in the backrest", the Sales Manager reports. Because Metzger and his colleagues at ebm-papst understand the current reality, they make do with the little space available: "We were able to reduce the number of fans with an intelligent arrangement and technical optimisations." Previously, four to six compact axial compact fans in the seat cushion and up to four in the backrest have ensured a fresh breeze. The future — which is already reality in the SL — is four fans in the cushion and a mere two in the backrest. "We continue to use fans from our 400 series, which have exceptional running smoothness despite a noteworthy increase in speed", Christoph Schindler, Key Account Manager in Metzger's team, explains proudly. "We now attain significantly higher output with fewer fans. This is due not only to the developers' pursuit of continuous innovation, but also the customers' desire for cost efficiency." However, Metzger also knows that not everything is dictated by technical or economic questions. "For example, the maximum size of the holes in the seat leather is decided not by the engineers, but by the designers." ○

"Even in the smallest space, we have to ensure optimum integration of the fans."

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Chillventa, Nuremberg, Germany, 15–17 October 2008
Convergence, Detroit, 20–22 October 2008
MATELEC, Madrid, Spain, 28 October–1 November 2008
HVAC (VVS Dagene), Lillestrøm, Norway, 29–31 October 2008
electronica, Munich, Germany, 11–14 November 2008
Elmia Subcontractor, Jönköping, Denmark, 11–14 Nov. 2008
Medica/Compamed, Düsseldorf, Germany, 19–21 Nov. 2008
SPS / IPC / DRIVES, Nuremberg, Germany, 25–27 November 2008
AquaTherm, Prague, Czech Republic, 25–29 November 2008
SCS Automation & Control, Paris, France, 2–5 December 2008
AHR Expo, Chicago, 26–28 January 2009

Events

Indoor football championships for A-Juniors, 10–11 January 2009
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tech.mag 2/2008 is available right now. Contact our sales team or e-mail Corinna.Schittenhelm@de.ebmpapst.com.

Being a good neighbour

Canteen Manager Dietmar Jeßberger cooks for children and teenagers of a neighbourhood foundation

Dietmar Jeßberger needs both hands to hold his stirring spoon. His pots are the size of children's bathtubs and the corresponding cooking spoon is as big as a walking stick. Every day, more than 1,000 warm meals are served in ebm-papst's staff canteen in Mulfingen, Germany. The freshly prepared meals are not only well-liked by staff, but also by the 100 or so children and teenagers in the care of the St. Josefspflege GmbH, a charitable foundation in the neighbourhood. Jeßberger and his team have been making extra portions for the church-owned educational institution since mid-2006. The institution provides needy young people with services including childcare, education and counselling. It was the division manager, Andreas Berns, who approached neighbouring ebm-papst with the idea for "Cooking for Kids" at the beginning of 2006.

Until then, the institution had operated its own kitchen. However, facing increasingly limited financial resources and cancelled subsidies for kitchen operation, the Josefspflege was forced to look for alternatives. Berns did not have to argue his point for very long. For a minimal fee, the canteen now also cooks for the children. Four times a week, the young man doing his civilian service at the institution, picks up the food in big yellow food warming boxes. In their own kitchen, the delivery is first "redirected": Main dishes, sides and salads are distributed to the different groups based on their individual wants and needs. Vegetarians receive vegetarian cuisine, the little ones get slightly smaller portions, and the group that just came from the gym get extra large portions. Every Wednesday, the catering service by ebm-papst is skipped for a day because the St. Josefspflege fires up the stove in its own kitchen. Guided by their teachers, the teenagers combine their efforts and cook their own lunch. This activity is part of the pedagogical concept and is intended to prepare the teenagers for leading a "normal" life.

Served fresh: Four times a week, the children's lunch is provided by ebm-papst.

"Healthy food that tastes great!"

Dietmar Jeßberger, 45, has been managing ebm-papst's in-house food service since 1998. Together with four chefs and 23 additional kitchen staff, he prepares approx. 250,000 large and small meals per year. Apart from the canteens at the plant in Mulfingen and the new plant in Hollenbach, he also cooks the meals for ebm-papst's guest catering facilities, provides catering services at trade shows and makes sure that more than 100 vending machines for beverages, coffee, ice cream and snacks are always well stocked.

Canteen Manager Jeßberger did not have any concerns that canteen food may not be the right thing for children and adolescents: "Our meals taste just like home cooking!" Living up to this high standard is the highest priority for his kitchen staff. It starts with the selection of ingredients. Generally, only fresh products are used for cooking, and the kitchen chefs prefer regionally produced products when shopping. That is quality you can see and taste. And how do the children like it? "In that respect our kids are no different from other children," says Andreas Berns with a laugh. "Obviously, we make every effort to offer them a balanced and varied diet, but at the very top on their list of favourites are, of course, classic menu items such as broiled chicken and cutlets with chips."

