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mag

This thing is fun!

Peter Herrmann's electric walker gives rehabilitation patients and seniors new freedom of movement

PAGE 10

Cover page: Philipp Reinhard; page 2 (clockwise): Philipp Reinhard; Climeworks / Julia Dunlop, Gernot Walter

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10 The focus is always on people at ebm-papst. That's the case in our company, and also in the applications that make life easier. Especially when they can help people with disabilities. That's shown by some of the applications in this issue, including a box-spring that helps asthma sufferers get a good night's sleep, an e-walker that will play a positive role in our aging society, and a hygienic air curtain that protects food from germs.

25 Another focus of our corporate philosophy is of course climate protection. We view the approach taken by Climeworks in filtering carbon dioxide out of the air as an extremely promising technology that we're pleased to support. We allow ourselves to be judged by our own standards, so we're proud of the pioneering role played by our US subsidiary in photovoltaics.

4 And we're also no strangers to the world of rock music. ebm-papst is happy to play along when a world-famous band like Pink Floyd has an anniversary.

Thomas Borst

CHIEF SALES OFFICER (CSO)

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"Am I seeing things?" customers might have wondered at a London department store. A sculpture, **THE PIG IN THE ROOM**, was a piece of art commissioned by the Victoria and Albert Museum's big Pink Floyd exhibition seen throughout London this summer. The "breathing" pig with its inflatable balloons is a tribute to the band's 1977 album, "Animals." The—quiet—inflation and deflation of the pink balloons is controlled by 900 ebm-papst axial fans. *Learn about how the piggish project came to be at mag.ebmpapst.com/pinkfloyd*

