

02° 2015

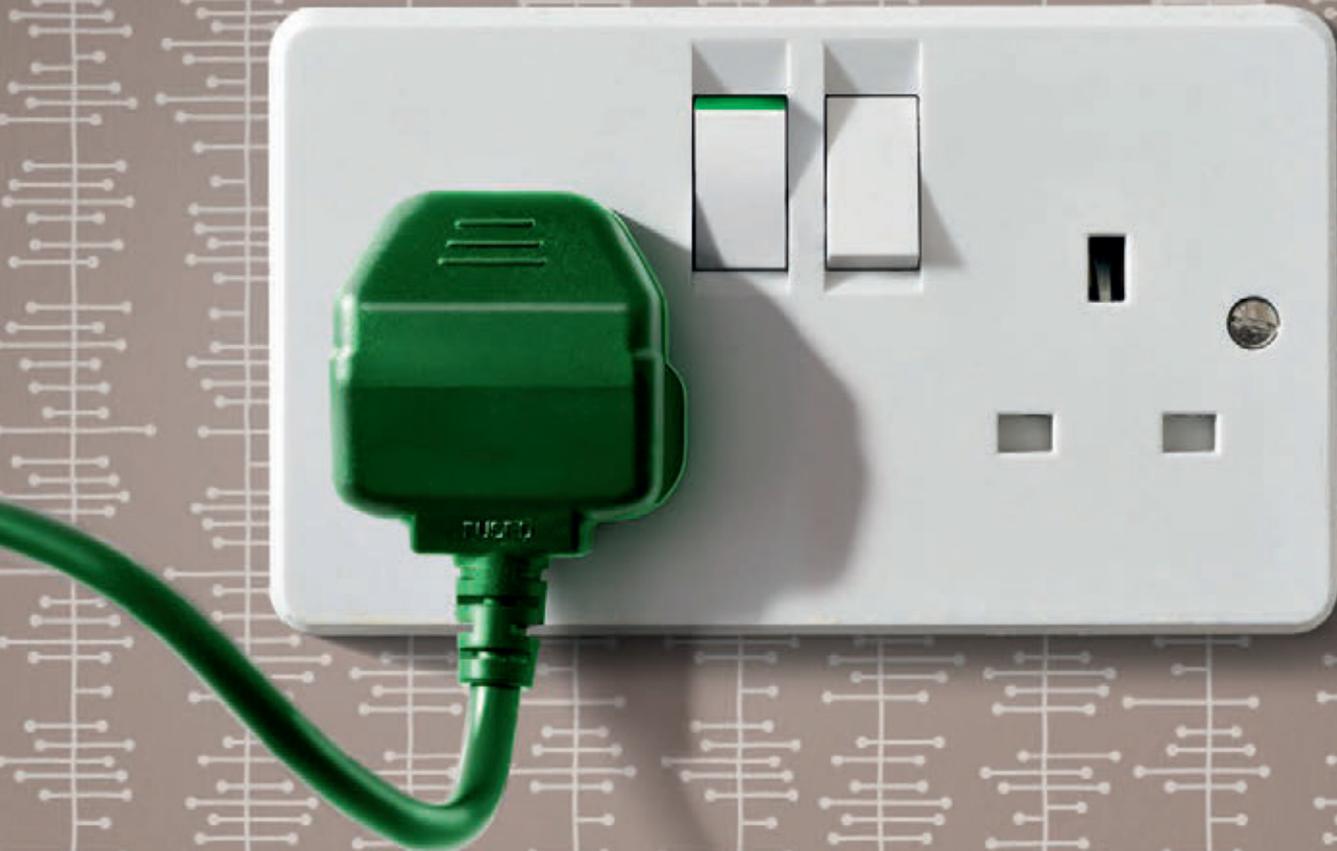
mag[°]
all about ebm-papst

°14 **Harmony on the high seas:** EC fans provide for perfect cabin conditions on a cruise ship.

°28 **The coolest team in Formula One™:** A garage cooling system makes work easier at hot races.

POWER TO THE PEOPLE!

A micro-CHP unit from the British company Flowgroup provides a clever power supply for small households



WORLDWIDE

“we make
room”

world





ebm-papst

Gaining, sharing and using experience

Thomas Borst

**Managing Director
Sales and Marketing
ebm-papst Group**

Dear readers, Every day we gain experience in many different applications — from cruise ships to inhalers for horses. An existing technology that we gain experience with in one sector can be a true innovation in a different sector, offering customers there a way to stand out from their competitors. But for that to be possible, the proverbial left hand has to know what the right hand is doing. Here at ebm-papst we work to make sure that information that flows in at one place can be transferred to other applications. We have established processes at the customer interface to allow the freedom of movement required for this transfer.

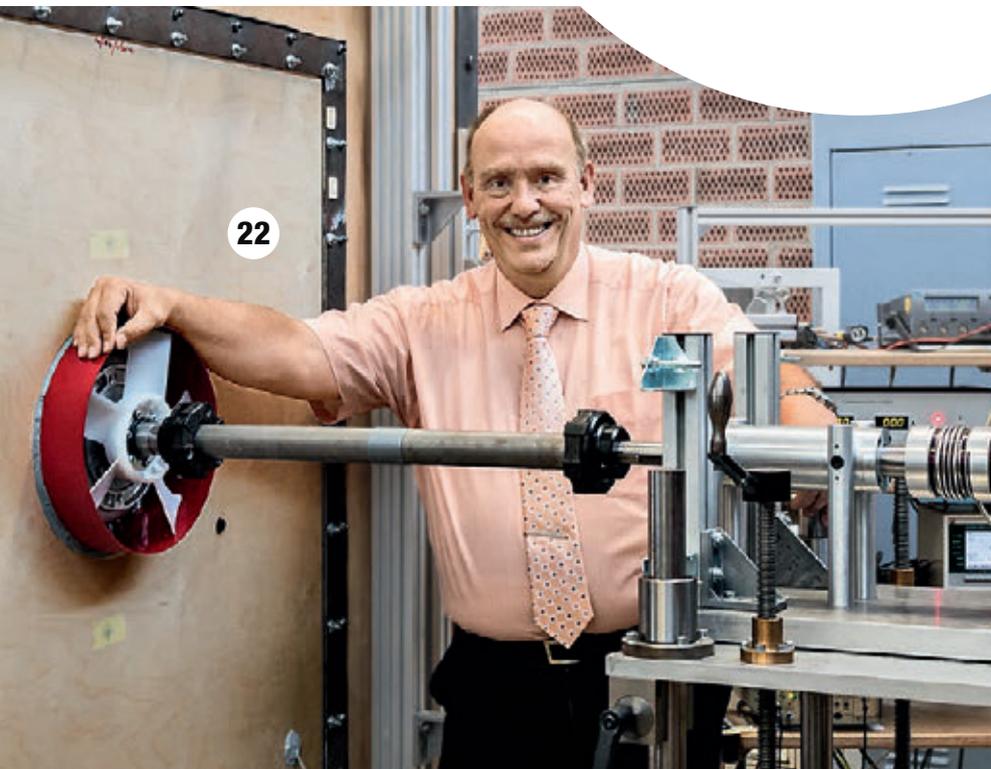
At the same time, our product toolbox provides the general capability to combine a wide range of impellers, motors and other technolo-

gies to match many different customer requirements. A good example is the micro-CHP unit from Flowgroup: This solution owes its success not least to the ability to match the motor technology of a BG 43 with the NRG 118 blower system. Another example of this transfer are the RadiPac centrifugal fans, which have proven themselves in everyday air conditioning use and are now holding their own in tough conditions at sea.

This broad experience in the use of energy-efficient products was also the reason MERCEDES AMG PETRONAS approached us in their search for a team partner for ventilation technology. In this issue, you can read about the solutions our partnerships reached in these and other projects. ○



02° 2015 mag





10



14



REHAU AG, James Andrews / ebm-papst, Royal Caribbean Cruises Ltd., Prof. Dr.-Ing. Wolfgang Elmendorf, MERCEDES AMG PETRONAS

06 ebm-papst 360°

10 NOT JUST HEAT

The micro-CHP unit from the British company Flowgroup is a super energy-saver — and it pays for itself

14 Harmony on the high seas

EC fans provide for perfect cabin conditions on the world's second-largest cruise ship.

17 Neighing instead of barking

A salt inhaler helps horses breathe freely.

20 Upgrade to the power of three

When upgrading its server air-conditioning system, a Danish company didn't do things halfway.

22 “Measurements have the last word”

An interview about the potential and limitations of measurements and calculations for product data.

24 Our most valuable capital

How ebm-papst develops its staff for the future.

27 It's already running?

Bitzer's new condensing units with EC fans are so quiet that they make customers look twice.

28 “The coolest team in Formula One”

The garage cooling system from ebm-papst ensures pleasant temperatures during even the hottest races.

31 Fresh air through closed windows

Fans and heat exchangers for perfect interior climate.

32 tech.talk

33 Service

34 Beyond your nose

35 ebm-papst worldwide

Where is ebm-papst headed, Dr. Lindl?

Dr. Bruno Lindl, Managing Director Research and Development, ebm-papst Group, on investment and competitiveness.

What are your main priorities for research and development investment?

Our strategic aim is technology leadership. In addition to highly qualified scientists and engineers, we invest heavily in simulation tools and measurement and test laboratories. We have also put a lot of effort into developing our R&D facilities in China and the U.S. — with the corresponding financial outlay. At present we are planning to set up a research institute for electric drives at the Künzelsau campus of Heilbronn University.

How can customers benefit from this?

Medium term planning requires familiarity with the market to be able to anticipate future customer requirements with a view to working together on the development of innovative sector-specific solutions to remain both competitive and fit for the future. This is why we cooperate closely with our customers when developing new products to achieve the best possible results.

Competitive and fit for the future: What exactly does that mean?

Being competitive means attaining a high level of profitable market acceptance in the coming years through the development of products with technical and economic features representing unique selling propositions. This involves organizing development and production processes along stringent lines. Being fit for the future on the other hand is more of a long-term strategy requiring creativity and access to the latest research findings. It is however essential to be competitive now in order to be fit for the future and have the resources to engage in research. To put it in a nutshell: Being fit for the future means running a sustainable business.



Dr. Bruno Lindl calls for sustainable business practices.

GreenTech worldwide

Making the world greener: energy-saving renovations in Landshut

Environmental awareness is a matter of course at ebm-papst, which just renovated the 1,770 square meters of roof and more than 500 square meters of windows at its Landshut manufacturing facility. Now the winter cold is kept outside by sandwich panels with especially high insulation and double-glazed windows to replace the old single-pane windows. The measure reduces ebm-papst's energy consumption by 89,000 kilowatt-hours per year, which corresponds to the average consumption of 20 single-family houses.



Following the renovation, sandwich panels with especially high insulation and double-glazed windows keep the cold outside.

WWW.GREENTECH.INFO



OUT WITH AC, IN WITH EC

The Danish IT company Jaynet replaced the fans in the cooling system for its 2,000-square-meter data center. This upgrade alone results in energy savings of 34 percent for Jaynet.

ebm-papst

Cool Future Racing Team

ebm-papst supports Chinese Formula Student Team

The Formula Student Team of Tongji University in China is receiving support from ebm-papst in China. The Sales Team is providing the young university engineers a total of twelve axial fans to cool the high-voltage batteries and circuit boards of the main controller of the electric racer. In September, the vehicle with ebm-papst cooling was on the race course in Japan, and in November it will participate in a competition in Shanghai before the team presents its new racer in December. Formula Student is an international design competition in which student teams from all over the world compete against each other with cars they have designed and built themselves. "For us this is a good opportunity to collaborate with young talent on real technical projects," explains Robert Cao, Senior Sales Engineer and Project Manager for the Formula Student, expressing his pleasure.



