



# The whiz from the car deck

Carsten Johansen sets the course for more efficiency on the ferries of his employer

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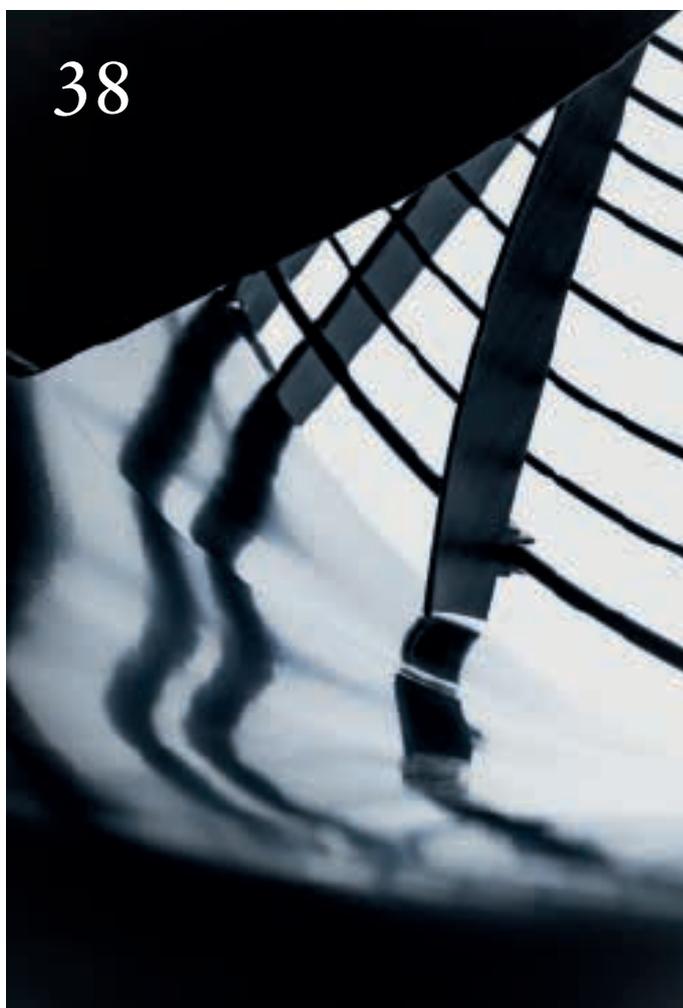


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**IO** From ventilating a Baltic ferry's car deck to gently cooling steaks in Brazil (page 24): No matter how exotic or challenging the tasks are, together with our customers we always find the best way with help from our extensive experience with applications and efficient systems and our ability to think in terms of solutions.

**I7** As a result, today we're already at home discussing and implementing connectivity solutions, for example when facing questions about networking a new condensing boiler or an autonomous logistics system (page 22). Our goal is always to integrate our system solutions in an application so as to maximize the added value for our customers and the end users.

We also had added value in mind while giving our customer magazine a face-lift. In our new design, we tell stories that zoom in on our customers to give you fascinating insights into solutions based on our entire range of technologies. For even more information, check out our digital sister publication [mag.ebmpapst.com](http://mag.ebmpapst.com), which we've also reworked for use with smartphones and other digital devices.



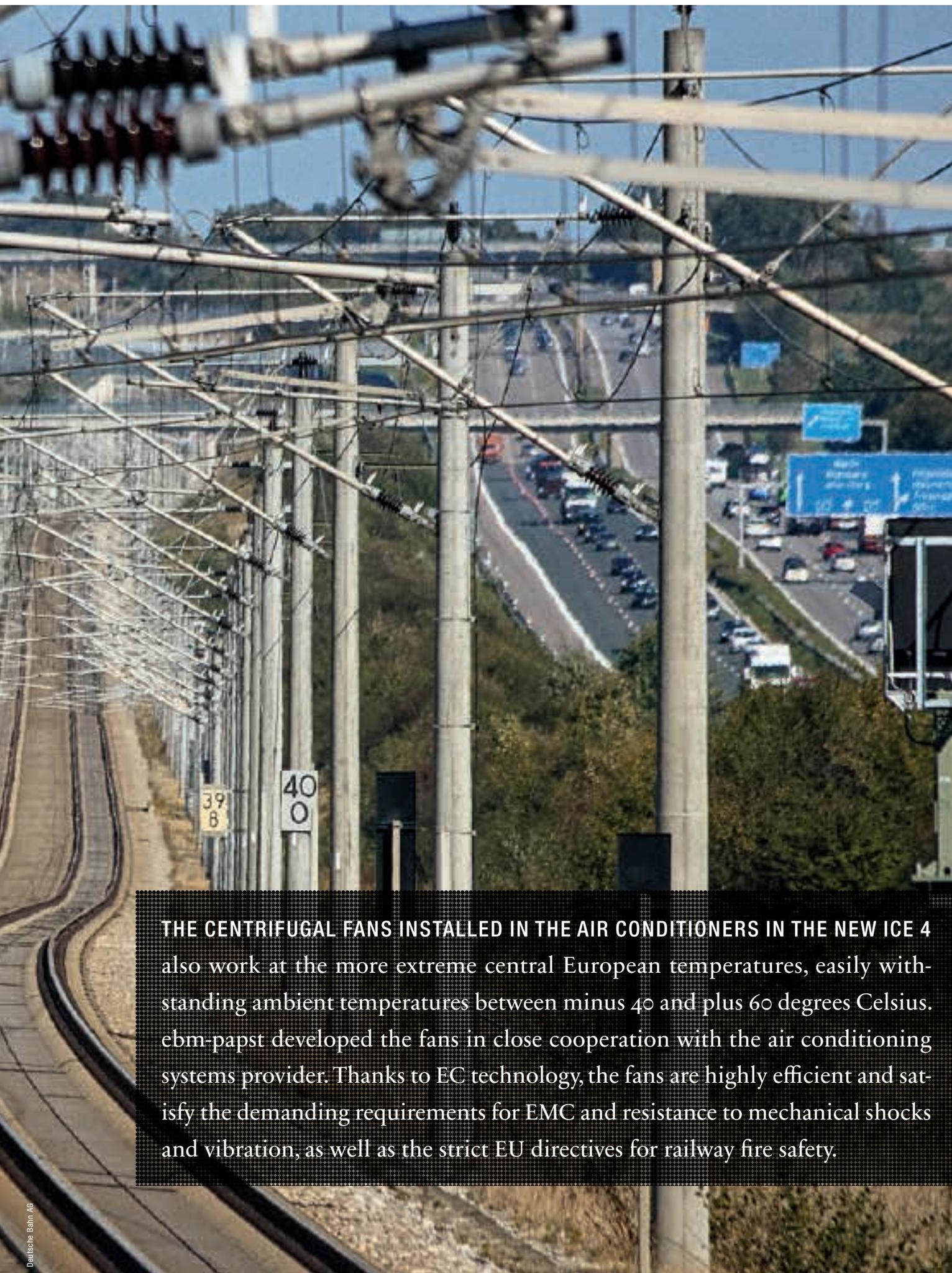
**Thomas Borst**

—  
MANAGING DIRECTOR  
SALES AND MARKETING  
EBM-PAPST GROUP

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"AxiBlade makes machines better!"





**THE CENTRIFUGAL FANS INSTALLED IN THE AIR CONDITIONERS IN THE NEW ICE 4** also work at the more extreme central European temperatures, easily withstanding ambient temperatures between minus 40 and plus 60 degrees Celsius. ebm-papst developed the fans in close cooperation with the air conditioning systems provider. Thanks to EC technology, the fans are highly efficient and satisfy the demanding requirements for EMC and resistance to mechanical shocks and vibration, as well as the strict EU directives for railway fire safety.



A juicy T-bone steak needs to be properly seared, but nobody wants odors from the kitchen in other rooms. Unfortunately, many odor-bearing particles and grease droplets don't make it up to the range hood. **THE BORA EXTRACTOR** is built into the cooktop, where it can draw off the vapors where they originate — all of them. Fans from ebm-papst suck in the air from below and convey it to the outside through a duct or an air recirculation system.

[www.bora.com](http://www.bora.com)



# No-sweat excavating

One feels pretty small next to one of the enormous mining excavators made by the Russian company IZ-Kartex. The gigantic machines are used in surface mining to extract valuable minerals from the ground, digging with shovels that have a capacity of up to 15 cubic meters. Air conditioners from Dokon cool the cabins of the yellow behemoths so their

drivers don't have to work up a sweat during a hard day's work. Centrifugal fans from ebm-papst convey the air from the air conditioner to the operator. Their reliability and durability contribute to one of the most important aspects of the excavators: their low life-cycle costs. ●



# What's next

Fiscal year 2015/16 saw growth of seven percent for ebm-papst. The six managing directors tell us how they want to continue this success.



*How did the last fiscal year go?*

We set a record for the third straight time with sales of 1.68 billion euros, and we strengthened our technology and market leadership. We're pleased that our customers trust in our solutions expertise and our products. Our numerous innovations were also well received by the customers.

*What goals follow for you from that?*

We want to continue along our path to success. For the 2016/2017 fiscal year, the ebm-papst Group plans for revenue growth of 9.3 percent to 1.836 billion euros. We want to top the two billion mark in 2019, so we're investing around

the world in new production facilities and new development centers. Our current plans call for 192 million euros in capital investment.