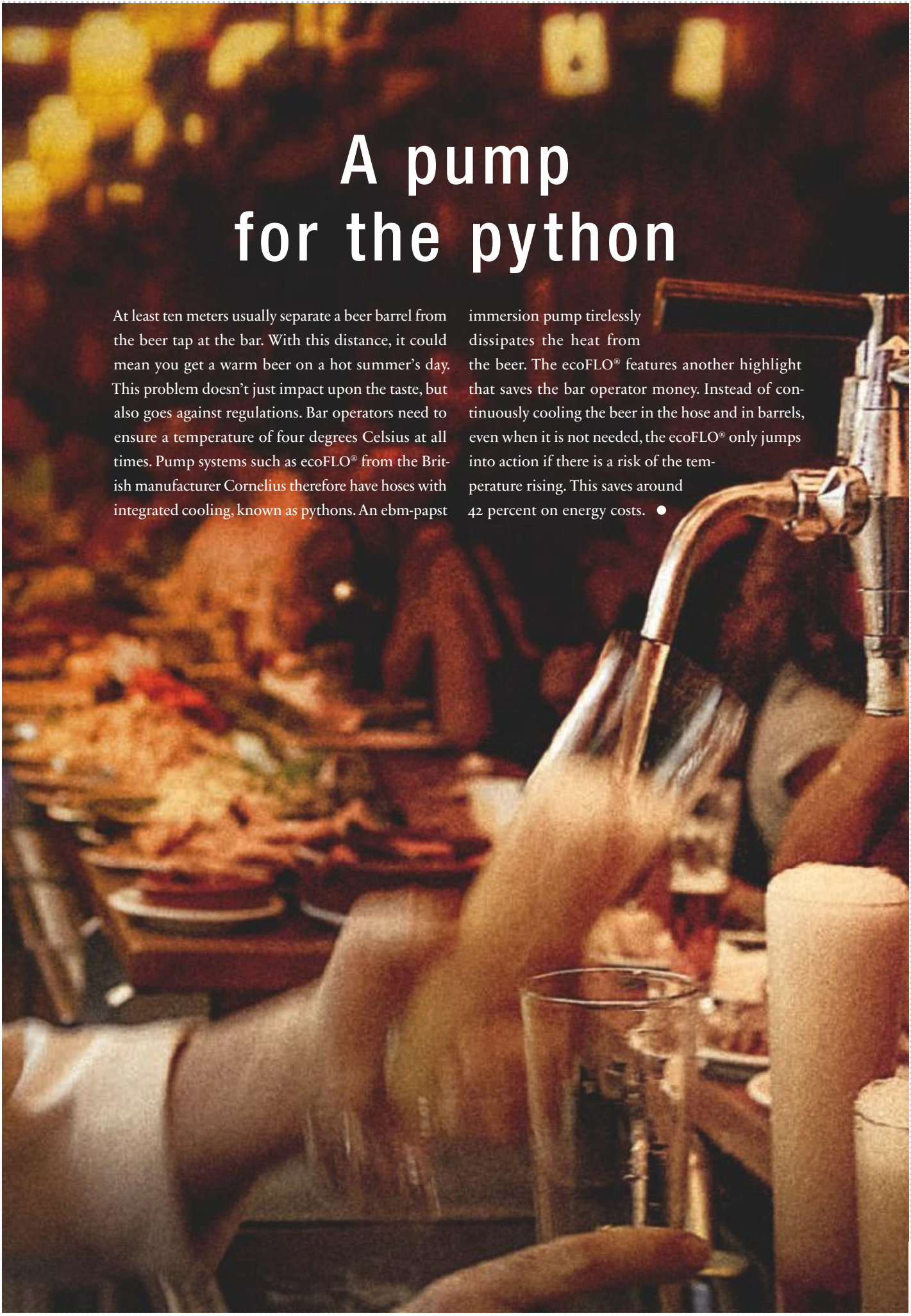
Architecture Social Club

Don't feel like counting sheep again? Then hop into **FRESHBED!** The beds of the Dutch manufacturer promise the perfect climate for quick, untroubled and refreshing sleep. They are well ventilated, pleasantly dry and always have the perfect temperature. The reason is underneath the mattress: a patented system of a fan from ebm-papst, climate control technology and a HEPA filter holds the temperature under the covers constant between 27 °C and 29 °C. People with asthma can breathe easier because dust mites don't like humidity under 50 percent relative and move to spots that are not as well ventilated. *Find the whole FreshBed story at mag.ebmpapst.com/freshbed*

fotolia/asferico

A pump for the python

At least ten meters usually separate a beer barrel from the beer tap at the bar. With this distance, it could mean you get a warm beer on a hot summer's day. This problem doesn't just impact upon the taste, but also goes against regulations. Bar operators need to ensure a temperature of four degrees Celsius at all times. Pump systems such as ecoFLO® from the British manufacturer Cornelius therefore have hoses with integrated cooling, known as pythons. An ebm-papst immersion pump tirelessly dissipates the heat from the beer. The ecoFLO® features another highlight that saves the bar operator money. Instead of continuously cooling the beer in the hose and in barrels, even when it is not needed, the ecoFLO® only jumps into action if there is a risk of the temperature rising. This saves around 42 percent on energy costs. ●



Diorgi/AdobeStock

»Construction is an important component of our growth strategy«

ebm-papst is investing in a number of construction projects. Thomas Wagner, Chief Operating Officer at the ebm-papst Group, tells us why.

You opened the new distribution center in Hollenbach in May 2017. But ebm-papst is pushing on with other construction projects. What are you working on now?

There are many projects. We held the dedication ceremony for the second phase of the extension in St.Georgen in September. We had groundbreaking ceremonies for an extension in Herbolzheim and for a completely new building in Lauf. In Mulfingen, we'll begin construction of a new development center with floor space of 18,500 square meters in the third quarter of 2018.

And what's happening at the locations around the world?

A factory expansion was just completed in the Czech Republic, and we recently opened a new plant in Serbia. We're expanding our site in Tapolca, Hungary, and we'll be opening a new plant in the coming year in Romania. In October we decided to build a new plant in China, which should start production in early 2019.

Do any projects have priority?

We push these projects according to the needs of our business. We have so much construction in progress now because we're working near our capacity limits at almost all of our sites.

How much of a role do energy efficiency and resource conservation play in construction worldwide?

We always take those into account. For us, it goes without saying that we should be able to operate a building as economically as possible. The situation at each site determines what technology ends up being used. For example, an ice reservoir like we built in St.Georgen isn't possible everywhere, but LED lighting in all new buildings is.

What is ebm-papst's objective with the projects?