The Dian Racing Team from the University of Tongji received support from ebm-papst.

Let's keep it up!

The most exciting figures from the past fiscal year at a glance.



Investment in research and development activities:
95 million euros



Germany's most attractive employer:
5th place in the machinery and plant engineering sector in the annual poll conducted by Focus magazine.

Number of new **jobs** worldwide:

+253

Revenue made with products less than four years old: **about 40 percent**

< 4 years



1.573

billion euros
in revenue

+3 %

Foreign share of total revenue:
up 3 percent to 75 percent



Outlook: 36 million euros to be invested in a logistics center in Mulfingen-Hollenbach



Running again soon: participants in the ebm-papst Marathon.

Ready for the starting gun

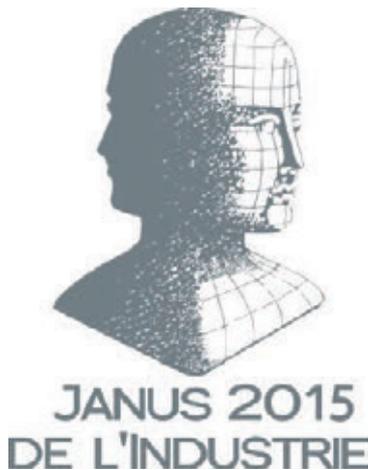
ebm-papst is organizing its 20th Marathon in Niedernhall.

On September 12 and 13, the ebm-papst Marathon will be held for the 20th time. Once again the company is organizing the event in Hohenlohe, to the pleasure of numerous endurance runners, handcycle riders and in-line skaters. The event is not just a unique experience for the participants; their friends, relatives or colleagues also like to come here to cheer on the athletes and enjoy the great atmosphere. At the finish, a medal awaits every participant as a memento.



Hasan Baran Özkan

The German Association of Communications Agencies (GWA) presented the **GWA Profi Award** at the “Tag der Industriekommunikation” (Industrial Communications Day) in July. Again this year, ebm-papst prevailed over the competition with its strong business-to-business communications. The jury honored the company in the “Industrial Commodities” category for its “Discover ebm-papst” campaign.



Economy, ergonomics, aesthetics, ethics and emotion — the Institut Français du Design has used these criteria to judge products from different sectors since 1953. This year ebm-papst was among those awarded the **Janus-Label**. Its AxiTop diffuser won over the jury with its high energy savings and noise reduction as well as its recyclable materials.

REASON TO BE PLEASED

Again in 2015, ebm-papst received awards for its products, its brand and its philosophy.



Deloitte

The auditing and consulting company Deloitte honored ebm-papst with the **Axia-Award** for companies that secure their shareholder structure, financing and brand image for the long run and also focus on their employees.



Martin Stolberg

Honors for the AxiCool fan: Baden-Württemberg's Ministry for the Environment, Climate and Energy Management nominated this user-friendly and rugged product for the **Baden-Württemberg Environmental Technology Award** in the material efficiency category. Franz Untersteller, Baden-Württemberg's Minister for the Environment, Climate and Energy Management (left), presented the certificate in Stuttgart. Since the first award in 2009, ebm-papst has received two prizes and a nomination.



ebm-papst

During the **China Refrigeration Expo**, the EC Axial fan with FlowGrid and Axi-Top won first place in the Heating and Ventilation Technology category. The combination of products received the Innovation Product Award for its outstanding compactness, its low noise level as well as its integrated GreenTech EC technology. Moreover, ebm-papst was honored with the Environmental Pioneer Award. This is already the sixth award that the company has received in the last four years during the Chinese Exhibitions.

A middle-aged man with glasses, wearing a blue blazer over a light blue checkered shirt, is smiling slightly. He is holding a green power plug with a cord in his right hand, pointing it towards the camera. The background is a dark grey grid pattern.

**“During development,
we decided to take
production and
marketing into our
own hands.”**

*Geoff Barker,
Business Development
Director at Flowgroup*

*Need power?
Geoff Barker's
company offers
a special kind of
CHP system.*

NOT JUST HEAT

The new boiler from the British company Flowgroup is not just any old boiler. It doesn't just produce heat, but electricity too, and pays for itself in the process. The story of an extraordinary project.

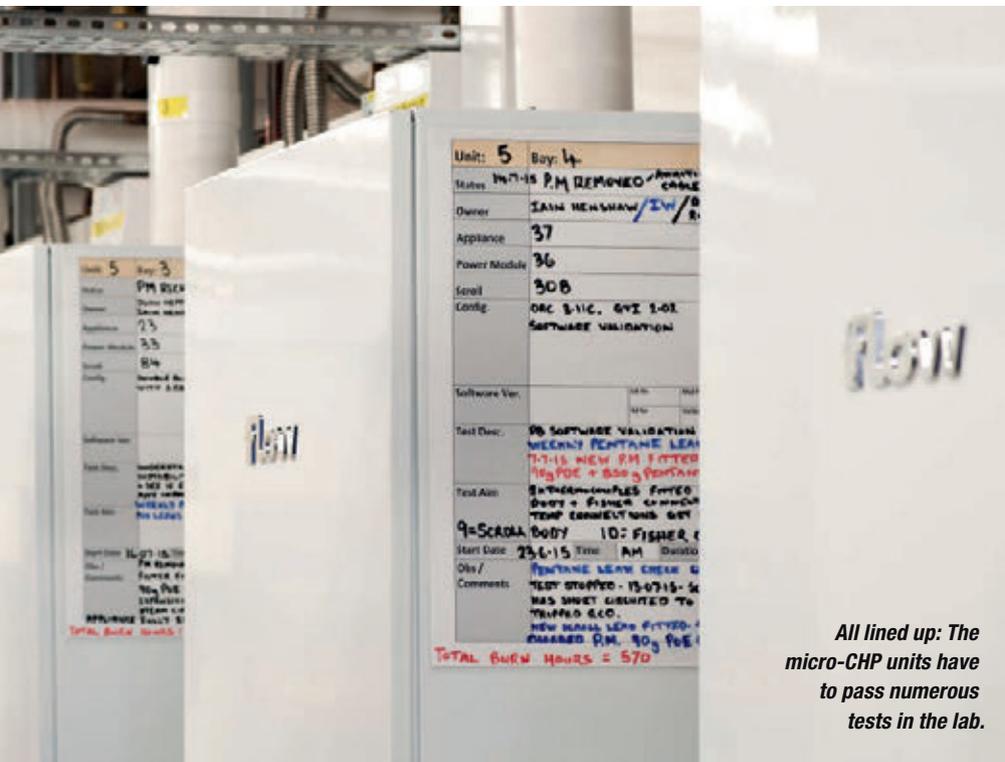
Geoff Barker turns the tap and smiles. Not just because there is warm water coming from the tap. You'd expect that from any new boiler. He's smiling because he knows he's saving money. From the outside, the compact device hanging on Barker's wall does not look any different to a normal gas boiler. It saves space and generates heat for water and central heating. But it also generates electricity. This kind of simple micro combined heat and power unit (short: micro-CHP unit) is the first of its kind. The little magic box, from the Flowgroup in Chester in north-west England, has been available since the start of the year on the British market under the name Flow, intended for larger households. If Barker were a normal customer, he wouldn't even have to pay for the unit. The deal works as follows: anyone wishing to purchase the Flow only has to pay the installation costs. They also take out finance for the cost of the Flow and sign up to Flowgroup for their electricity and gas. After this, the customer receives a rebate through their energy bill to cover the cost of the finance, all made possible by the local low cost electricity generation. After five years, the Flow has paid for itself and the electricity produced results in energy savings for the owner.

From start-up to success Barker isn't a normal customer, however, the device on his wall is only for test purposes. He is

Business Development Director at Flowgroup and was involved in the development of the Flow from the beginning. Getting the product ready for full production was a long journey. The business began in 1998 with the business model of developing new energy technologies and then selling them to other companies.

The Flow's story begins in 2006. "Originally, we just wanted to develop new, cost-effective technology for a micro-CHP unit, which we then wanted to sell to heating appliance manufacturers. But during the development process, we decided to take full control of the production and marketing", explains Barker. This was no small venture for a company that had never built a boiler itself before. Even the technology it was based on had never been used in this form.

The inverted refrigerator The technology is similar to a cooling cycle in a refrigerator, which obviously has little to do with a gas boiler. One aims to remove heat while the other has to generate as much of it as possible. The designers turned the cycle principle on its head and the Flow boiler now works in precisely the reverse manner with the so-called Organic Rankine cycle. This process has previously been used in geothermal or solar power facilities. Other manufacturers use expensive solutions in these devices like Stirling engines or fuel cells. By contrast, the



All lined up: The micro-CHP units have to pass numerous tests in the lab.

Flow essentially functions like a normal gas condensing boiler, except that instead of water, the combustion heat evaporates a special fluid with a low boiling point. This fluid is similar to the cooling fluid in a refrigerator. The vapor that this creates drives a scroll, which acts like a mini generator and produces electricity. Once the vapor has fulfilled this task, it enters a heat exchanger where it heats the water. The vapor condenses back to a liquid and the cycle can begin again. A pump keeps it moving through the system.

That's the theory. In practical terms, this meant a lot of development work. "Most of the work went into developing the pump, which is the key component for the cycle", explains Barker. This is because the pressure and the speed at which the pump drives the fluid are decisive for the Flow's performance. The motor for the pump must be able to cope with high and low pressures, without heating up too much. As the boiling point of the fluid is very low, the motor cannot heat it up too strongly, as the vapor bubbles created would damage the pump.

Expertise from the continent At around the same time, the engineers at ebm-papst in Landshut were working on a new motor for fans. When Paul Prescod, Commercial Director at ebm-papst Automotive & Drives UK, found out about this project at a presentation, he immediately thought of the drive for the

pump which the engineers at Flowgroup had asked him about. "The motor from Landshut may not have been developed for this kind of application, but its characteristics were a pretty good fit to the requirements", remembers Prescod. His colleagues in Landshut were quickly convinced and produced a prototype of the motor, which would later be launched on the market as the BG 43. The EC motor was an instant hit. "It was exactly what we were looking for: a highly efficient and compact motor", says Barker. It was the beginning of an intensive cooperation. "We developed many different prototypes of the Flow and ebm-papst supported us in every new development step with their expertise", explains Barker. In the end, an Italian company was chosen to produce the pump. "As we are also active in Italy, we were able to go along with this step with no problems and support the work there, too", emphasises Christian Diegritz, Head of Sales Department at the Landshut plant. The plant gave the development of the project significant support. But this support was not just limited to the motor. Flowgroup also chose to use the NRG 118 blower from ebm-papst. That was music to the ears of Steve Durant, Senior Consultant at ebm-papst UK, who was responsible for this component. "We were now able to offer the motor and blower in a single package, which further reduced the costs for the Flow." No small matter when you remember that the Flow aims to be an affordable solution.



Working closely: Geoff Barker (middle) discussing motors and fans with Paul Prescod (right) and Steve Durant from ebm-papst UK.

Top: The components from ebm-papst enable a compact design.



Bottom: The boiler takes up little space in the home.