*How will you meet the needs of customers?*

We need to keep getting from customer requests to reliable, customized products quickly, and for that our motor platforms, impeller sets and product lines provide an excellent foundation for all markets. We're improving the interplay among sales, development and production so that we can deliver suitable solutions even more quickly and continue to be perceived by customers as a technological trendsetter that provides quality and satisfaction.

*How will ebm-papst confront internationalization?*

Many of our customers are positioned across regions or globally. With sales teams focused on market segments, we're adjusting to strengthening global market and customer structures to further strengthen our customer focus with speed, flexibility and a high level of technical expertise. In addition, we're increasing efforts to build up technological expertise at our production sites abroad.

*Where do you see technological potential?*

With our core expertise in motor technology and aerodynamics, we can make even more progress in efficiency, noise reduction and

resource conservation. We see particular potential for further development in aerodynamics and aeroacoustics. We will satisfy more complex requirements with more easily installed and highly efficient system solutions.

*How is ebm-papst approaching Industry 4.0?*

Many of our products are already parts of big networks and communicate with a variety of other systems. We want to continue along this path and also develop more expertise in software. We're very enthusiastic about digitalization and are increasing our research activities there. ●

# Mr. Johansen knows the course



COMPANY  
**Scandlines**

LOCATION  
**Rødby and Copenhagen, Denmark**

Thanks to modifications to the car deck's and passenger ventilation system, the ferry operator Scandlines saves two million kilowatt-hours per year. For chief engineer Carsten Johansen this is an important step towards zero emissions.



Where one big AC fan was working before the retrofit (left), now four smaller EC fans are helping to exchange the air.

# T

The water around the ferry *Prinsesse Benedikte* shimmers metallic blue as she leaves the harbor in Puttgarden on the German island of Fehmarn and heads for the Danish port of Rødby. What very few passengers know: They're on a hybrid ferry that gets its energy from both diesel generators and batteries. One who knows that very well is Carsten Johansen, who is standing on the ship's bridge and taking a close look at the instruments instead of enjoying the sun over the Fehmarn Belt. Johansen, who is affectionately called the "energy minister" by his coworkers, is chief engineer at Scandlines, where he is steering the helm more and more toward efficiency. "Sustainability isn't just part of my job, nowadays it also dictates my personal lifestyle. That's inevitable when you concentrate on this subject so much." At home, the 57-year-old therefore replaced an old oil fired heating system with an energy efficient heat pump, installed solar panels on the roof and changed lighting to low energy LED lamps.

Since 2003, Johansen's daily work has involved bringing the ferries between Puttgarden and Rødby ever closer to the goal of zero emissions. Back then he replaced the first of five diesel generators with an electric energy storage system. It quickly became clear to him that it would not be enough to replace the power from the ship's diesel generators bit by bit with battery power. The ship also needed to save electricity in order to limit the number and cost of the expensive batteries. So Scandlines replaced water pumps, converted to LED lighting, and had its captains trained in energy-saving sailing techniques. In 2015, the energy minister took on the ship's climate control system. "It used an enormous amount of power, so we hoped we could save a lot of energy there."

### *A revealing voyage*

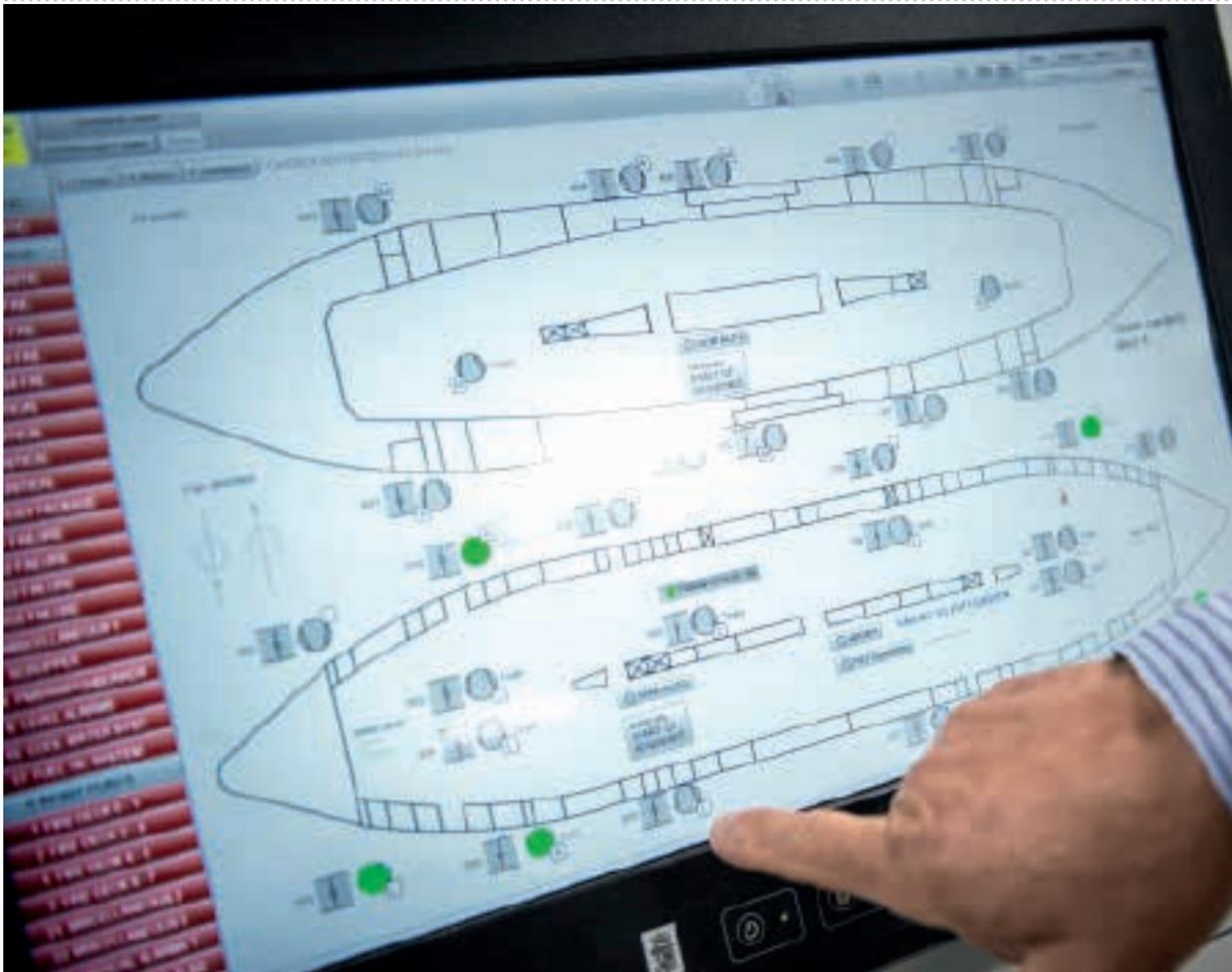
That's how Niels Knokgård and Torben Kirkholt came to take a short voyage to Germany and back again. Johansen had invited the technical sales representative from ebm-papst Denmark and his managing director to an on-site visit. During the short trip, in addition to examining the ventilation system in the passenger area, the two also took a close look at the system in the 12,000 cubic meter car deck, where eight large AC fans were responsible for air circulation. During the ferry ride, six fans brought fresh air into the closed deck from the outside while two others conveyed used air to the outside. In port, two fans took a break while the other six aired out the ship. Since the two modes required the air to be transported in opposing directions, some fans had to run in reverse. "That's a very inefficient way to operate a fan," Knokgård pointed out to the energy minister as the three men stood in front of the AC giant. "Yes, that's precisely the problem," sighed the latter. "If only we could turn the fans around." A sentence Knokgård and Kirkholt couldn't forget.

### *Pivoting fans*

"It was obvious that we can't easily turn a fan around," says Knokgård. After puzzling over the problem a bit, he and his colleagues came up with the idea that they didn't have to turn the individual fans at all. Together they developed a pivoting square metal plate on which four fans are mounted so that they can operate in both directions without running >>

Not afraid to sully their hands: Carsten Johansen, Chief Engineer at Scandlines (in the middle) and Torben Kirkholt and Niels Knokgård from ebm-papst.