Construction is an important component of our growth strategy. Our main aim is to develop capacity to meet our needs. By positioning ourselves for growth, we can better support our customers in their development. And by globalizing our production network, we get closer to our customers. In addition to expanding capacity, that's a main consideration behind our construction activity. It helps us to offer our customers much better service. ●

Thomas Wagner, Chief Operating Officer ebm-papst Group

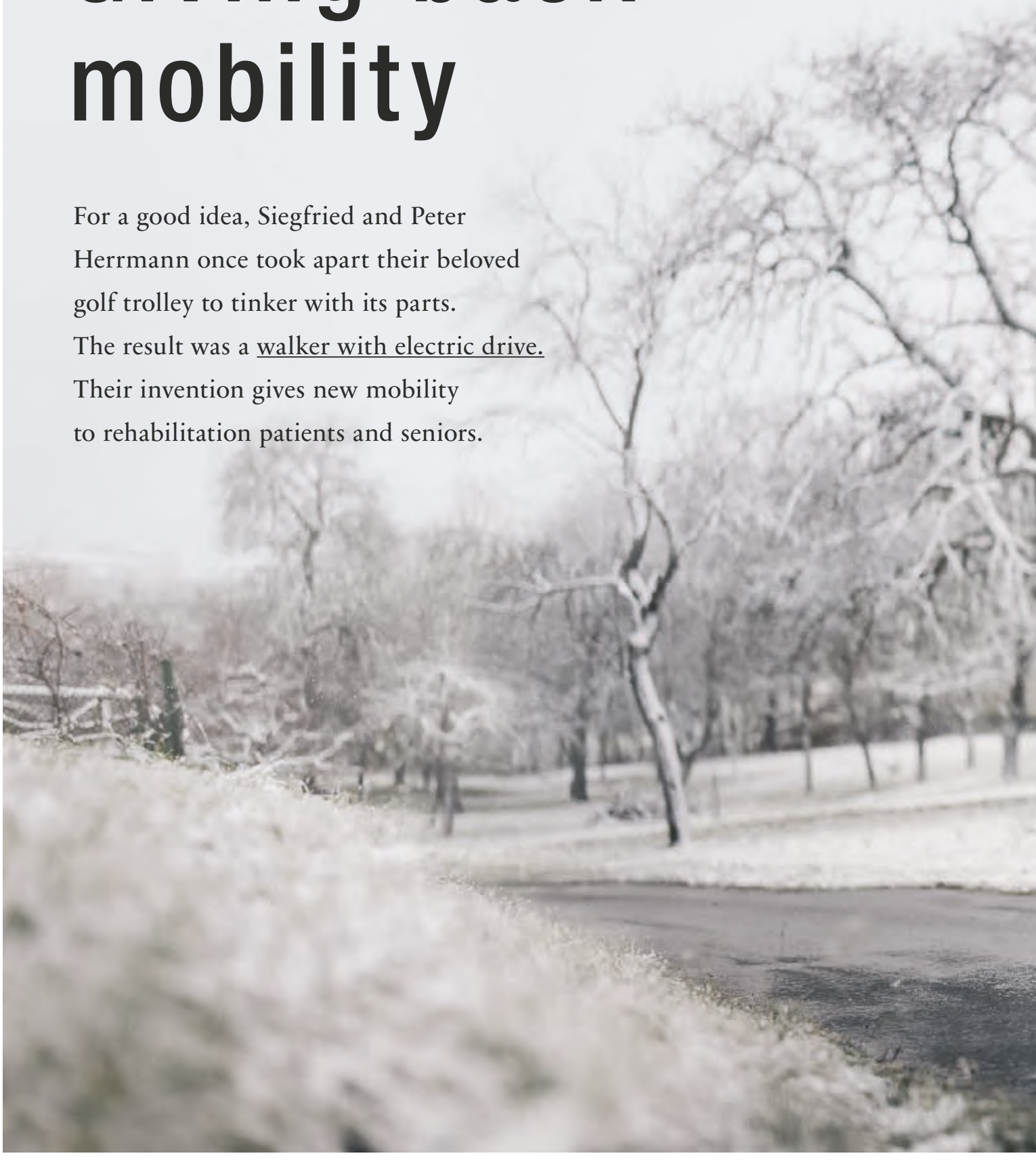
ebm-papst

COMPANY
Bemotec GmbH

LOCATION
Reutlingen, Germany

Giving back mobility

For a good idea, Siegfried and Peter Herrmann once took apart their beloved golf trolley to tinker with its parts. The result was a walker with electric drive. Their invention gives new mobility to rehabilitation patients and seniors.