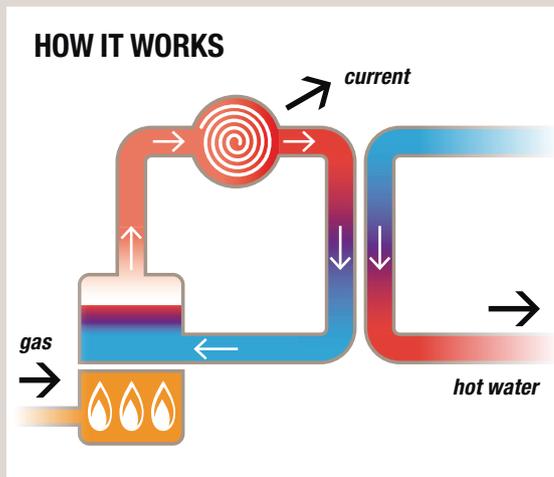


James Andrews/ebm-papst

A clever business idea After countless tests and certifications, the micro-CHP unit kept making progress. In 2013, the question for Flowgroup was how to best get the mini power station into households. The slightly unusual answer was to use their own energy company. “We founded a subsidiary which provides customers with gas and electricity. This gave us a customer base to act as potential buyers of the Flow”, says Barker of his somewhat different business idea. Customers will be able to profit from this from early 2015 in a range of ways. The device is compact and easy to install. “We designed the Flow so that it could be installed on the wall by heating specialists with minimal training”, explains Barker. Here, it produces around 2,000 kilowatt hours of electricity in addition to heat. This corresponds to half the consumption of an average British household. Once the Flow has paid for itself after five years, the consumer therefore saves around 50 percent of their electricity bill. The Flow is currently only available in Great Britain. “We are already in talks with energy companies in other countries to introduce the micro-CHP unit there”, says Barker. ○

Smart electricity

The gas-fired combustion chamber heats a special liquid comparable with the refrigerant in a refrigerator. The resulting steam drives a generator that produces electricity. Then the hot steam heats water in a heat exchanger and condenses. The liquid is pumped back to the combustion chamber and the cycle resumes.



“Quantum of the Seas needed to consume 20 percent less electricity than its precursor ship. That was the requirement.”

*Taru Lähteenmäki,
R&D manager at Kojia*



Harmony on the high seas

Almost 3,000 EC fans provide for perfect cabin conditions on the world's second-largest cruise ship. Active PFC technology ensures that so many units can work together without problems.

Swimming pool, cabin, Royal Esplanade or spa — EC fans ensure a pleasant climate.

Quantum of the Seas is the queen of the ocean. The most expensive cruise ship in the world and a floating oasis for 4,180 passengers, it was launched in the summer of 2014. It is nearly 350 meters long and 41 meters wide. Entertainment features on board include a glass capsule on a swivel arm for panoramic views from a height of 90 meters, a climbing wall, bumper car rides, numerous restaurants, a musical stage, a surf simulator and much more. Taru Lähteenmäki, R&D manager at Koja, a Finnish supplier of air conditioning systems, says: "Vacationers here have high standards. For air conditioning too, of course. They expect the air to be at just the right temperature, no matter what climate zone the ship happens to be cruising through."

Lots of power in a small space Each cabin has its own air conditioning, with which passengers can set the temperature they prefer. Together with the big EC blowers in the public rooms, 2,956 fans ensure a pleasant climate on board. Because of the salty and often tropically humid air at sea, the fans from ebm-papst have a special coating to protect them against corrosion. →



Royal Caribbean Cruises Ltd.

VENTILATION



Fan coil production line at Koja. Important for on-board air conditioners: they have to be especially compact.

Koja Group

Many of the ship's rooms are in the interior or have no windows that can be opened. Air exchange in most parts of the ship takes place only in the ventilation system. Jukka Blåfield, technical manager at ebm-papst Finland, says: "A high rate of air exchange needs to take place in a limited space here." One of the main challenges for air conditioning on ships is the available space. Lähteenmäki agrees, saying: "On a cruise ship, every cubic centimeter counts. All of the space needs to be available to the passengers or crew, so the electronics has to take up as little space as possible. For these reasons and others, we chose the compact but powerful ebm-papst centrifugal EC fans with forward-curved blades for the cabins, and Radi-Pac centrifugal EC fans with backward-curved blades for the public areas."

Quiet energy-savers When the cruise ship operator Royal Caribbean International ordered "Quantum of the Seas," one of its most stringent requirements was: 20 percent less energy consumption than the precursor ship! That also applied for the air conditioning system. "The low energy consumption of the EC fans was an important reason for us to choose ebm-papst as our partner. The ship has over thousands of fans but only a few compressors, for example. If you want to achieve savings with air conditioning, the fans give you a huge amount of leverage," Koja's Lähteenmäki says. "Besides that, the fans are extremely quiet. So here too, they fulfill the high standards of the passengers."

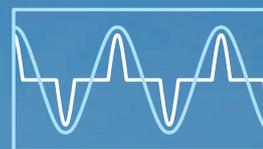
Relief for supply network But when over 5,000 EC fans are connected to the same generator in the same network, so-called harmonics can lead to problems in the supply network. To avoid these problems, ebm-papst has developed a solution, a module that is integrated in the fan electronics: active PFC (power factor correction). The module filters out input current peaks with an electrical engineering trick that minimizes disturbing harmonic content. Jukka Blåfield summarizes: "Especially in the closed system on board, that's a huge advantage. The active PFC technology al-

lows the shipowner company to plan for a smaller generator from the start, since they can assume a lower peak load. That saves money, weight and space. And the power cables for the fans only need to be half as thick as without active PFC. That makes the system even more compact." ○

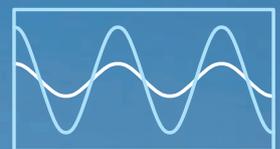
Active PFC

The challenge: EC fans work with a permanent magnet motor, which receives pulsed input current that causes current harmonics. When many EC fans are connected in parallel, the harmonics strain the supply network and can result in increased losses due to reactive power. Even other devices in the system network can be negatively impacted.

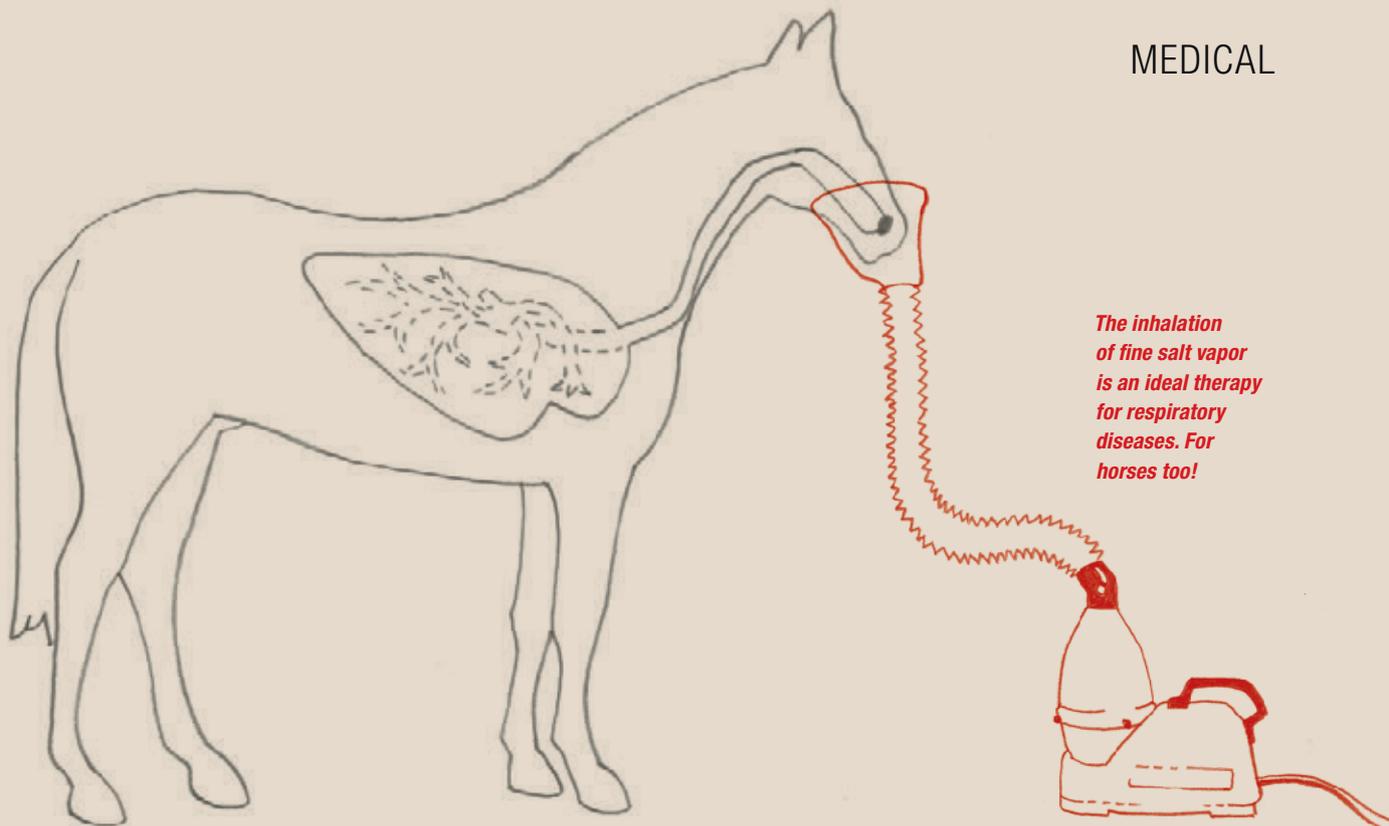
The solution: ebm-papst has developed active PFC (power factor correction). A module integrated in the fan electronics converts the pulsed input current of the EC motors into a sinusoidal current. Then the current is shifted so that it is in phase with the voltage. This significantly reduces the harmonic content and minimizes the input current's peak value. Electricity consumption remains at an acceptable value.



Without PFC



With active PFC



The inhalation of fine salt vapor is an ideal therapy for respiratory diseases. For horses too!

Neighing instead of barking!

Clear airways for horses: A salt Inhaler from the Estonian company Plastpuit provides support for animal health.

As far back as the Middle Ages monks appreciated the healing effect of a salt inhalation. The augmented water vapor relieves coughs, clears a congested nose and moistens irritated mucous membranes. What's beneficial for people must also be pleasant for animals — at least that's what one of the customers of Plastpuit OÜ thought. Up until now he used the salt inhaler from the Estonian company as a remedy for his asthma. Finally, he asked himself whether it could also help his horse to take a few deep breaths. Lo and behold: The horse coughed the mucus out of its bronchial tubes.

This idea prompted Plastpuit to test various components for a horse inhaler together with its Finnish business partner Polar Health. Based on the inhaler for people that already existed, they developed the therapy device further for animal patients — and equipped the portable breathing apparatus with a radial fan from ebm-papst. Veiko Proos, Regional Director of ebm-papst Estonia, is pleased with the cooperation and explains: “The rugged radial fan from ebm-papst runs very quietly and reliably, and is therefore a permanent part of the inhaler. The therapy device from Plastpuit went into series production at the beginning of this year.”