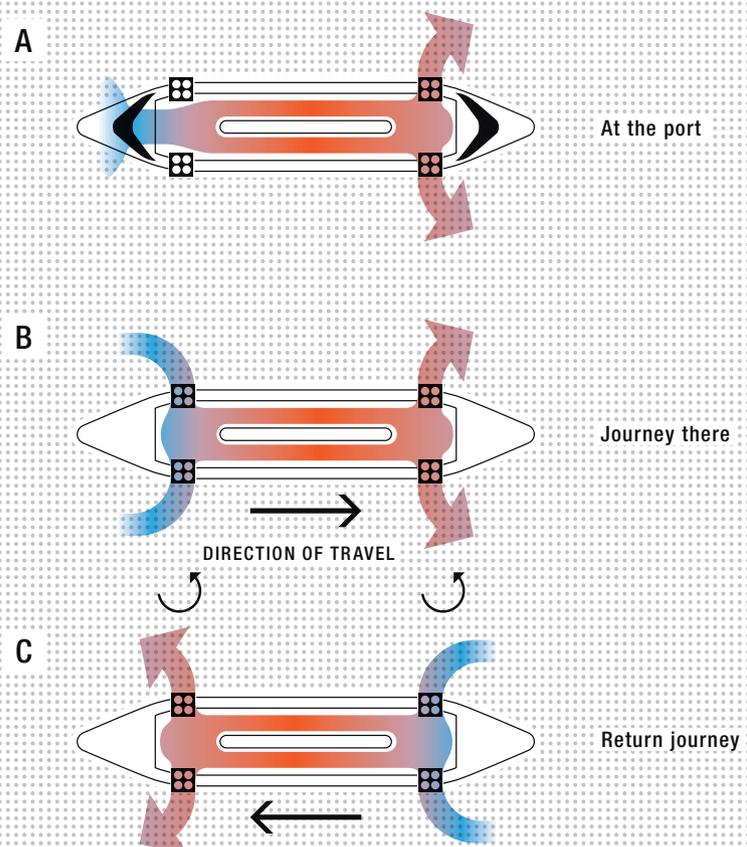
The ventilation system of the car deck can now be controlled centrally and precisely.

## How the car deck is ventilated

When the ferry is in port (A), the doors facing the quay are open so that sufficient air flows into the car deck. Two FanGrids are turned outward to provide extra air circulation support.

During a crossing (B), the two FanGrids in the ship's stern take air in and the two FanGrids at the bow expel it to keep saltwater spray out of the intake air. To save time in port, the ferries have two bridges so they do not need to turn around; a ship can embark on its return voyage from the same position.

Since the former bow of the ship is now its stern and vice versa, the fans at each end are turned in the opposite working direction (C).





## “The payback period for the change from AC to EC technology is just one year.”

Carsten Johansen — CHIEF ENGINEER AT SCANDLINES

»»

in reverse. “Since no modifications to the ship are allowed, there wasn’t much room for us to work with. That means the fans can’t be pivoted by exactly 180 degrees,” explains Knokgård, but the idea works anyway.

*From AC to EC*

But with this new concept, ideas for increased efficiency were far from exhausted. Replacement of the AC fans with fans using EC technology seemed an obvious next step. The latter can be smoothly adjusted to the output that is actually required, so they can be operated very economically. To generate even more pressure in the same amount of space, Knokgård suggested using FanGrids with four smaller fans

instead of large single fans, increasing the area over which the air is conveyed and further improving the air exchange on the car deck. When Johansen heard about the idea at the next meeting, he was enthusiastic and commissioned a technician to install a test unit with a pivoting metal plate and four EC HyBlade fans.

*Explosion protection included*

A glance at the car deck shows that not only globe-trotting tourists and seasoned commuters use the connection between Denmark and Germany, but also a lot of truck drivers. Some of the trucks transport flammable substances, and that places another important demand on the fans. »»



## Scandlines facts and figures

The German-Danish ferry operator Scandlines operates two short ferry routes with high capacity and frequency and with a green vision for the future. On the Puttgarden-Rødby route alone, the five ferries transport 1.5 million cars, 400,000 trucks and 12,000 railroad cars annually. The ships are in constant use, spending an average of only 15 minutes in port and reaching an official total of 104 departures per day.

VIEW THE VIDEO ABOUT THIS STORY:

[mag.ebmpapst.com/scandlines](http://mag.ebmpapst.com/scandlines)

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“Of course it was a big plus for us that ebm-papst is the only manufacturer that offers EC fans in an explosion-proof ATEX design,” says Johansen. After refitting the test unit, the chief engineer made some comparative measurements and found that the savings actually exceeded the expected values.

A finding with consequences: During the next routine maintenance, Johansen had another three FanGrids installed in the ferries while they were in the docks. And Scandlines also switched to EC fans for the ventilation system in the passenger area. The results are very impressive. Thanks to the ventilation changes, Scandlines now achieves total energy savings of two million kilowatt-hours per year and ship; the payback period for the project is a little over one year. “That’s a giant leap for us,” says Johansen. Following up on the successful pilot project, Scandlines will implement the solution on the other three ferries that ply the route between Puttgarden and Rødby as well.

Meanwhile, the Prinsesse Benedikte has docked in Rødby. Johansen is stretching his legs on the pier as an unending stream of cars and trucks flows out of the ship. “Our goal is to achieve emission-free and fully electric-powered travel within the next few years,” he says. “If all goes well, we might already get there by 2019.” The energy minister already has an idea for the next step. After all, the ferry has another car deck... ●

COMPANY  
Remeha

LOCATION  
Apeldoorn, the Netherlands

# The heating Dutchman

When Ton van Maaren started working at Remeha 33 years ago, condensing boilers were still in their infancy. Now they'll soon be able to call a service technician themselves via Internet when they need help. The new Quinta ACE condensing boiler is prepared to do that.



## Remeha: From mid-sized company to global player

When the businessman Gerard van Reekum founded “Van Reekum’s Metaal Handel” in Apeldoorn, Holland, in 1935, most households still heated with coal-burning stoves. At that time, the young company supplied steel pipes and fixtures to the heating industry. When central heating became popular, Remeha developed its first water heaters in the 1940s. In the following decades, the company continued to develop its expertise in this field. Since 2009, together with brands such as De Dietrich, Baxi and Brötje, Remeha has belonged to the BDR Thermea Group B.V., which is headquartered in Apeldoorn and has a total of 6,400 employees.



Remeha's latest hit: the Quinta ACE gas-condensing boiler.

# A

Apeldoorn, Holland, in the not-too-distant future: A heating technician sets out for an apartment building in the city center, where he is to service the water heater. But his assignment isn't from the building's owner. It's from the heater in the cellar, which reported the problem by itself via Internet. The technician was already able to make a diagnosis on the computer and bring along the required replacement part.

If it were up to Ton van Maaren, this would soon be an everyday scenario. “We've established the technical foundation and the first projects are already in progress,” says van Maaren, senior product manager at Remeha, a heating company from Apeldoorn, Holland. Anyone listening to him can quickly tell that he knows exactly how the boiler market works. After all, he has been with Remeha for 33 years. When he started there, the company was still

small. Since then, Remeha has become part of the BDR Thermea Group, which has operations worldwide.

### *Saturated markets*

At the beginning of van Maaren's career in 1983, condensing boilers were still relatively new. “Nowadays 99.9 percent of the boilers sold in Holland are equipped with condensing technology. The trend is similar in other European countries. So the market is nearly saturated and is barely growing anymore,” says van Maaren. If Remeha wants to gain market share, it has to offer more than just efficient and clean combustion. “A lot of the development work is no longer related to combustion technology, it's about aspects like easy installation and maintenance, user-friendliness and, most importantly, digitalization. Smart devices that can

communicate are becoming more and more important.” Devices that decide on their own whether they need servicing and for which remote diagnosis with a computer is possible could soon be part of the standard repertoire for boilers. But as van Maaren emphasizes, that's up to the manufacturers. “When it comes to innovation, the boiler market is actually pretty sluggish. We manufacturers have to show the market what's technically possible and worthwhile. We can't allow ourselves to wait until the market asks for it.” So Remeha's new boilers are Internet-capable and ready for the digital future.

### *Power on the wall*

In the company showroom, the product manager shows Remeha's latest product, the Quinta ACE. The boiler, which measures only 100 x 60 x 60 centimeters, has

an output of up to 161.5 kilowatts and hangs on the wall to save space. The unit has been on the Dutch market since the beginning of 2016. It supplies heat for apartment buildings, schools, hospitals or offices and industrial buildings. “Previously there were only floor-mounted units in this output class since they were too big and heavy to mount on walls. They need a lot more space and also take much more effort to install,” says van Maaren. Since the boilers hang at chest level, installers no longer need to crawl on the floor during installation and maintenance. And fewer interfaces means there is little effort required for installation.

If higher output is needed, up to eight boilers can be cascaded to reach a total output of 1,292 kilowatts. “We supply complete modular systems for that. The installer only has to hang up the boilers and screw the prefabricated parts together.” What sounds so simple had a very busy background story. More than four years of development work went into the high-powered boiler. “The challenge was to fit

all of the components into a limited space,” says van Maaren, adding “For that we needed dependable development partners.”