Jochen Frieß, 37, and son Jonas, 2, Managing Director ebm-papst Middle East
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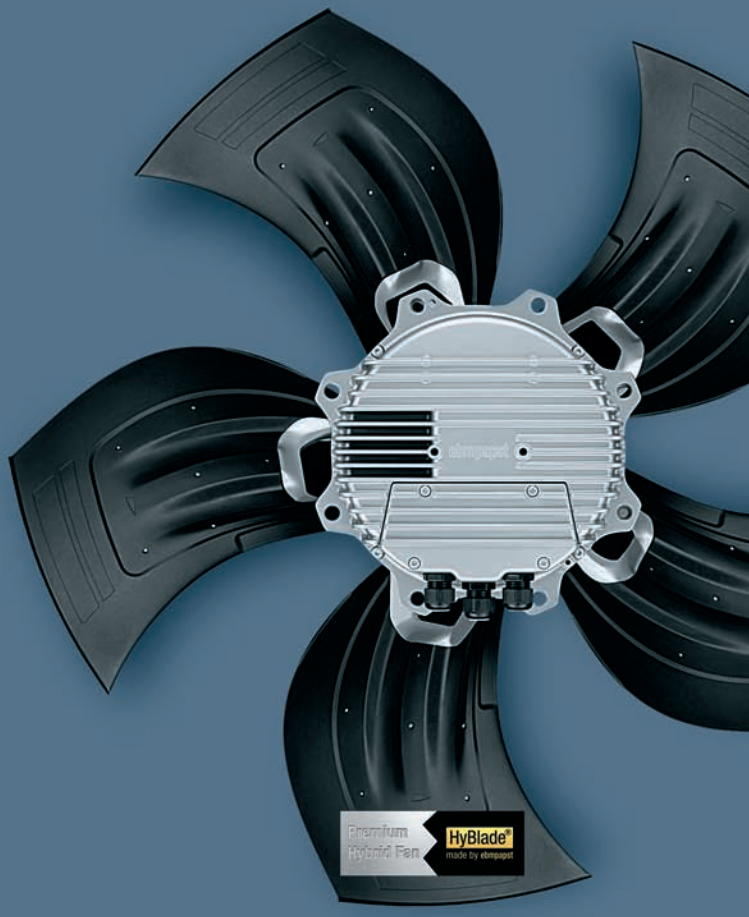
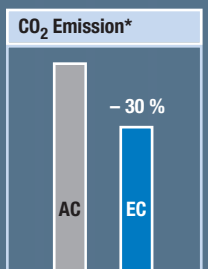
info@ae.ebmpapst.com

"When I look out of my window, construction cranes are stretching high into the sky everywhere. Every day, I witness the immense pressure the sheikhs apply to push the development of the emirate ahead. The goal is clear: independence from oil. This also includes a liberal economic and fiscal policy, which makes it easier for foreign companies to set up in the country. In the free trade zone where ebm-papst is located, already more than 5,000 international companies do business — and that number is continuously growing. ebm-papst has been represented in the emirate of Dubai since the beginning of 2006. The establishment of the company in Dubai also happened to be the topic of my Master's thesis. Our approach in Dubai is typical for ebm-papst. We are a sales company with our own local warehouse. Customers receive their order within 24 to 48 hours if the corresponding forecast has been provided. Not only our clientele here in the UAE, but also in Iran, Egypt or Saudi Arabia are impressed with the speed of delivery. My five colleagues and I work very hard to capitalise on our competitive advantage. After all, we at ebm-papst also have high aspirations here in Dubai."

Win

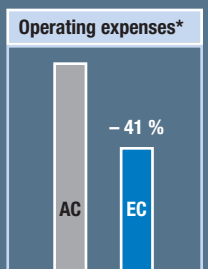
Win





* Detailed calculations on our website

- conventional technology
- ebm-papst EC technology



At last, here you have a proper win-win situation: In a single year, the entire European industry consumes about 86 billion kWh in electricity just to run conventional fans for ventilation, refrigeration and air-conditioning applications. If one were to replace all these fans with our latest generation of so-called EC-fans – which is as easy as pie, by the way – 26 billion kWh in electricity could be saved! And the winner would not only be you, enjoying a considerable reduction in operating expenses by a solid 41 %, but our planet, too. Each year, Earth could enjoy up to 16 million tons of CO_2 less in harmful emissions. For details on how you can profit from such a win-win situation, simply turn to **www.eco.ebmpapst.com**

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