Its use frees the horse's lungs of mucus and bacteria: The horse owner places two teaspoons of salt in the lower cylinder of the device and closes the lid. At the press of a button an air stream is generated that swirls up and heats the salt granules inside the container. The resulting friction produces a fine salt dust which is blown into the mask through a hose. It can be fastened quite easily to the halter and surrounds the horse's nose during the treatment. As the inhaler is made of high-quality plastic and acid-resistant steel, it is resistant to corrosion and easy to clean after use. Regardless of whether it's in a stable box or out on the farm, horses can inhale the salt particles anywhere — completely without side effects. This respiratory therapy is frequently used for race horses to increase their performance. However, regular treatment also helps older horses breath more easily. Especially in Scandinavia, several horse owners already swear by the effectiveness of the salt dust. ○

 Find images of the salt Inhaler at work at mag.ebmpapst.com/horseinhaler



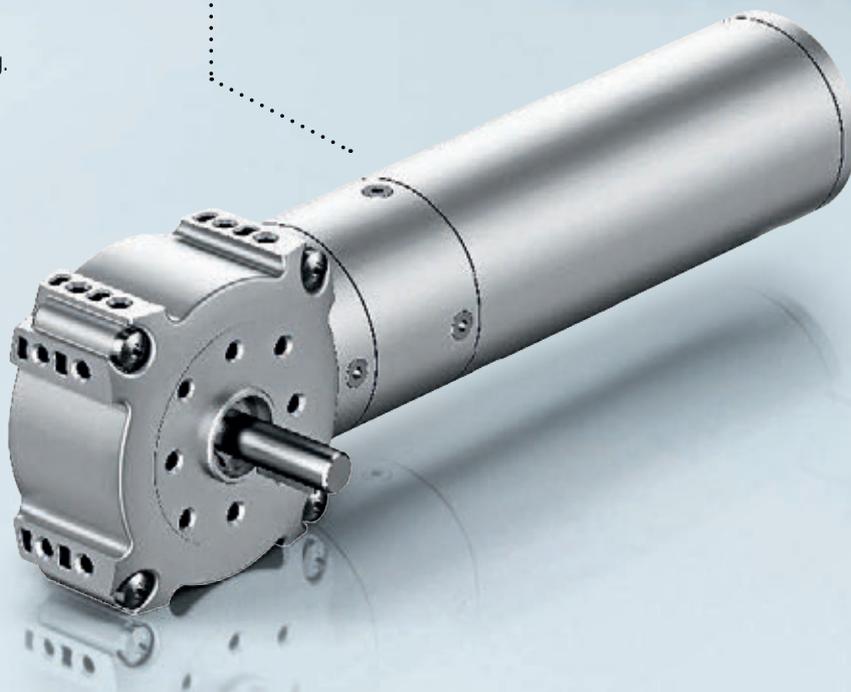
TAILOR-MADE

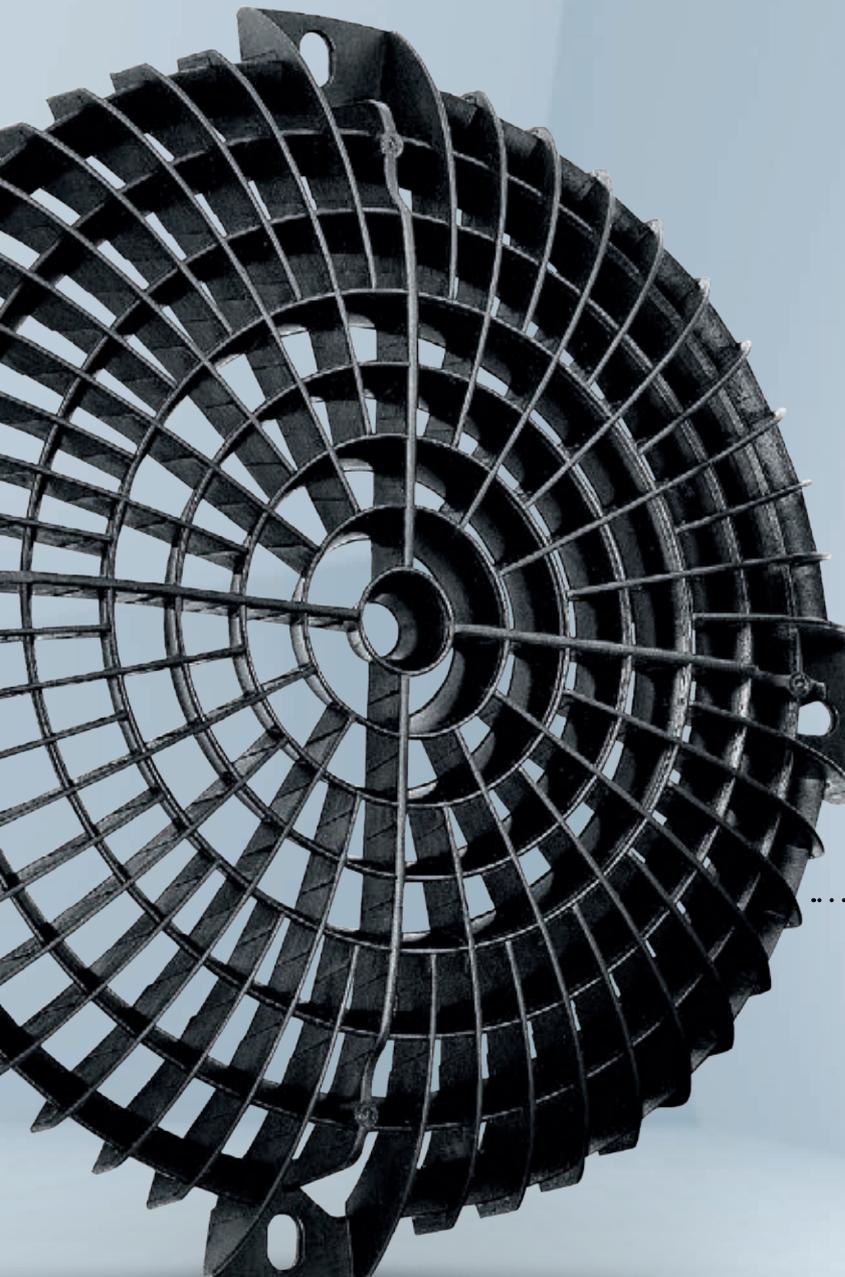
This gas-air premix blower was specially developed for a specific customer application. The system consists of the NR 118 blower, an integrated venturi and the separate E01 gas valve. It has commutation electronics with current control to achieve the specified boiler output. The aerodynamically optimized venturi with 180° deflection was adapted to the installation conditions and ensures low blower input power. The gas valve belongs to the latest generation with die-cast valve housing.

MIX AND MATCH

Modular design with gearboxes, motors and software-based control systems provides even more possibilities for drive engineering. Like the combination of the compact and powerful EtaCrown gearbox with the ECI 42.40 motor including the integrated K4 controller. The flexible modular drive design enables optimum matching to applications without complex and expensive adaptations.

www.ebmpapst.com/modular_drives

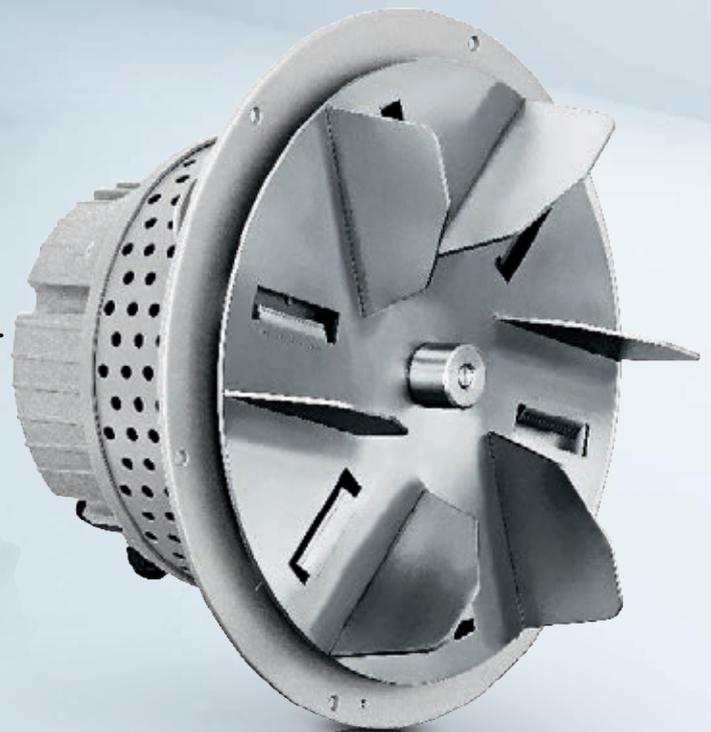




BEHIND BARS

The FlowGrid air inlet grill is now available for small centrifugal fans with diameters from 190 to 250 millimeters. It reduces the intake-side sound power level by two dB(A) and the blade-passing noise by 15 dB as measured on a size 190 centrifugal fan. Costly passive noise protection measures can be kept to a minimum and in some cases avoided completely. FlowGrid combines optimum air conduction with contact protection in accordance with DIN EN ISO 13857 and makes additional guard grills superfluous.

www.ebmpapst.com/small_flowgrid

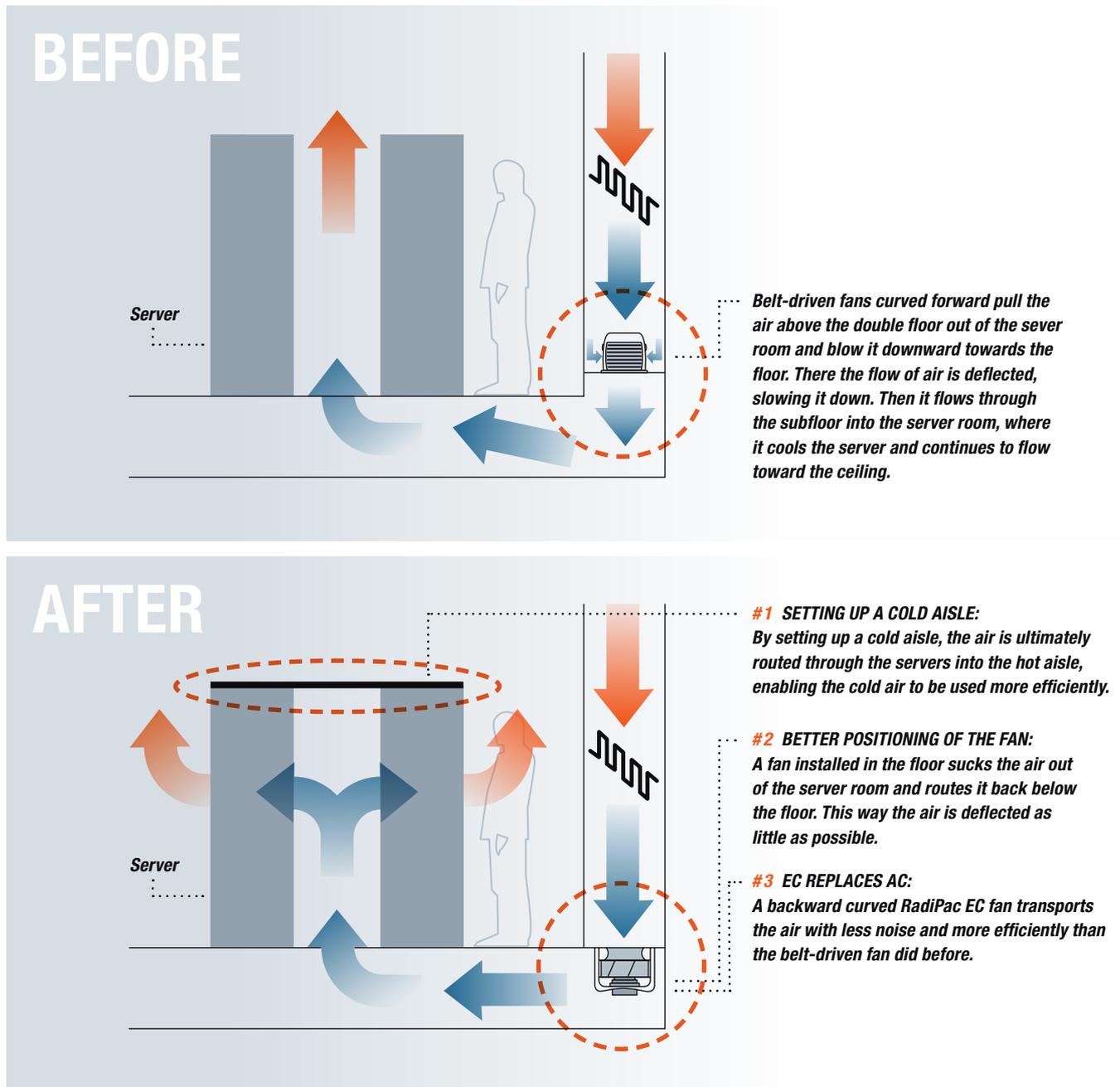


JUST HOT AIR! That's what the rugged single-intake centrifugal fans for wood pellet, wood chip and split log boilers might say, since they reliably extract hot exhaust gases with air performance of up to 1,000 m³/h. With a size 250 model, ebm-papst has expanded its line of EC induced draft fans for high-output heating systems of up to 250 kilowatts for public or commercial buildings.