#### *Compact all-in-one solution*

The boiler’s modular construction enables its compact design. “As in the automotive industry, for some time now we’ve been taking the approach of installing system solutions. That improves the quality,” says van Maaren. As proof he points to a condensing boiler in the showroom, the Tzerra, designed for use in private households. “In this unit, for the first time we used a preassembled gas-air module with a combustion controller from ebm-papst that was specifically developed for it. Perfect interplay among these components is crucial for optimum combustion.” While the Tzerra had an output of 28-40 kilowatts, the Quinta ACE with its 161.5 kilowatts was a step into a new dimension. ebm-papst developed a new all-in-one solution; in addition to the venturi, valve, blower and combustion

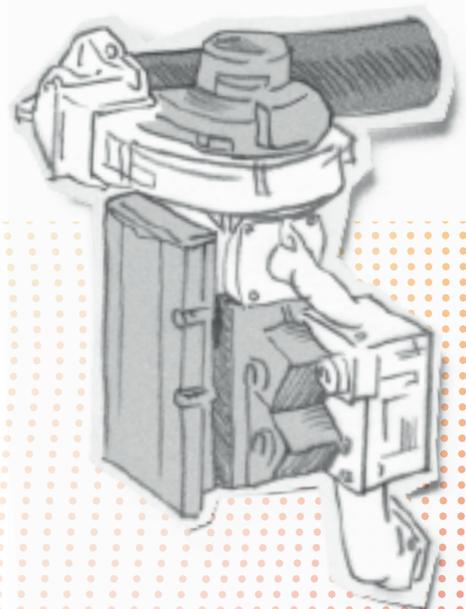
controller, even the burner is integrated. Such a complex system from a single source is unique on the market so far,” emphasizes van Maaren as he heads for the manufacturing facility.

#### *Quick installation*

There another advantage of the modular construction becomes apparent quickly. All the workers there have to do is place the gas-air unit in the boiler, tighten a few screws and connect the cables. After that only a few more steps need to be performed before shipment. Since its launch at the beginning of 2016, hundreds of Quinta ACEs have been installed in Holland. “For a new boiler in this output class, that are very impressive volumes. Soon they’ll also be on the market in other European countries,” says van Maaren on the way back to his office. There he attends to the next project. “We’re in the process of adapting the gas-air unit for higher output classes. They’re still too heavy for the wall. But who knows what the future will bring.” ●

## The gas-air unit from ebm-papst

The right gas-air ratio is crucial to optimum energy yield, so the blower, venturi, valve and combustion controller have to be perfectly matched. The venturi provides the correct gas-air ratio. The blower draws in this mixture for combustion in the burner. The valve regulates the gas quantity depending on the vacuum produced by the blower in the venturi. And the combustion controller is responsible for controlling the system as a whole. It sits directly on the blower, so it gets cooled and needs no elaborate wiring, saving space and installation time.



# Nice and quiet here

In the search for peace and quiet, Silvento fans from LUNOS make you yearn to be in your bathroom.

Next time things are too hectic in the office, Michael Merscher, technical director at LUNOS, can work in peace in the bathroom.

COMPANY

**LUNOS Lüftungstechnik**

LOCATION

**Berlin, Germany**

Your coworkers are phoning loudly again, or chatting right in front of your cubicle, and constantly somebody's coming by with questions — and you're supposed to concentrate on your work? Impossible. What to do? Head for the bathroom, because there's one thing you can be sure of there: peace and quiet — at least when a Silvento fan from LUNOS Lüftungstechnik GmbH is keeping the air fresh. This product line features extremely low noise and the highest pressure increase for its size. The fans also excel with their low power consumption. "Energy efficiency had top priority while we were developing it," says Michael Merscher, technical director at LUNOS. "After all, this is the parameter that decides how well our fan will do on the market." LUNOS was quick to recognize how important the issue would become, and in the fan and motor manufacturer ebm-papst they found the right partner: its EC centrifugal blowers are installed in the Silvento fans. A completely customized product that both

companies developed together over a period of three years. The effort was worth it. With its prize-winning fan series, LUNOS is now a market leader.

### *Little space, lots of power*

Limited space was a special challenge for the development partnership. "Our customers want fans that are quiet and can reliably transport the required air volumes," says Michael Merscher in describing the requirements. "They also need to always deliver the same performance in different installation scenarios without complicated settings," he adds. To save space, ebm-papst separated the motor controller from the fan. Now it can simply be placed wherever enough space is available without blocking the air flow. That makes installation easier.

Thanks to electronic control, the fans can also be customized with various control options such as sensors for humidity detection so they can ensure a pleasant bathing — or working — environment. ●



READ ALL ABOUT THE  
DEVELOPMENT PARTNERSHIP BETWEEN  
LUNOS AND EBM-PAPST AT  
[mag.ebmpapst.com/lunos](http://mag.ebmpapst.com/lunos)

## COMPANY

Karlsruhe Institute of Technology (KIT)

## LOCATION

Karlsruhe, Germany

» *We're surfing the  
4.0 wave* «



Andreas Trenkle surfing to the interview on a KARIS PRO. The module can reach a speed of up to seven kilometers per hour. A laser scanner constantly scans the surroundings to detect possible obstacles.

It comes when called, finds the shortest path to its destination, and connects with its fellow modules when necessary: the little factory runabout KARIS PRO. Twelve industrial and research partners are developing it. Project manager Andreas Trenkle from the Karlsruhe Institute of Technology tells us about its chances.

*Mr. Trenkle, who needs a flexible transport system like KARIS?*

Anyone who needs more flexibility for in-house transport. Automated logistics systems are not only expensive, they're also inflexible and getting them up and running costs lots of time and money. So today many transports are still done by hand with dollies, stackers or milk run trains. KARIS PRO plans its routes on its own and transports its cargo to its destination autonomously.

*Is anybody already using your modules?*

We're starting two pilot projects now. In Audi R8 production at its Quattro supplier, five KARIS modules get parts from the warehouse. A module drives under a box containing all of

the parts needed for a certain production step, docks with it, and brings it to the assembly site at the correct time. If an entire pallet has to be transported, four modules combine to form a single unit. At Bosch Diesel Systems, our modules transport parts from different production areas to and from a measuring room. It's a big area extending over two buildings. A tow train used to do the job, making its rounds according to a schedule. Now our module comes when it's needed and chooses the best route by itself. A taxi instead of a train, you could say. The advantage is that the workers get their materials sooner.

*How do the modules know what they're supposed to do?*

Workers enter the orders on a tablet. All modules are informed via WLAN and negotiate among

themselves about which of them will carry out an order; there's no centralized control. Then the module with the shortest path to the destination and enough battery power takes the job. The KARIS PRO could also get its jobs directly from an SAP system or from RFID tags on the boxes instead of from manually entered jobs.

*How do you ensure that your modules don't bump into the shins of production staff?*

KARIS PRO has a safety laser scanner that continuously sweeps the area in front of it — a sort of eye. With data from that, it can detect obstacles and drive around them. If an object such as a walking person is on a collision course, the module will stop immediately. The complex drive units monitor themselves constantly, checking the speed

and position of the steering drives. So the module always knows how fast it's going and in what direction. If it ever has to drive backwards, the drive's motor currents are used for tactile detection of collisions. The drive notices as soon as it encounters an obstacle and then brakes immediately. This way we don't need additional sensors.

*What's next for KARIS?*

Things will really get interesting when our modules are used in a flexible production environment with machines that communicate with KARIS and tell it, "Bring me this, take that over there." KARIS PRO should be able to deal with the dynamics and fluctuation of such a situation. We're in discussions with businesses about industrializing and marketing KARIS PRO. ●

ebm-papst supplies the external rotor motors and transmission components that drive and steer the KARIS modules. The drive (photo at right) lifts the platform slightly when the vehicle picks up a pallet.



FOR MORE INFORMATION, GO TO:  
[mag.ebmpapst.com/karis](http://mag.ebmpapst.com/karis)

COMPANY

Frigorífico Verdi

LOCATION

Pouso Redondo, Brazil

# Cool beef

Crisp outside, juicy inside, that's how a good steak should be. In the southern Brazilian state of Santa Catarina, that steak could be from Frigorífico Verdi, a medium-sized company that covers about ten percent of the demand for beef in the state, which has a population of six million. The company, with headquarters in the community of Pouso Redondo, supplies grocery giants such as Brasil Food (BRF) and JBS S. A. as well as individual supermarkets, butchers and restaurants. All of them want the same thing: fresh, high-quality beef.

## *Non-stop freshness*

The best way to find out how Irmãos Verdi satisfies the wishes of these customers is to look behind the plain green and white façade of the company's headquarters. Jamur Gerloff and Leandro Gauss are standing in the cooling tunnel's control room. Gerloff is a food chemist with Frigorífico Verdi and Gauss is an engineer with Cooling & Freezing, the company that installed the cooling tunnel. They are viewing two monitors that show the inside of the cooling tunnel, with identically sized boxes

neatly lined up and stacked, each filled with 22 kilograms of meat. "It takes 36 hours to complete the cooling process. It can't be done faster, or else it could happen that only the outer layer is frozen," says Gerloff while the monitor shows how some of the boxes automatically leave the tunnel as others come in on the other side. "Basically we can decide how long every box has to stay in the tunnel, making a seamless production process possible."

And here's how the process works: In the neighboring hall, employees cut the cattle into smaller portions and vacuum-pack them in boxes. The boxes are moved into the cooling tunnel on a conveyor belt and then out again after the specified time — ready for shipping. "A total of 3,024 boxes can fit in the cooling tunnel at a time," says Gerloff. The giant refrigerator is 17 meters long, 8 meters wide and 10.5 meters high. It's actually nothing unusual for the experienced engineer Gauss. After all, he has been responsible for even larger facilities at Cooling & Freezing. But this project is still something special for him. He goes with Gerloff to the back of the facility.

## *Brazilian premiere*

There are four huge fans vertically arranged on the outside wall. They circulate the cold air uniformly throughout the cooling tunnel. "Normally we use AC motors for such applications, but here we're using medium-pressure axial fans with EC motors

from ebm-papst," says Gauss. An innovation on the Brazilian market. "Until now, many companies have shied away from the higher initial costs, but those can be recovered quickly thanks to the lower energy consumption of the EC motors," says Gauss. In addition, the fans are easy to install. "Conventional fans still need ad-

## WHERE THE MEAT GOES

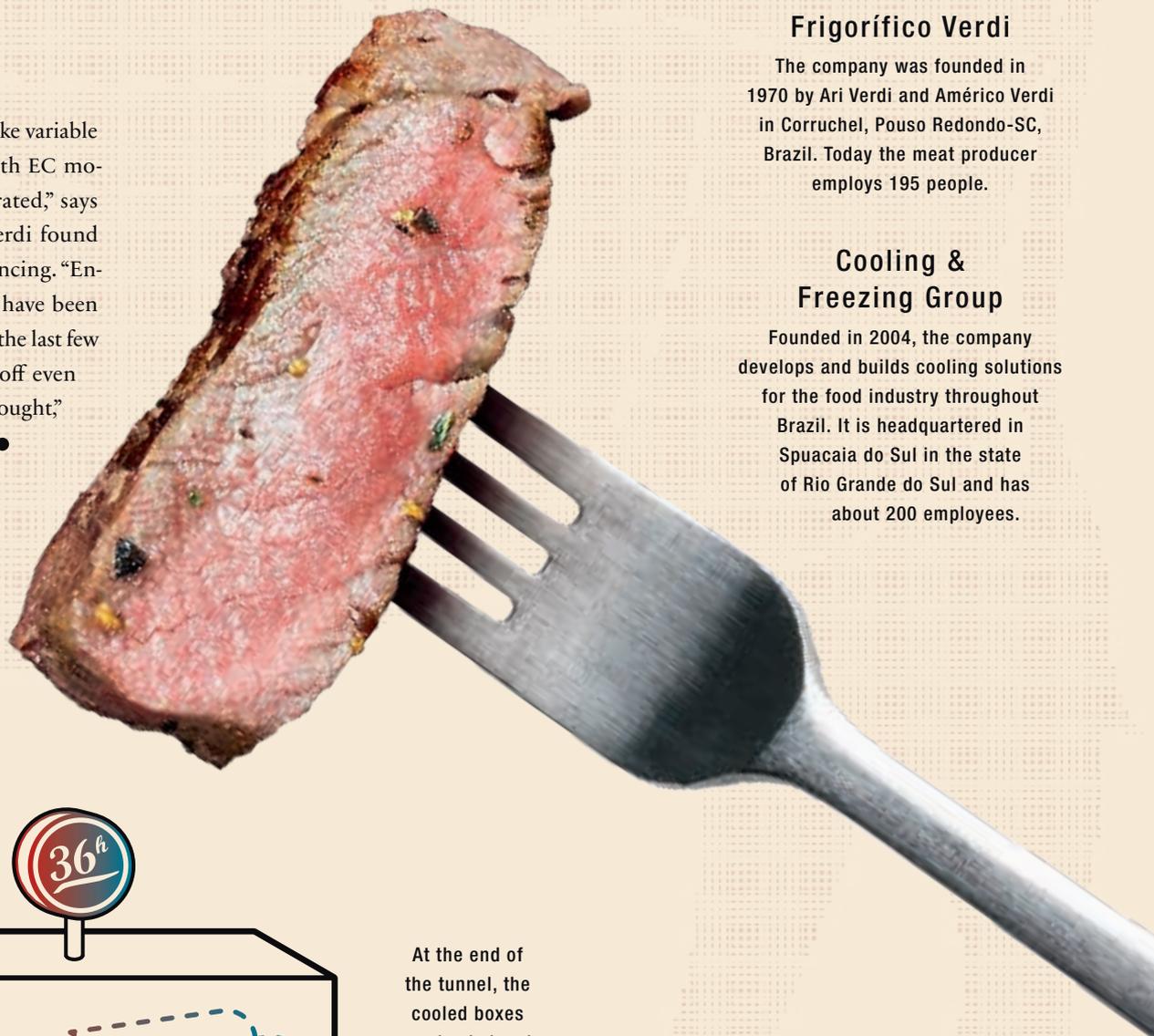
Frigorífico Verdi processes 150 cattle per day.

About 200 employees cut the cattle up into smaller portions, which are then vacuum-packed in standardized boxes.



Frigorífico Verdi, a meat producer, was looking for an efficient cooling tunnel; Cooling & Freezing, a specialist for such solutions, was looking for a customer for its new application ... The story of a Brazilian premiere.

ditional equipment like variable frequency drives. With EC motors, that's all integrated," says Gauss. Frigorífico Verdi found the arguments convincing. "Energy prices in Brazil have been increasing steadily in the last few years. So it's paying off even faster than we first thought," says Gerloff happily. ●



### Frigorífico Verdi

The company was founded in 1970 by Ari Verdi and Américo Verdi in Corruchel, Pouso Redondo-SC, Brazil. Today the meat producer employs 195 people.

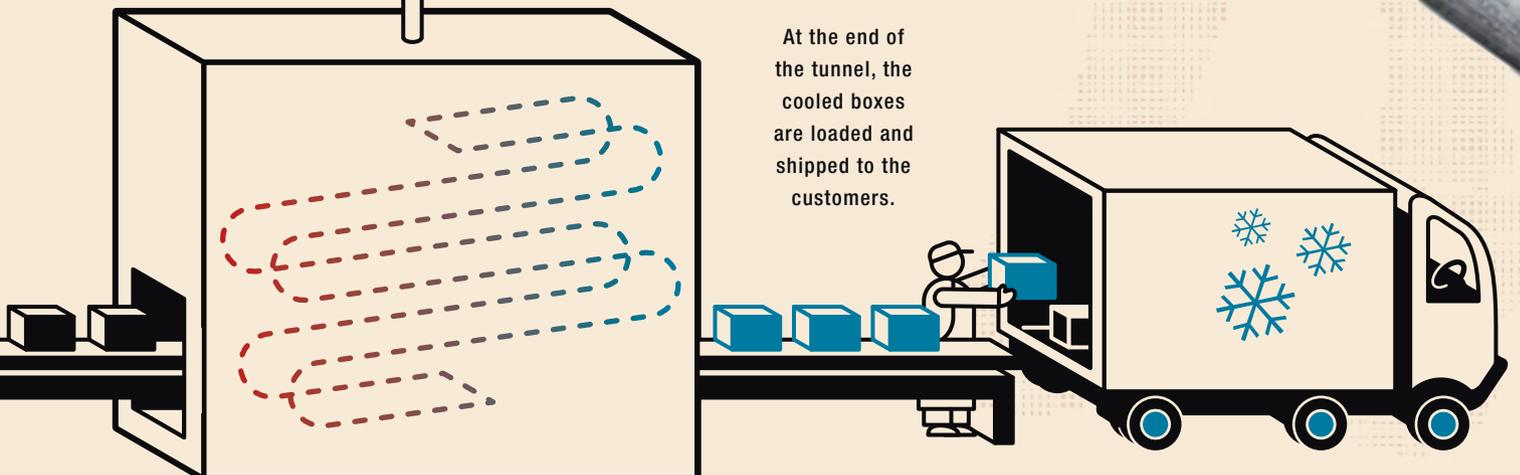
### Cooling & Freezing Group

Founded in 2004, the company develops and builds cooling solutions for the food industry throughout Brazil. It is headquartered in Spuacaia do Sul in the state of Rio Grande do Sul and has about 200 employees.

The boxes are automatically moved by conveyor belts into the cooling tunnel and then out again in 36 hours.



At the end of the tunnel, the cooled boxes are loaded and shipped to the customers.