www.ebmpapst.com/induced_draft

UPGRADE TO THE POWER OF THREE

EC instead of AC, a new fan type and economical cold aisles — when upgrading its server air-conditioning system, the Danish company William Demant didn't do things halfway.



Generous offices, tasteful furnishings and lots of light: When the Danish hearing-aid manufacturer William Demant moved into its new headquarters, they offered everything the heart desires for a modern office. Only the cooling air-conditioning system in the server room couldn't quite keep up. Large belt-driven fans ran in the air-conditioning units and used a great deal of energy. That didn't fit into the company's concept, which places great importance on environmental protection and energy efficiency. As a result, those responsible looked around for alternatives. On the subject of air conditioning, Henrik Jensen, Service Manager at William Demant, immediately thought of ebm-papst: "I was already familiar with the products from my previous job and I knew what kind of performance they can deliver."

Support for a neighbor It didn't take long for Henrik Dahl Thomsen, Product Manager at ebm-papst, to get to the first appointment for a visit to William Demant. His office is in the immediate vicinity of the hearing-aid manufacturer. In the server room Thomsen first obtained an overview of the cooling system's condition. As is usual in rooms of this kind, the air-conditioning units route the warm air out of the server room, cool it down and then blow it into a subfloor. From there the cooled air flows through small openings in the floor and cools the server located in the room. "However, at William Demant we immediately noticed a special design feature. The AC fans were curved forward and installed quite a bit above the floor and pressed the air downward from there. This had the disadvantage that they actually blew the air directly onto the floor, which then deflected the air flow by 90 degrees. That slowed down the flow of air and made the system even more inefficient."

Together with his partners at William Demant, Thomsen looked for a more efficient possibility and proposed that the fans were not only be replaced, but that their position in the air-conditioning unit would also be changed. As a result, they were

no longer to be installed directly in the unit, but instead recessed in the floor. Moreover, Thomsen proposed a backwards curved fan, which routes the air horizontally under the floor directly towards the server.

Simple conversion "Even though I had never seen this type of installation before, the proposal immediately sounded plausible," remembers Henrik Jensen. "So we ordered the modifications and a technician installed RadiPac EC fans." Only minor work was required for this conversion. The installation technician enlarged the hole in the floor of the cooling units, enabling the fans to be recessed in the floor. As the compact fans are supplied as a complete module with a frame, they then only had to be screwed into the opening in the floor. At the same time, William Demant implemented an additional measure that makes the computer center even more efficient: The company introduced a so-called cold aisle. For this purpose, it installed enclosures around every second corridor in the server room. This enables the cold and hot air to be separated more effectively and the entire system can be operated with less energy due to this clear separation.

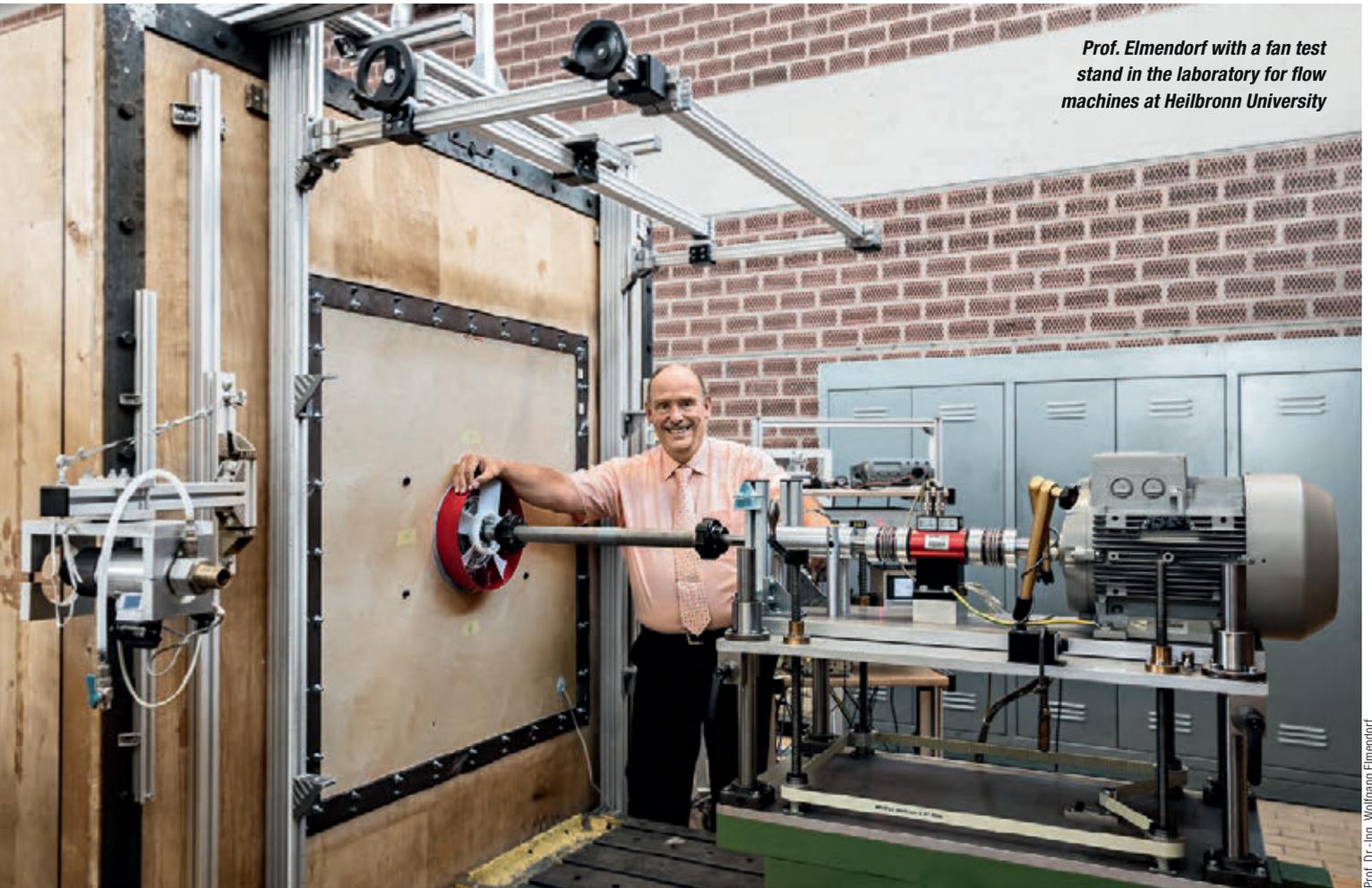
This restructuring in the cooling room brought William Demant energy

savings of 23 percent, and the conversion to EC fans reduced the energy consumption by another 38 percent. Through the decreased electrical costs, the investment already paid off for the hearing-aid manufacturer after about one year. In addition, the modifications enable the temperature around the server to easily be kept below 27 degrees centigrade (81 degrees Fahrenheit). That's important, as the servers' own small fans are not started until this temperature limit is exceeded. If they remain inactive, additional energy is saved. Thanks to their low noise level, the RadiPac EC fans also make it easier for the technicians to work in the server room, as they can now work with fewer disturbances. Henrik Jensen is extremely satisfied with the upgrade: "The energy savings were even greater than we had hoped. You don't see that every day." ◯



Henrik Jensen, Service Manager at William Demant, and Henrik Dahl Thomsen, Product Manager at ebm-papst are very satisfied with the result of the upgrade.

Prof. Elmendorf with a fan test stand in the laboratory for flow machines at Heilbronn University



Prof. Dr.-Ing. Wolfgang Elmendorf

“Measurements have the last word”

Prof. Wolfgang Elmendorf on the potential and limitations of measurements and calculations for product data.

Where do product data come from, and how dependable are they?

Both depend on the approach taken by the business. There have been cases in which data was regularly extrapolated for years on the basis of measurements made only once. Of course that's not a dependable solution, but it's also an exception. The classical approach is to determine the data on test stands, because in the end, measurements have the last word when it comes to reliability.

What requirements have to be fulfilled by such test stands?

First, test stands have to be set up according to standards; the primary standard applicable to fans is DIN EN ISO 5801. Test stands that comply with this standard provide a suitable basis for comparisons. Second, an organization's quality management specifies the processes for performing and analyzing measurements; in today's industrial landscape that is governed for the most part by DIN ISO 9001. Then the processes that lead to the results are also reproducible.

In your experience, does that really lead to comparable data?

As a rule, yes. If the comparison result deviates significantly, then the set-up conditions were not complied with completely — often because they're unknown. So the setup has to be clearly defined and documented.

How realistically can the operating conditions even be represented in tests and calculations?

The question to begin with is: What do I need the results for? If I want to compute complex fan geometries, then with some experience I know that I can make certain simplifications that will only have a marginal effect on the results. For example, there are many fans in which the blades are not spaced evenly for aeroacoustic reasons. That has no effect on the air performance. So if I'm interested in ventilation results in a computation, I can also space the blades evenly. But if I'm interested in aeroacoustic results, then I have to take the complexity into account. The hard and fast rule is: A fan never works alone. It's always in an environment. To assess the true operating behavior, I need to know the characteristics of both the fan and the system.

And then come results that are close to reality?

It may happen that not all factors can be taken into account in a computation. But these shortcomings can also arise in measurements since you can't always make a one-to-one simulation of the original customer situation. If the customer wants to know the exact behavior, the only way to do so is usually to test the fan in the device. In cooperation with the customer, the operating behavior in a special installation situation can be predicted very reliably in this way. But it can be computed only with an unreasonable amount of effort.

What is better, measuring or computing?

Both together! In some fields, you can make better progress with measurements and in others with computation. For example, better computing methods allow for faster product cycles. The reliability of modern computational methods is outstanding and continues to improve. But without validation from measurements they aren't productive. And at the latest, the customer will demand this verification.

What should one watch out for when comparing measurements and computations?