COMPANY  
Zeppelin Power Systems

LOCATION  
Dresden, Germany

# Hot in here

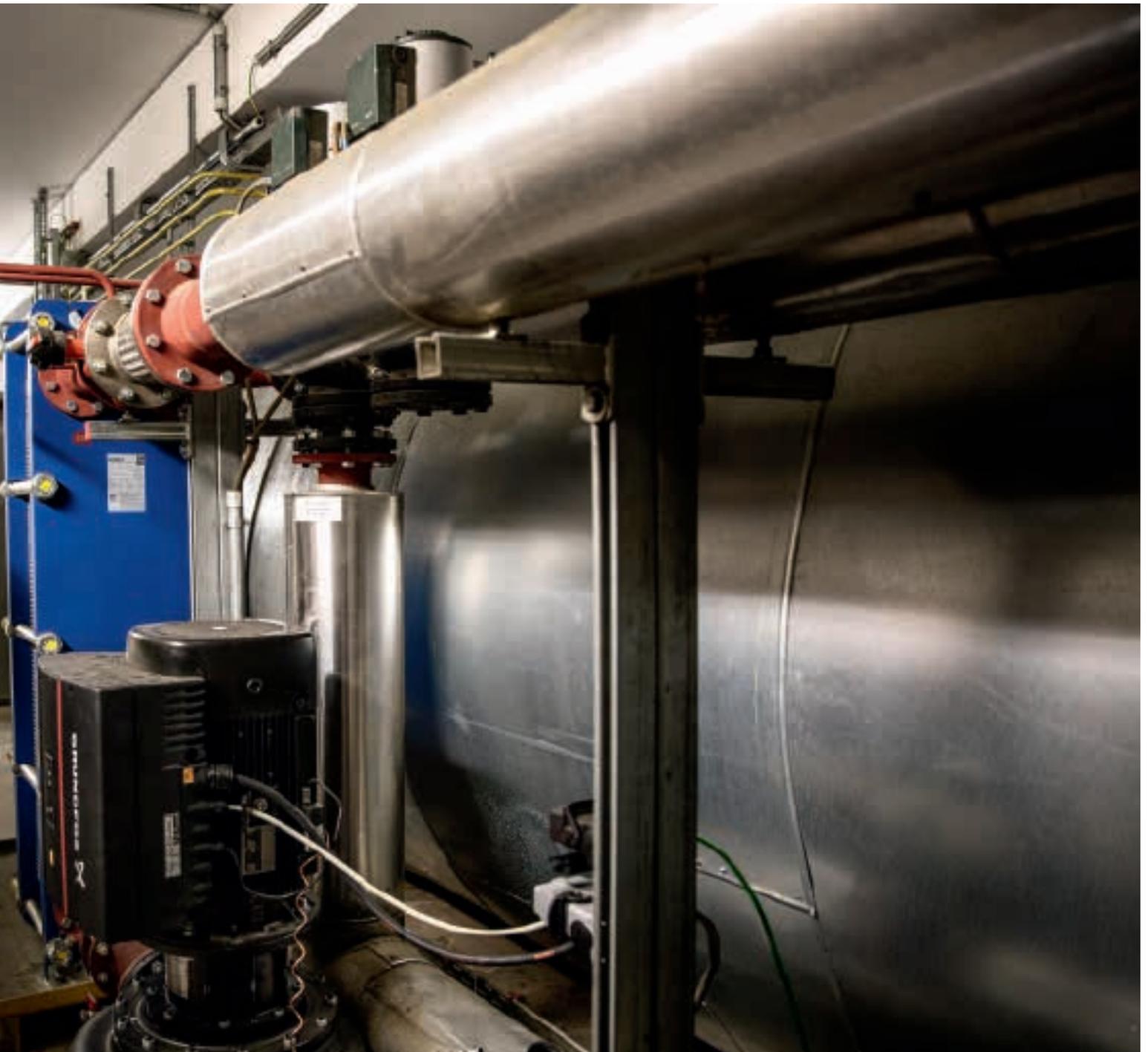
The cooling water in a gas power plant in Dresden releases its heat through heat exchangers on the roof. But they were terrible for the overall efficiency. Then the operators took a radical step resulting in a cut of nearly 90 percent in energy consumption.



The high-tech heart of Dresden beats far outside the baroque city center on a feeder route to the A4 autobahn. On a field in the middle of nowhere is a hulking factory building surrounded by parking lots. The noise of departing airplanes drifts over from the nearby airport. Globalfoundries makes ultra-tiny transistors on semiconductors here. Next to the chip factory, two chimneys rise into the sky from a power

plant. Andreas Büttner from Zeppelin Power Systems, the head service technician here, says “We provide electricity and process heat for the chip factory.” A company called EVC operates the exclusive gas power plant, and the service technicians from Zeppelin Power Systems make sure that the systems work flawlessly day in and day out. “Chip production requires an extremely stable power supply with the

Andreas Büttner, head service technician with Zeppelin Power Systems, at the vertical exhaust pipe over the humming gas engines. The heat from the exhaust gases can also be used when heating demand is high.



highest possible voltage and frequency stability, at a level that the public grids can't provide. And we can also deliver when there's a blackout all around us. That's why this gas power plant is here."

#### *Getting rid of heat*

The gas engines roar in the cellar-like rooms, with 16 cylinders per engine driving the crankshaft of a generator and delivering output of four megawatts in full-load operation. Red cables lead from the generator into the floor, conducting the produced electricity. The power plant also supplies water in two temperatures — 32 and 80 degrees Celsius — and steam for EVC's absorbers. The operators use the immense amount of waste heat from the engines and generators, which they carry off through a cooling water circuit.

Every minute, 65,000 liters of water rush by the hot engine parts. The cooling water starts at a temperature of 75 degrees Celsius; afterwards it has reached about 96 degrees Celsius. "After we've decoupled the heat for the chip factory with heat exchangers, the water is still at around 90 degrees, much too hot to reuse for cooling the engine. So even more heat needs to be extracted from the water. For that we have two horizontal condensers on the roof for each engine," says Büttner and heads up the stairs.

#### *Shimmering air*

On the roof, the hot cooling water flows through pipes with tiny aluminum ribs in the horizontal condensers. Above them, axial fans suck up the ambient air from below and blow the heat up into the sky. The air above the fans shim-

**"The EC fans need 89 percent less electricity.  
At first I thought I'd done the math wrong."**

**Andreas Büttner** — HEAD SERVICE TECHNICIAN WITH ZEPPELIN POWER SYSTEMS



Every one of the nine gas engines is connected to eight piping systems: compressed air, oil, gas, engine cooling water, two levels of cooling water, exhaust, bypass for exhaust heat recovery. It may look confusing, but it's a very sophisticated arrangement.

mers with heat. Büttner leans over a fan and says “Two years ago, you would hardly have been able to talk up here. There were 192 old, unregulated fans, always running flat out and eating up huge amounts of electricity. Every month we had to repair ten of them because their electronics couldn’t take the heat. We knew something had to be done.” Büttner had two horizontal condensers refitted with EC fans with Flow-Grid air-inlet guards and AxiTop diffusers as a test. A fan’s EC motor adjusts itself depending on the temperature of the ambient air and the output of the gas engine so that on typical warm days, 25 percent of motor capacity is enough. After a few months, Büttner checked the results. “The EC fans needed 89 percent less electricity. At first I thought I’d done the math wrong, but it was true. Of the savings, 30 percent was due to the more efficient fan motor and 70 percent to the adjustable speed.”

*The environment likes it*

A year later, Büttner had the other 168 fans replaced. They’ve been humming quietly and problem-free ever since. Büttner is still leaning on an AxiTop as he says, “We’re saving over 1.1 million kilowatt-hours every year, electricity we don’t have to produce in the first place. For the climate and the environment, that means less natural gas, less exhaust and a total of 613 fewer tons of carbon dioxide.” Büttner looks over the roof into the distance. “At Zeppelin Power Systems, we’re serious about protecting the environment. I always say we want to leave something for our children.” Two kilometers away, an airplane takes off. Even with 192 fans at work, it can still be heard. ●

**LEFT** Büttner checks the gas valves on an idle engine. Each engine weighs 78 tons and stands on an isolated concrete base two meters high that absorbs vibrations. At full-load operation, the engine and generator produce 523 kilowatts of radiant heat — and 110 decibels.

**RIGHT** “The EC fans need 89 percent less electricity than the old fans,” says Büttner proudly. The fans blow the 50-degree air into the sky.



SEE MORE PHOTOS AT  
[mag.ebmpapst.com/zeppelin](http://mag.ebmpapst.com/zeppelin)

COMPANY  
RELO

LOCATION  
Nuremberg, Germany

# Steep? I don't care!

The RELO slip-on drive helps push the pedals when it gets hard for the cyclist. And it fits on every bike, whether mountain or city bike. The drive only provides as much assistance as the cyclist wants, and reaches a speed of 25 kilometers per hour. To develop the transmission, the experts from RELO and ebm-papst formed a tandem.

FOR MORE INFORMATION ABOUT THE RELO SLIP-ON DRIVE, GO TO  
[mag.ebmpapst.com/relo](http://mag.ebmpapst.com/relo)

The bicycle drive weighs  
in at only

# 3.7

kilograms. The lithium-ion battery contributes 700 grams of that. It has a charging time of 45 minutes. The brushless 250-watt motor weighs 1.3 kilograms and the transmission, which is fixed to the bicycle, weighs 1.7 kilograms.

The transmission needed to fulfill two main requirements: it had to be compact and quiet. With the EtaCrown Wts5 crown gearhead from ebm-papst ZEITLAUF, the drive runs

# quietly

and with an efficiency of 91 percent. The transmission was specially tailored to this application.

The cyclist selects the desired drive power level with the wireless Bluetooth thumb switch and is well

# connected

with the RELO app that shows the speed, drive power level and battery level on a smartphone.

The app also takes care of software updates for the drive.

A magnesium housing encloses the transmission, making it both light and rugged.

Whether the cyclist charges over rocky terrain or just makes the rounds in city traffic, the

# magnesium

housing is maintenance-free and meets all expectations.

Once the transmission is mounted on the bike, it remains permanently attached to the frame. The motor and battery can be removed in

# no time

and carried in a backpack. The cyclist can decide on a whim whether to ride with or without the drive.



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## Imprint

### *Publisher*

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GmbH & Co. KG  
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www.prco.de

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Raff GmbH



$$I_{fault} = \frac{\sqrt{2} \times U_{ac,rms}}{R_{fault}}$$



Helmut Lipp,  
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A fault current’s waveform is crucial to the selection of the right residual current circuit breaker — also for EC motors.