With a computation you will not exactly match the measurement. Often you'll systematically over- or underestimate parameters such as pressure increase or efficiency — and then notice that the results only undergo a

parallel shift. So if I achieve improvements in the computation by changing geometric parameters, I can transfer those one-to-one to the measurements. In this way, computation can identify factors I can use to make improvements — much faster than with measurements.

How much can such results improve the efficiency of equipment?

In ventilation applications, aerodynamic optimization plays a crucial role. There is still potential for improvement here, even though it's getting smaller all the time. You have to focus on the efficiency chain. The impeller is a major factor, but all the other components play a role as well. The impeller can be viewed in terms of various physical causes of efficiency losses such as friction and static pressure. The efficiency can be increased simply by improving the inlet nozzle or the outlet area, with effects on both the aerodynamic performance and on the aeroacoustic side. Geometric details also offer potential. However, the result of an analysis can sometimes be that it's impossible to make full use of the aerodynamic potential, for example because of required space limitations.

Do analysis methods also offer potential?

Mathematical optimization strategies are being applied with increasing frequency. They involve taking the results of fluid dynamics calculations and using mathematical methods to derive the optimum configuration of the parameters. That's

very laborious since it's a multi-variable problem. And such methods typically also require validation by experiment in the end.

How important are measurement results to customers?

The customer needs the measurements but also needs help in interpreting and implementing them. It has to be a matter of course for manufacturers to provide clarification in their statements by means of standards-compliant recording of measured quantities and clear identification of parameters. Open dealings between the parties are called for. Customers have to be clear about what they want. That sounds simple but is actually astoundingly complicated because when they design their products, customers often don't know the requirements of their own customers yet. ○

„The experimental setup for every measurement has to be clearly defined and documented.“

Prof. Wolfgang Elmendorf

 **For information about determining product data at ebm-papst, go to mag.ebmpapst.com/precision_measurement**

Prof. Wolfgang Elmendorf heads the laboratory for flow machines at Heilbronn University. His work centers around the development of fan test stands, experimental fluid dynamic analyses, theoretical fluid dynamics calculations, and the optimization of fluid flow systems.

There is a reason why ebm-papst maintains its position as a leader in the global market: the right employees and a good work climate. In order to maintain this position, we strive for the sustainable development of our staff, as is borne out by the stories of three of our colleagues.

Our most valuable

It is a problem sometimes faced by a company in a rural area. In addition to the youth of our region, how do we get young, capable people from other parts to move to the country, and then stay here? “The career opportunities just have to be right,” responds Maximilian Kemkes, 21 years young. His experience demon-

strates that it can work. Two years ago, as a graduate fresh out of high school, he was facing the important decision as to what should happen next. Based on career counseling, he could see himself pursuing a path of industrial engineering, as he had always been comfortable with industrial as well as technical matters. But he wasn't too keen on spending years studying theory alone. Therefore he considered a dual course of studies

with regular practical phases. Back home in the Lower Rhine area of Germany, he had never heard of ebm-papst, but with his profile, he quickly came across our company in the Internet. “By the time I talked about it with a friend who already knew about ebm-papst, it was clear to me that I wanted to apply here,” says Kemkes. He liked both the innovative technology and what he learned about the corporate culture — and the job interview confirmed this impression. Kemkes' decision was made, and he began his studies at the Mosbach campus of the Baden-Württemberg Cooperative State



KD Busch/ebm-papst

“I get to work on my own here.”

Maximilian Kemkes, dual study student in industrial engineering at ebm-papst in Mulfingen

University. “That was the right decision,” he says today. He especially likes that fact that he has already been able to put theory into practice a few times. In his practical projects, he is constantly encouraged to take the initiative. For example, Kemkes helped introduce shop floor management to a production section, and programmed a production robot. “I really get to work on my own. And when I do need help, there is always someone in the team by my side.” So there are many reasons why Kemkes would like to stay in Mulfingen after he has completed his masters degree course.



Maximilian Kemkes appreciates the combination of theory and practice in his dual study program at ebm-papst.

capital

A woman with three major projects A good 9,000 kilometers to the east, Iris Ren is already a few steps ahead. She has already been working at the Chinese branch of ebm-papst for ten years. She has something in common with Kemkes: ebm-papst was her first job after graduation. Ren started as an assistant to management and today as Marketing Manager takes care of communication matters for the company in China. Despite the fiercely contested labor market in China, ebm-papst has been able to earn her loyalty. “I have always felt challenged in my job,” she emphasizes. “I always enjoy carrying out the tasks that the company gives me. These successes are my personal incentive. I want to improve continuously.” In this sense, her per-



“My boss is open to a personally adjusted working time model.”

Iris Ren, Marketing Manager
ebm-papst China

sonal philosophy is closely tied to that of ebm-papst: always to reach for the maximum potential. This also applies to the other areas of her life, which to an outsider appears to be as demanding as playing a piano sonata for four hands by yourself. In addition to her full-time job, she is working hard on her MBA — and is the mother of a two-year-old son. She handles this triple load with her

innate, practically inexhaustible store of energy, but on the other hand especially with the support of the company. “My boss is open to an individually functioning model,” she explains. “He allows me to arrange my work schedule flexibly, so that none of my life projects misses out. And when it becomes too much, I can always rely on my team.” She points out that her situation is not the exception in the company, but rather an example for handling staff. “I am proud to work for such a company,” she says with conviction.

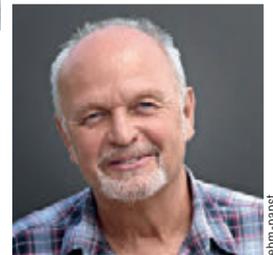
Five decades at ebm-papst Bernhard Voigt from St. Georgen was also proud as he was honored publicly this year. 50 years anniversary of service is simply



Iris Ren is pursuing an MBA degree while working full time as Marketing Manager at ebm-papst China.

“I’ve always enjoyed working here, especially because of the congenial atmosphere.”

Bernhard Voigt,
Facility Manager ebm-papst
St. Georgen



Bernhard Voigt has been working at ebm-papst in St. Georgen for 50 years.

a reason to celebrate, even if you are not used to being the center of attention. On April 21, Voigt completed five decades of service. In 1965, as a boy that had just turned 14, he started his apprenticeship as a toolmaker at the company, then known as Papst Motoren KG, in the Black Forest — incidentally, at the recommendation of his mother, who worked there herself. His career got off to a good start. He finished his apprenticeship with distinction and was happy to receive the princely sum of ten marks. For 20 years he worked in his field before moving on to new assignments. “At the end of the 80s I applied for a position that was becoming available

as Building Superintendent because the diversity of the job appealed to me,” he remembers. “At the time I was happy that it had worked out, although toolmaking did not want to let me go altogether.” Voigt became the all-round guy at St. Georgen, took care of the winter service, repairs, and everything else that was required. In the process he met every one of his colleagues — and all of them know him. “Especially because of the great collegiality here, I have always been happy to go to work,” he says. So it is with a bit of melancholy that he looks forward to October when he will start his well deserved retirement. ○

Simply the best!

For the second time in a row this year, ebm-papst is one of the best employers in Germany. In the survey that FOCUS Magazine carries out every year in cooperation with social networks XING and kununu.com, those polled chose ebm-papst in an outstanding 56th place in the overall ranking. In its field of “machinery and plant engineering” ebm-papst made 5th place out of a total of 48 companies examined.

www.kununu.com/ebm-papst-unternehmensgruppe



*Top model in
the new line of
condensing units
with GreenTech
EC technology: the
Ecostar LHV7E.*



Bitzer Kühlmaschinenbau GmbH

IT'S ALREADY RUNNING?

With a view to the EU's ErP Directive, Bitzer redesigned its proven condensing units, relying on energy-saving and very quiet EC fans.

A Herculean task awaited Dieter Hildebrandt and his team at the Bitzer Kühlmaschinenbau GmbH factory in Schkeuditz at the end of 2013. With the F gas directive and the second stage of the ErP Directive slated to take effect in 2015, the entire range of condensing units was to be completely overhauled. "On the one hand, we wanted to comply with all current efficiency regulations and also design the units for future compliance with other directives," says Hildebrandt, Manager World Condensing Unit. On the other hand, they had to ensure backwards compatibility, which meant retaining housing dimensions and connection points. While Bitzer took care of the improvements to the heat exchanger, a strong partner was needed to deal with the fans. Thanks to years of successful cooperation, ebm-papst got the nod. Detailed requirements for noise levels, stepless control characteristics and energy efficiency soon led the project staffers to the HyBlade® EC axial fan. A positive side effect for the series with its modular design: The work done by 25 fan models in the old generation of condens-

ing units is now done by only three HyBlade® models with 350, 400 and 500 millimeters and two different guard grilles. Hildebrandt is full of praise, saying "Good products, top technical support and expert advice helped us make rapid progress with the project." Obligatory verification measurements from the aeroacoustic fan test stand at ebm-papst in Mulfingen were especially helpful. The test stand makes it possible to record air performance data and noise emissions simultaneously and provided impressive verification of the nozzle's optimized air duct design.

Quiet power Besides its convincing energy efficiency, the HyBlade® has a noise level up to 3 dB(A) lower — with higher performance — thanks to its sophisticated blade geometry. More than once, commissioning has demonstrated just how quiet the new condensing unit is. Hildebrandt recalls with a smile, "The customers waited intently for the fan to start, but it had already been running for a while at partial load an 70 percent power consumption!" ○