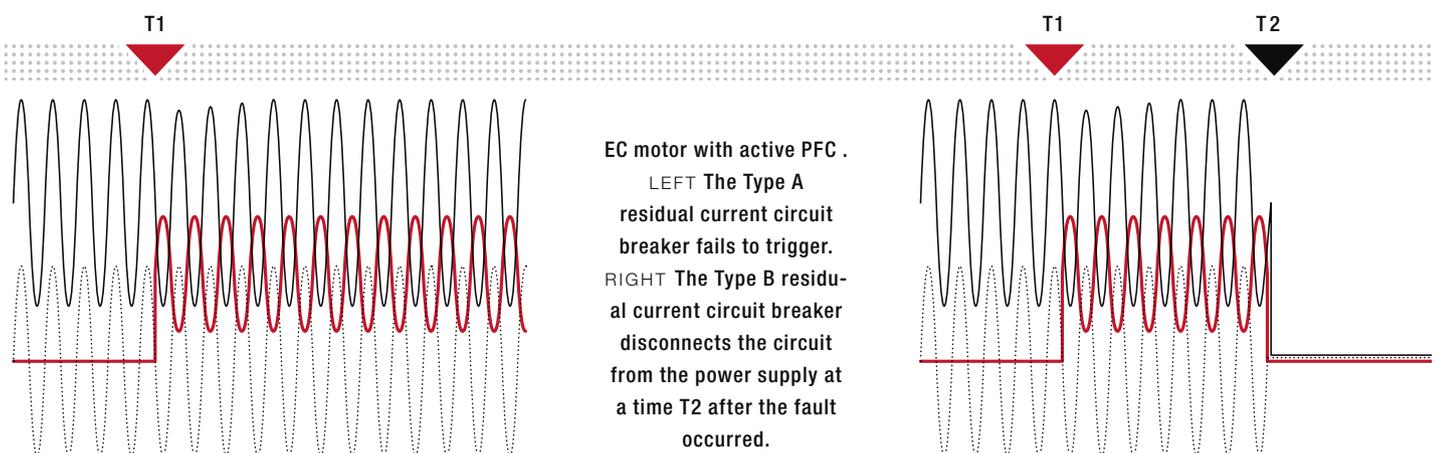
Fault currents can be dangerous for people, machinery and entire systems. For personal safety, Type A residual current circuit breakers with a maximum tripping current of 10 mA or 30 mA are required. Type B with 300 mA is required for fire safety, but such high currents can lead to irreversible harm or even death in humans, so the choice in industrial settings is not always easy.

This is also an issue when electronically commutated (EC) DC motors are used. For EC devices with passive power factor correction (PFC), Type A serves its purpose reliably. However, if for example EC fans are operated in parallel, active PFC is used to avoid harmonic currents in the power grid. To decide which circuit breaker is the right one here, the topology of the commutation electronics needs a closer look since it determines the current waveform in the event of a fault. Depending on the DC link voltage  $C_{ZWK}$  across the capacitor, a voltage builds up between the positive terminal of the capacitor and the PE potential; this voltage has a waveform that differs with the topology.

With active PFC, the DC link voltage  $C_{ZWK}$  across the capacitor can be set to values of  $U_{ZWK} > \sqrt{2} \times U_{ac,rms}$ . Here the voltage potential is always greater than 0 V. The minimum value is  $U_{min} = U_{ZWK} - \sqrt{2} \times U_{ac,rms}$ .

If there is an insulation fault, this is the same condition as if a resistor were inserted between the potential  $U_{ZWK+}$  and PE. The fault current behaves analogously to the voltage. For an inverter with active PFC, the current drops to a minimum value  $I_{fault} = \sqrt{2} \times U_{ZWK_{min}} / R_{fault}$ . We have measured the behavior of the circuit topology, taking an insulation fault into account; a fault current  $I_{fault} > 30$  mA was set. With this fault current, the Type A residual current circuit breaker did not trip.

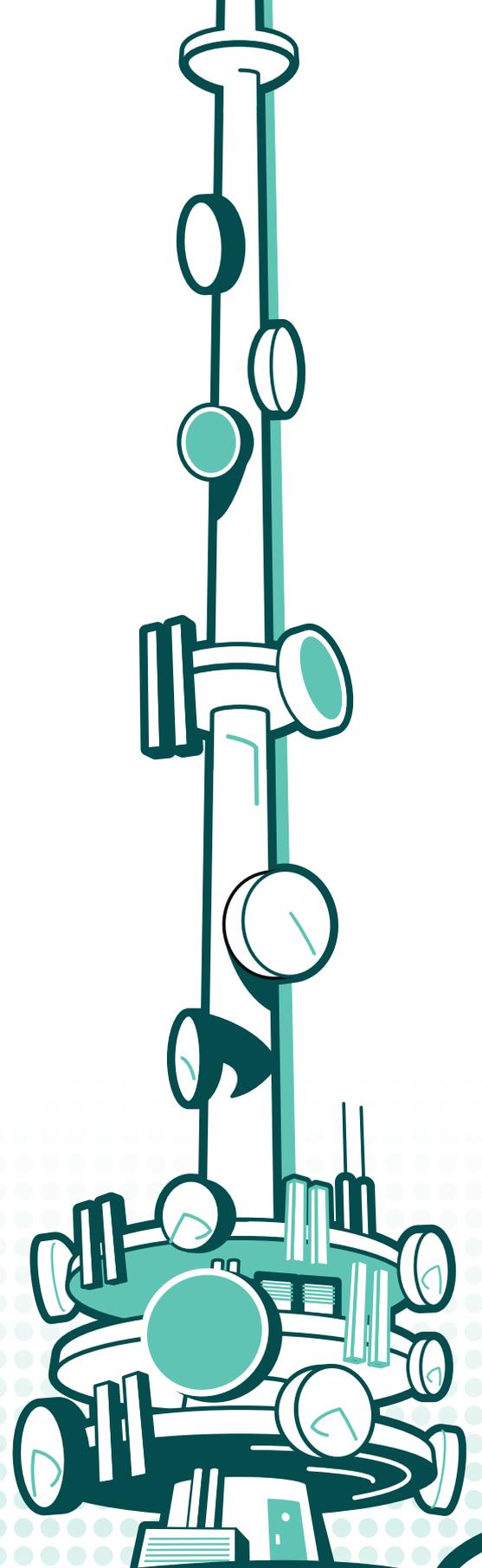
In the same experiment using a Type B circuit breaker, it disconnected the circuit from the power supply at a time  $T_2$  after the fault occurred. In order to provide the necessary safety for people, machinery and systems with EC drives connected to circuits using electronics with active PFC as boost converter, these residual current circuit breakers Type B are the right choice. ●



# Now fans can live longer

Fans often last longer than their specified service life but are replaced sooner to be on the safe side. FanCheck saves money by calculating the remaining service life based on the actual wear.

Many IT and telecommunications companies use fans to cool sensitive electronics in data centers or cellular network base stations to guarantee the desired availability for their customers. So they replace the fans at regular intervals with plenty of time to spare before the specified service life expires. But hardly any fan operates constantly at its speed or temperature limit. They could work much longer than they actually do. ebm-papst's FanCheck software resolves this dilemma and calculates the service life based on actual operation. This results in a considerable reduction in material and replacement costs. ●





## THE WEAKEST LINK

A fan's service life depends primarily on its bearing, which is the weakest link in the entire product. So FanCheck focuses on this component for its service life calculations.



## SPEED AND TEMPERATURE

The speed at which a fan's bearings wear out depends primarily on its speed and operating temperature. Both values are recorded as standard for most ebm-papst products. The higher these parameters are over the entire service life, the faster the bearing will wear out.



## CALCULATIONS ACCURATE TO THE MINUTE

FanCheck records the temperature and speed of a fan every second. A database in the microcontroller stores information about how many credits have to be deducted for each combination of speed and temperature values. This value is summed every second. After one minute, FanCheck subtracts the credits to be deducted from the remaining service life and writes the result to a non-volatile memory. The information from the database is based on experience gathered by ebm-papst over decades in the field and in endurance tests.

In remote base stations, every fan replacement results in considerable costs. Thanks to FanCheck, operators can wait to replace fans until it's really necessary.



## CREDITS FOR SERVICE LIFE

At the beginning of its lifecycle, every fan gets service life points (credits). This figure (in the millions) varies depending on the size and design of the fan. The number of credits can also be adjusted during the fan's design. For example, it can be reduced if the fan operates under especially hot or humid conditions.



## INFORMATIVE SOFTWARE

The customer can specify at which time and in which way the fan is to provide status information or warnings; it can closely monitor the remaining service life or trigger an alarm when it goes below a previously set value. In this way, FanCheck can be easily integrated into existing control systems.

# Perfect climate from the ice tank



The new building at the St. Georgen location doesn't just shine on the surface. Its cold heart beats under the parking lot.