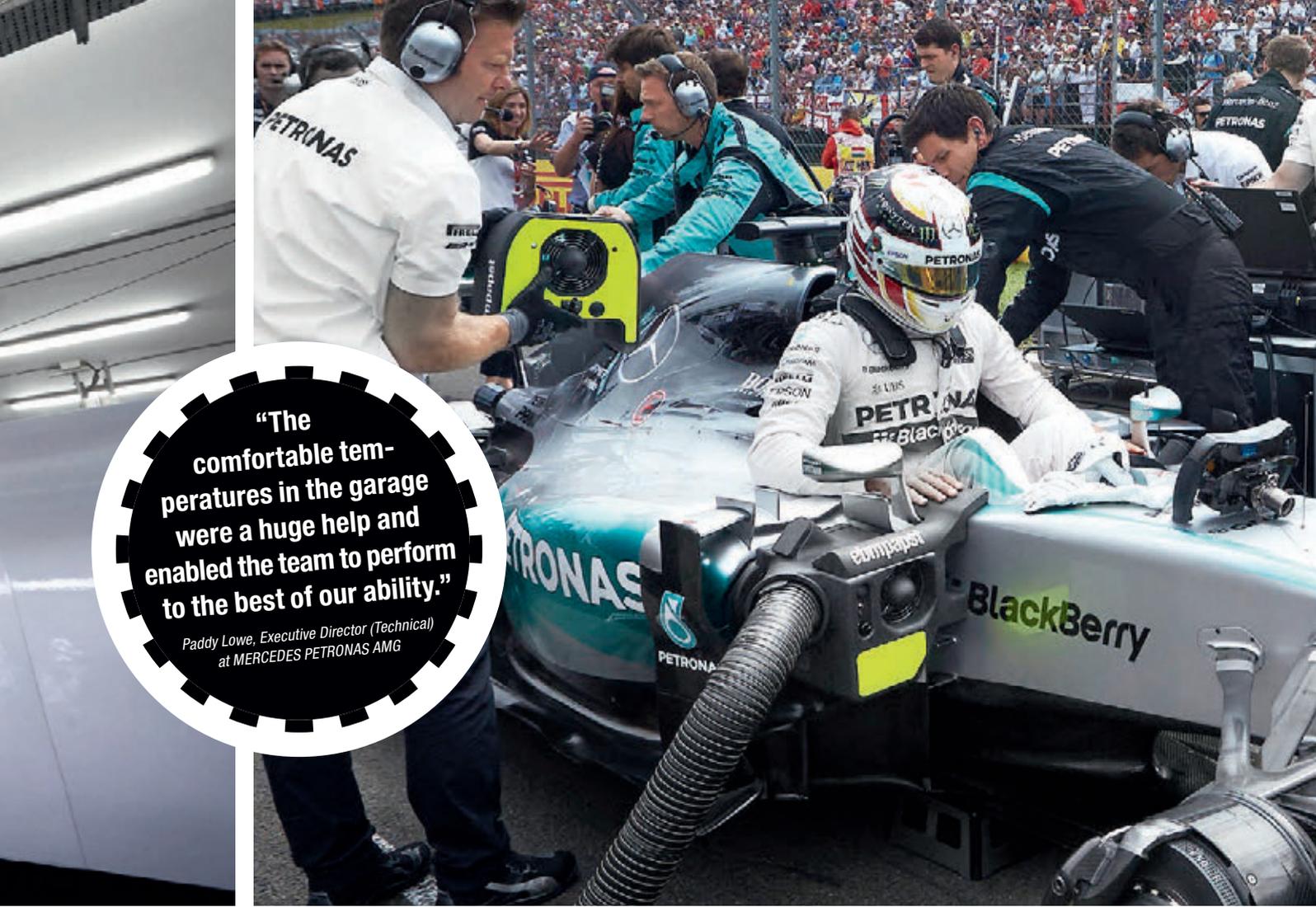
THE COOLEST TEAM IN FORMULA ONE

Even in hot races, the engineers from the MERCEDES AMG PETRONAS Formula One™ Team don't work up a sweat with their garage cooling system from ebm-papst.

Formula One can be a hot business, for the drivers in the racing cars, for the audience in the sun-bleached stands, and also for the engineers who work in the team garage to prepare the cars for qualifying and racing. Paddy Lowe, Executive Director (Technical) at MERCEDES AMG

PETRONAS, knows all about that: "At circuits in hot climates such as Malaysia, temperatures in the garage can reach 40 degrees Celsius — and that's compounded with almost unbearably high humidity. In this environment it's a real challenge for the team and drivers to maintain concentra-

tion and maintain peak performance over the four-day race weekend." So it's a good thing that MERCEDES AMG PETRONAS has ebm papst, the cooling experts, as a Team Partner. "When we were discussing how to shape our cooperation, garage cooling quickly became a priority



“The comfortable temperatures in the garage were a huge help and enabled the team to perform to the best of our ability.”

Paddy Lowe, Executive Director (Technical) at MERCEDES PETRONAS AMG

40 degrees Celsius and nearly unbearable humidity: Those are the circumstances the MERCEDES AMG PETRONAS Formula One™ Team had to face at the PETRONAS Malaysia Grand Prix. The garage cooling makes working at the cars significantly more comfortable for the engineers.

issue,” says Gareth Jones, Managing Director of ebm-papst Automotive & Drives (UK) Ltd. So ebm-papst, together with a long-time partner, took a close look at the problem and developed a system for cooling the team garage at circuits which have high ambient temperatures and no air conditioning system.

Flexible system There was a wide range of requirements which needed to be considered. The solution needed to be portable, resistant to water and dust, easy to install and remove and most importantly, provide a noticeable cooling effect to the team. “To reduce the weight, we decided in favor of a water-cooled air conditioner, which is considerably lighter and smaller than an air-

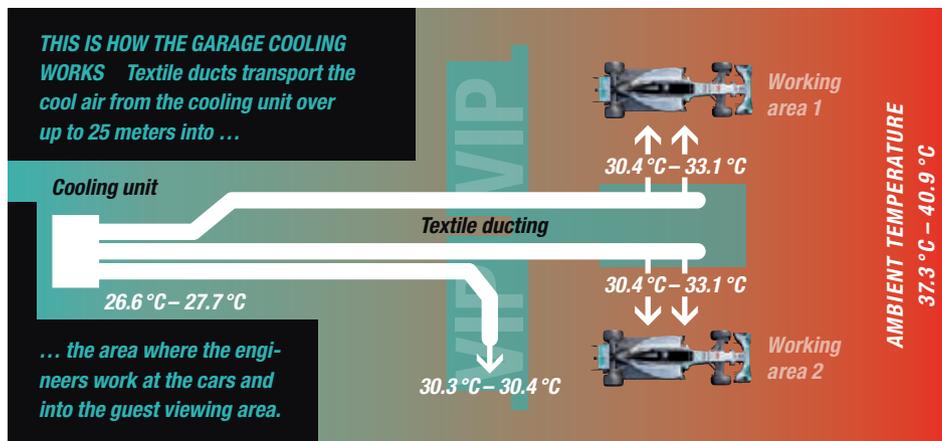
cooled unit,” explains Gareth Jones. While an air-cooled system would have weighed several thousand kilograms, the water-cooled unit only weighs in at 350 kilograms — and it's very compact: 1.30 meters wide, 2.10 meters high and 90 centimeters deep.

An additional challenge arose from the different layouts of the garages at the different Formula One circuits around the world. The team from MERCEDES AMG PETRONAS divides the space into various areas such as bodywork, gearbox, wings, engineering, IT and tires as well as the working area for the two race cars. Two of the system's air outlets cool the working area immediately adjacent to the cars at the front of the garage while an additional outlet ensures

cool temperatures in the guest viewing area to the rear of the cars. However, the cooling unit itself needs to be located in the rear part of the garage to avoid taking up too much space. Therefore, ebm-papst selected textile ducts for air transfer throughout the garage. The ducting is very light but durable, compact for easy transport, and can be easily adapted to the size and layout of the garage.

Depending on the garage, the air may be transported over as far as 25 meters from the rear part of the garage to the desired area. To ensure strong air flow at the end of such long channels, there is an efficient, high-performance RadiPac EC centrifugal fan installed in the cooling unit. →

TEAM PARTNERSHIP



Endurance test in Malaysia The garage cooling system passed its first live test at the Italian Grand Prix in early September 2014. “Everything worked as we’d hoped and the system achieved the desired cooling effect without difficulty,” says Jones. For the next step, MERCEDES AMG PETRONAS used a pit lane garage at the Sepang International Circuit in Malaysia for three days in February. However, the system failed to achieve the desired results. “The ambient temperature in Malaysia was considerably higher than in Italy, so at first we weren’t able to generate a perceptibly cool air current in the desired areas. That wasn’t because of the cooling system’s performance; the air transfer was the problem,” explains Jones. He had parts of the textile air duct system transported to Britain and tailored them to deliver considerably stronger air flow at the critical areas of the garage. ebm-papst also changed the orientation of the air outlets. “Instead of trying to cool the air throughout the entire front area, we designed diffusers to direct the cool air where the engineers work,” says Jones. Using the modified components, his associates at ebm-papst in Malaysia performed the next test in a factory building with an improved and satisfactory result: the cooling system reduced the temperature at the critical areas by almost 12 degrees Celsius — from hot and sweaty to comfortable.

A promise kept The system survived its baptism of fire in practical use at the Malaysian Grand Prix in late March. “We were really looking forward to having the ebm-papst cooling system operational in our garage in Malaysia. During the race weekend, the pace of work is extremely hectic, and it can be a really tough challenge for the drivers, engineers and mechanics in the particularly high heat and humidity locations. It was a huge help to us that the temperature in the garage was comfortable, enabling the team to perform to the best of our ability.” emphasises Paddy Lowe. During the race weekend, the system brought the temperatures in the critical areas down by up to nine degrees Celsius.

Now the Formula One™ Team will use the garage cooling system at all race circuits in Asia where temperatures are high and where no air conditioning exists in the pit lane garages. Using its global network of subsidiaries, ebm-papst manages the storage and logistics between the races — an additional facet of the partnership with the team. Gareth Jones is pleased that he and his colleagues were able to improve working conditions considerably for the engineers at the racetrack. “I always promised the team at MERCEDES AMG PETRONAS: ‘We’re going to officially make you the coolest team in Formula One™,’” he says with a laugh. ○



TOP: Before using it during an official race, ebm-papst tested the garage cooling under demanding climatical conditions.

MIDDLE: The textile ducting can be individually adapted to the layout of the garage at different circuits.

BOTTOM: Because it's working with water the cooling unit does not take up much space and can be easily transported.

Fresh air through closed windows

REHAU worked with ebm-papst to develop a ventilation system that provides fresh, warm air with closed windows.

Heat insulation is trending in Germany. But when heat stays in a house, moisture and contaminants stay in as well, and that promotes mold growth. To date, the remedy was provided by central ventilation systems or decentralized units built into a building's structure. In cooperation with ebm-papst, REHAU AG + Co has now developed an elegant solution: a window with ventilation system and waste heat recovery built into the frame.

The solution faced two challenges: The fan, the heat exchanger and the control electronics all had to fit in the limited space offered by the GENE0 series window frames, and the fans had to be as quiet as possible so as to avoid disturbing the residents. ebm-papst suggested the use of an especially compact centrifugal fan, which the engineers developed in three steps. First they integrated a three-phase EC motor in the fan, which is used in home appliances due to its low noise level. Then, using flow simulations, they changed the number and angles of the fan blades to work out the best compromise between size and noise level. Finally, they

adapted the fan to the available space and insulated it. "A window is supposed to last at least 30 years, so we use only durable and reliable components. So for this innovative new product, we looked for a company with an expert development team," says REHAU's Dr. Rainer Schork.

The main benefit of these self-ventilating windows, which are primarily intended for energy-saving renovations and new buildings, is that they can be installed quickly and easily. No air ducts need to be installed, nor is any masonry work required. Owners can perform maintenance work easily as they can replace filters and other components themselves. REHAU has already tested the windows in several pilot projects and recently began mass production. "The number of inquiries has already vastly exceeded our expectations. We're very confident that the entire project will be a success," says Schork. ○

 Read the technical article at mag.ebmpapst.com/techmag_window_fan

In every window in the GENE0 INOVENT line, two fan pairs for air intake and exhaust are integrated in the frame. While one fan routes the used, warm air from the interior through a heat exchanger to the outside...

...the other fan brings in cold outside air through the exchanger and preheats it. Using the waste heat in the outgoing air minimizes energy losses and lowers heating costs.



ebm-papst

Julien Grilliat

laboratory group leader for aerodynamics, acoustics and vibration measurement

ebm-papst St. Georgen

Perception of noise levels

The human ear is capable of perceiving acoustic waves of very different amplitudes. At a frequency of 1 kHz, the hearing threshold is about 20 µPa; the pain threshold is approx. 64 Pa. The dB scale was designed as follows to allow visualization of this very high dynamic range:

$$dB = 10 \log_{10} \left(\frac{p^2}{p_0^2} \right)$$

where $p_0 = 20 \mu Pa$ and p^2 represent the energy of the acoustic signal.

Examples of noises, in dB(A)

- 160 Rifle shot near muzzle
- 130 Jet fighter at distance of 7 m
- 120 Airliner at distance of 7 m
- 110 Private aircraft at distance of 7 m
- 100 Circular saw
- 90 Car at 100 km/h at distance of 1 m
- 80 Car at 50 km/h at distance of 1 m
- 70 Lawn mower
- 60 Normal conversation, car at distance of 15 m
- 50 Quiet radio music
- 40 Humming refrigerator
- 30 Whispering
- 20 Dripping water faucet
- 10 Rustling leaves in forest
- 0 Defined threshold of hearing

Sound effects

Analyzing noise to provide figures relating to physics and people

A product's quality in terms of its sound emission is usually determined by its dB(A) value, which refers to the sound pressure level generated by an acoustic source at a certain distance. Depending on the level of the alternating pressures from which the sound pressure level is determined, exposure to noise can cause effects ranging from slight reductions in mental performance to pain and even unconsciousness.

The concept of dB(A) also includes a means of assessing acoustic measurements to help answer the question, "How does noise affect people?" This question has kept scientists busy for decades and is now of increasing interest to engineers. For example, the following findings have been compiled in psychoacoustic studies: For physiological reasons, humans do not perceive every frequency equally. Figure 1 shows the results of hearing experiments with tones of different frequencies. The curves show, depending on frequency, what sound pressure level is needed in order to be perceived uniformly by humans. This is called loudness.

This diagram provides a number of insights. For one thing, it can be seen that the human ear is most sensitive in the range between two and

four kilohertz. Much higher or lower frequencies are perceived as quieter, even at the same sound pressure level. It can also be seen that this characteristic of hearing is not only dependent on loudness. The isophone at 40 phon was used for the dB(A) weighting (Figure 2).

In addition to dB(A), there are other frequency weighting methods. For example, dB(C) has been proposed as a better alternative for high sound pressure levels. The dB(D) weighting has become established for aircraft noise.

The dB(A) value and its reduction from one product generation to the next are sales arguments for industrial products. This is insufficient when the effect of noise reduction on people is determined by a significantly different perception than that of pure loudness. For example, other research has shown that a noise reduction of approximately ten dB(A) is perceived as a halving of the loudness.

For the continued improvement of our products, these issues cannot be neglected. This was one of the reasons for building the "Kombikanal," a test stand at our St. Georgen location for combining air performance and acoustic measurements for fans to enable acoustic and psychoacoustic analyses of the products. ○

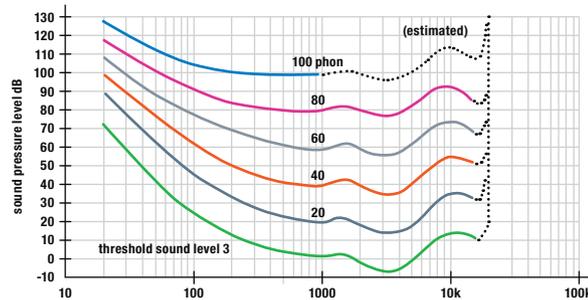


Fig. 1: The curves show how much sound pressure is needed so that humans perceive sound uniformly.

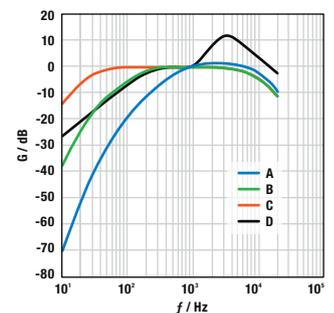


Fig. 2: Curves of equal loudness level — isophones (ISO 226:2003)

Imprint

Publisher:

ebm-papst Mulfingen
GmbH & Co. KG

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Reproduction and Print:

Raff GmbH



Find us here: Trade fairs & dates

Trade fairs

Busworld, Kortrijk, 16 – 21 October 2015

Interclima, Paris, 2 – 6 November 2015

China Shop, Wuhan, 5 – 7 November 2015

Elmia Subcontractor, Jönköping, 10 – 13 Nov. 2015

Compamed, Düsseldorf, 16 – 19 November 2015

Swissbau, Basel, 12 – 16 January 2016

AHR, Orlando, 25 – 27 January 2016

HVAC & R, Tokyo, 23 – 26 February 2016

Energiesparmesse, Wels, 24 – 28 February 2016

Mostra Convegno, Milano, 15 – 18 March 2016

For more trade fairs dates visit: www.ebmpapst.com

Events

Cooling Days, Würzburg, 20 – 22 October 2015

14. ebm-papst Hallenmasters, Mulfingen, 6 – 9 January 2016

Jugend forscht, Künzelsau, 25 – 27 February 2016

02°2015 mag

Technology for further reading

Are you interested in technical data, developments and products?
The current issue of our sister publication *tech.mag* once again features a wide range of technical articles:

An efficient family: The NRV systems provide the perfect gas/air mixture

The next step toward greater efficiency: Plug & play centrifugal fans for ventilation systems

Small centrifugal fans: Fresh air through closed windows

EC fans for fan coils: With active power factor correction

S-Panther series: Family of compact high-performance fans featuring high performance at top efficiency

The *tech.mag 3/2015* is available. Contact our sales team or e-mail Katrin.Lindner@de.ebmpapst.com.



Green Deeds Worldwide

“Every day is a green day” was the motto of the 2012 ebm-papst sustainability campaign that was initiated by the company’s trainees. Since then, June 5, which is the UN’s declared World Environment Day, kicks off a new round of “green” action weeks. Already in the last three years, ebm-papst subsidiaries worldwide have been making their mark when it comes to environmental protection, sustainability, and efficiency. Here are just a few of the many green actions that a select four of the company’s global locations implemented in the fourth year.

USA At the beginning of June, three trainees from the Mulfingen location traveled across the pond to describe their work as energy scouts to their American colleagues while also providing three days of practical training on how to handle energy more efficiently. They presented their project to the German-American Chamber of Commerce AHK USA and were welcomed as guests by companies interested in their work. They also visited the Environmental Program at the United Nations in New York as well as a technical high school.



INDIA A photovoltaic system of 100 kW capacity at the plant in Chennai will supply part of the energy required by the Indian location. Rainer Hundsdörfer, Chairman of Board of Directors of the ebm-papst Group, traveled there to attend the official dedication of the new PV system, which includes solar cells on the roof and six solar inverters equipped with fans produced by ebm-papst. A computer monitors the entire



plant in real time and provides information on its current output.

AUSTRIA Employees committed to purchasing only products without plastic packaging for one week. This required them to consistently adjust their consumer habits. Instead of going to the supermarket around the corner, employees went to the weekly farmer’s market, straight to the farm or to organic food stores where employees were able to buy milk, chocolate, and vegetables without or in alternative packaging materials. With this action, the location boosted employee awareness of the negative consequences of our throw-away mentality on the environment and our health.



SWEDEN The team used Green Day as an opportunity to introduce sustainable food practices to the company cafeteria. Since April, the cafeteria has been making seasonal fruit as well as milk, tea, and coffee from organic farms available. The new selection of organic food helps to protect the environment, makes employees more aware of the benefits of organic food stores, and encourages them to think about their own consumer habits. On June 5, a vegetarian lunch was also served.



 More campaigns: greenday.ebmpapst.com

“ U.S., Hungary, Germany: At many of our locations worldwide we are currently expanding our capacity to pave the way for further growth. For example, in Hollenbach we have doubled the amount of floor space for production of our large motors and fans. With the new 30,000-square-meter shipping facility planned for Hollenbach, we will be able to optimize our logistical processes and provide even better service for our customers. In the U.S., at mid-year we began motor production in Farmington so that we can deliver to our customers even more quickly. But investing in floor space and equipment alone is not enough. To supply all of our customers simultaneously, quickly and reliably, we need to adapt our production planning even more exactly to their needs. By pacing our production to customer needs, we aim to supply the products at exactly the times and rates at which the customers actually need them. ”



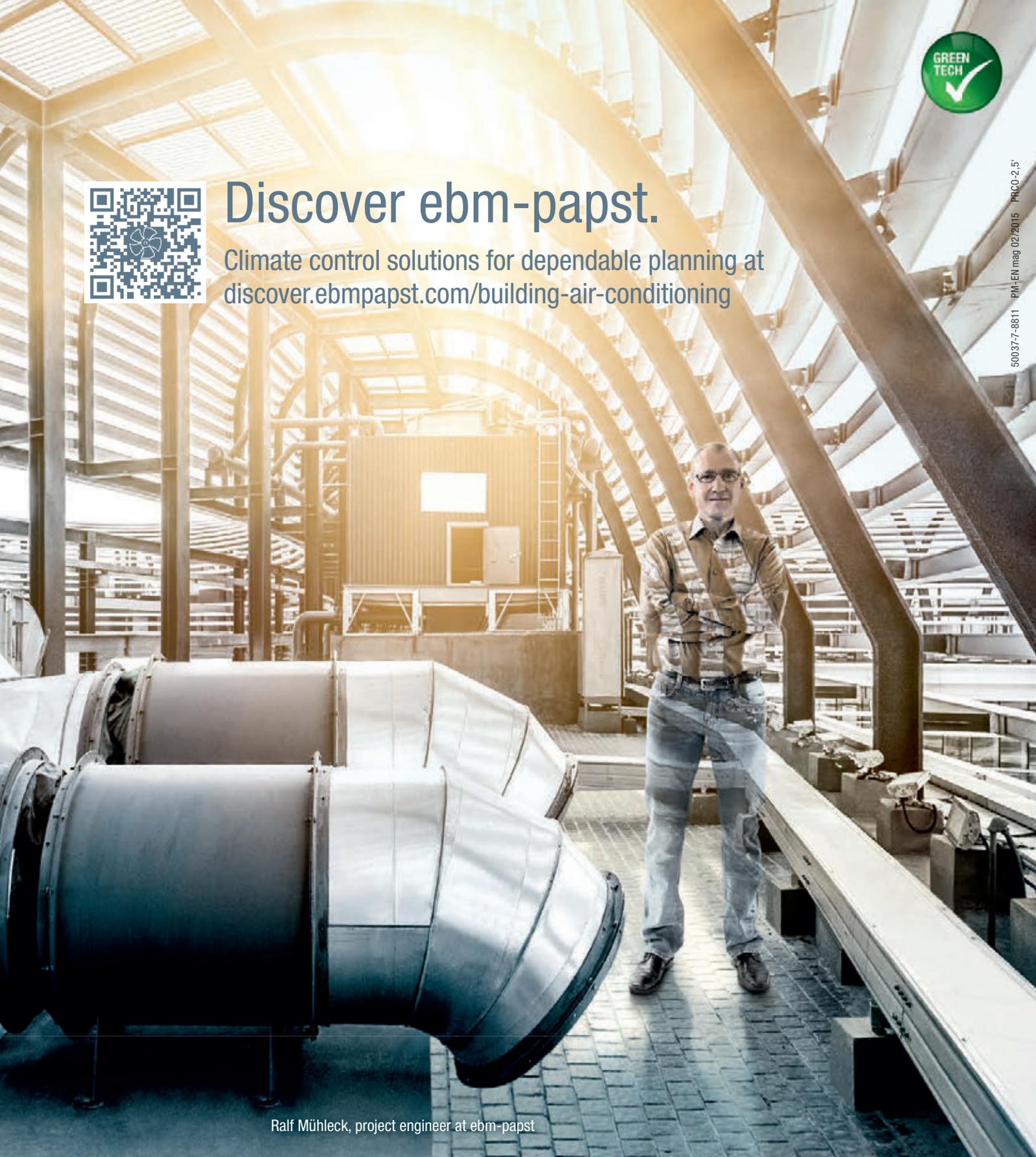
*Thomas Wagner,
Managing Director
for Production and Materials
Management, ebm-papst Group*





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Ralf Mühleck, project engineer at ebm-papst

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