People who park their cars in the parking lot at the new electronics production facility opened in March by ebm-papst in St. Georgen-Hagenmoos probably have no idea that there is a cistern filled with 500 cubic meters of ice water beneath their feet. It has a diameter of 16 meters and a depth of four meters and serves as a heat reservoir that supplies the entire building. Heat from ice? It sounds paradoxical, but the system makes use of a physical principle called heat of crystallization. This heat is released when water undergoes a transition from the liquid to the solid phase. The energy released during freezing, the heat of fusion, is extracted from the water with a heat exchanger and used to heat water. A so-called regenerative heat exchanger, which is also in the tank, thaws the ice with heat extracted from exhaust air and completes the circuit. If warm outdoor temperatures make it necessary to cool the building instead of heating it, a circulation pump routes the cooled water through the heating pipes.

The ice tank is serviced through an inspection shaft. Divers can stay in the tank's cold water for up to thirty minutes to perform any required

work — and to connect the second tank to the first one when the second phase of construction is completed in March 2017. Then the system will guarantee the energy supply for the entire new facility in Hagenmoos.

“This energy concept is virtually predestined for energy-intensive production facilities,” says Tobias Maurer, managing partner of H. Maurer GmbH + Co. KG, responsible for the design and construction of the ice reservoir. “They depend on constant indoor temperatures and humidity throughout the year and generate a large amount of waste heat that we can use to thaw the ice reservoir.” The ice reservoir is not only an energy concept with a future. Peter Metzger, Director Business Development and Marketing in St. Georgen, is also enthusiastic, saying “When the second ice reservoir with another 500 cubic meters of water is brought online, it will result in a 63 percent reduction of CO<sub>2</sub> emissions compared with a conventional energy concept. That's a very convincing value for us.” The company, with its strategic focus on energy efficiency, accepts that the construction costs will only be amortized after twelve years. ●



## COOL SQUARE

The new 4300 N high-performance fans are suited for demanding cooling assignments in devices with high component density, from inverters in welding equipment to IT servers.

Specially formed discharge vanes and innovative winglets on the blade tips improve efficiency and reduce noise, making the 4300 N 57 percent more efficient and 9 dB(A) quieter than its precursor.

[www.ebmpapst.com/4300n](http://www.ebmpapst.com/4300n)



## UNDERSTANDING CUSTOMER WISHES

Which fan is the right one for my application?

Thanks to ebm-papst FanScout, customers can now answer this question much more easily.

Based on the desired operating point, the selection software dependably determines the ideal product while taking into account criteria such as noise, efficiency or space requirements.

It also calculates the lifecycle costs for the selected fan and for several fans operated in parallel. Since FanScout's recommendation is based on true measured values, the user gets reliable data with high calculation accuracy certified by TÜV SÜD.

[www.ebmpapst.com/fanscout](http://www.ebmpapst.com/fanscout)



## NEXT GENERATION

The NiQ combines the proven features of the complete iQ motor series with higher efficiency and economy — and a new design. The plastic used in its housing allows operation in areas with indirect food contact, an enormous advantage for driving axial fans in situations such as open vegetable display cases.

[www.ebmpapst.com/niq](http://www.ebmpapst.com/niq)



# » *AxiBlade makes machines better!* «

What can AxiBlade do better? And what's in it for customers?

Patrick Stern,  
Head of Market  
Management,  
Refrigeration  
Technology  
Division, tells us.



*What was behind the development of the AxiBlade?*

We're always kicking new ideas around, because we really are innovative and don't just say we are. Four years ago, with AxiTop we took the first step toward pressure recovery using the diffuser effect. Now we wanted to combine this effect with the aerodynamic benefits from the interplay of a new impeller, fan housing and guard grill. Which is exactly why the AxiBlade is a quantum leap. Because it integrates everything in one unit without any additions.

*For which applications is the AxiBlade especially suited?*

It's ideal wherever air-cooled heat exchangers are used, be it condensers with refrigerants for refrigeration or chillers with water mixtures for air conditioning. Since we've retained the external dimensions of the fan, customers can easily use the new product with their existing applications without having to make any adaptations.

*How else do the customers benefit?*

The AxiBlade has up to 54 percent\* higher efficiency than the current market standard and it's up to eight decibels\* quieter, even with a higher power density. These technical benefits grant the customers flexibility. Now they can choose: Do I want a quieter, more efficient unit or do I need more power? So with the same unit they get a higher cooling capacity — for example, in chiller applications, the more air the better. If they don't need the higher air performance, with appropriate speed adjustments using EC technology they can save even more energy since the entire series needs much less power consumption for the same air performance. The AxiBlade makes the customer's end products technically better so they can stand out from the competition.

*How do customers find the right AxiBlade?*

There are two basic designs as far as the combination of fan housing and peripherals is concerned. The standard design is best used for the intermediate pressure range. For use at higher back pressures, the version with a higher fan housing with integrated diffuser and guide vanes is better. But in finding the best option for a particular customer application, good advice is still as important as ever. ●

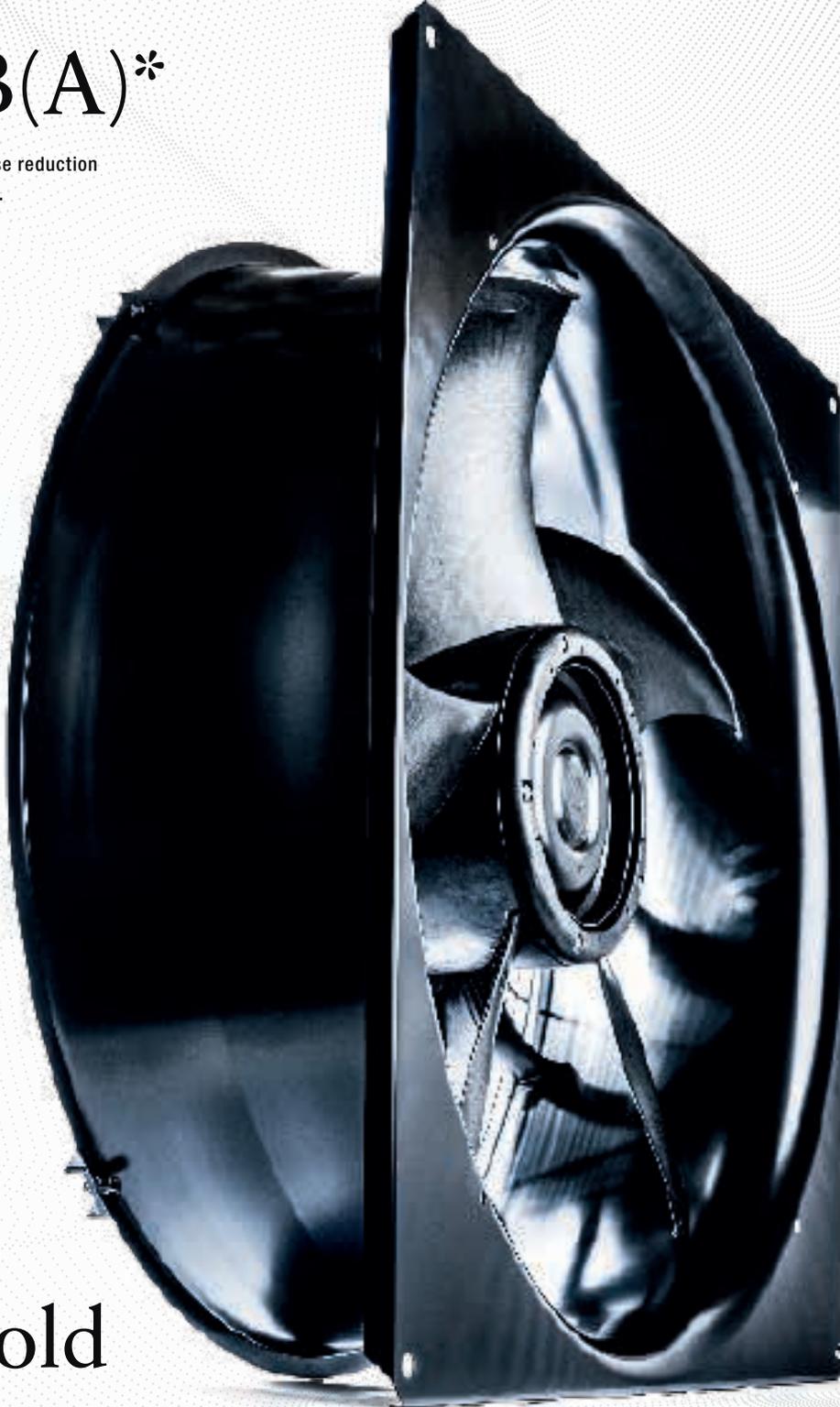
VIEW THE AXIBLADE VIDEO AT  
[ebmpapst.com/axiblade](http://ebmpapst.com/axiblade)

# Integrated performance

AxiBlade combines the benefits from the interplay of the impeller, fan housing and diffuser in one unit.

## 8 dB(A)\*

is the maximum noise reduction enabled by AxiBlade.



## 54%\*

higher overall efficiency with the new axial fan.

## Ice cold

Thanks to higher power density, higher refrigerating performance is possible with smaller heat exchangers.

## Footprint

The space required for installation remains the same; no structural adaptations are needed on the application.

WOULD YOU HAVE RECOGNIZED IT? — THE NEW AXIBLADE MAKES HEAT EXCHANGERS MORE EFFICIENT AND QUIETER. TAKE A LOOK INSIDE ↗