Old team with new ideas: Working with his father Siegfried Herrmann, Peter Herrmann developed the first walker with an electric drive.

Philipp Reinhard

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"Baden-Württemberg. Where ideas work." That's what it says on the cup with state emblem that Peter Herrmann is sipping coffee from. He's sitting in his office. Next to the desk with the flag of Baden-Württemberg is a crib for the days when his offspring comes along to work. One notices quickly that this is a Swabian family business starting up. "We're actually a classic systems service provider for large medical technology companies," says Bemotec's junior boss with a Swabian accent. His father, Siegfried Herrmann, started the company in his garage and built it up to the 60 employees it has today. So far, so typical—the kind of story many mid-sized companies could tell. But Peter Hermann still has a special story to tell. He has founded a start-up to market a product he developed: a walker with electric drive, the "beactive +e."

Passion for tinkering

The story actually begins on the golf course. "My father is an avid golfer, and he has a trolley with an electric motor," says Peter Herrmann. "On the way home from golfing, it occurred to him that such a drive ought to be possible on a walker. He'd already been interested in mobility for seniors for a while." Siegfried Herrmann's tinkering instincts were awakened. At home, his beloved trolley had to make the ultimate sacrifice as a result. "We took it apart, got a typical walker at a local medical supply store, removed its wheels and attached the trolley's control unit," recalls his son and has to laugh. It quickly became clear that the idea was good, but implementing it wasn't so easy. The tubular structure of a standard walker was too flimsy, and operating it would be too complicated for elderly people.

A sturdy frame ensures extra safety for patients and seniors. The "beactive +e" was developed in Reutlingen, Germany, and is also assembled there.

"It occurred to me that a drive like the one on my golf trolley ought to be possible on a walker, too."

SIEGFRIED HERRMANN

BEMOTEC

Clever details

A chance encounter rescued the project. At an innovation event held by the local chamber of commerce, Peter Herrmann came across Tricon Design AG, a company specializing in transportation design. It has designed subways in Hamburg and Shanghai. "It was clear to me right away that we needed to talk to them." That was when the e-walker really started to roll. Working with the experts, Bemotec developed a design study with special focus on the walker's drive, ergonomics and operating aspects.

That was mostly uncharted waters for the team. "For most of our customer orders, we don't get involved until later and don't have to worry about fundamental issues," says Peter Herrmann. Three wheels or four? How can we make the walker stable? How should the perfect hand grip look? The developers looked for answers to these questions. The result: four wheels, a sturdy frame made of rectangular tubing, and an ergonomic grip. The "beactive +e" costs between 3,000 and 3,500 euros and weighs 20 kilograms—and it looks pretty futuristic when it rolls quietly humming into a room. "But it's not supposed to make a high-tech impression; that's something that puts off elderly people quickly," notes the junior boss. And that's why the technology is all under the hood.

Solid support for therapy

The frame's sturdiness is particularly important to Herrmann's biggest customer segment. "We currently do 80 percent of our business in therapy," he says. "Strokes, multiple sclerosis or Parkinson's

Philipp Reinhard

The necessary power comes from a lithium-ion battery integrated in the walker's seat. And soon it can be steered through an app.

Philipp Reinhard

"We were done with the actual development in two years, but the approvals cost us another year."

PETER HERRMANN

BEMOTEC

patients often suffer from impaired balance and have an unsteady gait. A lightweight walker is exactly the wrong thing for them."

For the drive, the Bemotec team decided on an EC motor with angular gear from ebm-papst ZEITLAUF, which the specialists adapted to Bemotec's special requirements. For Bemotec, smooth movement was especially important. "The users also have to be able to move the walker without motor support. That's no problem with the adapted angular gear. You can just hear it turning, but you can't feel it," says Peter Herrmann. "Energy efficiency was also important because of the range." The battery has a lifetime of up to ten hours, so the walker can reliably get through a full day of therapy without recharging. Thanks to the motor's compact design, it was also easy to integrate it into the walker's frame without limiting the user's freedom of movement. Herrmann and his developers selected the individual components from ebm-papst's modular system, a simple and convenient solution.

Adjusts automatically

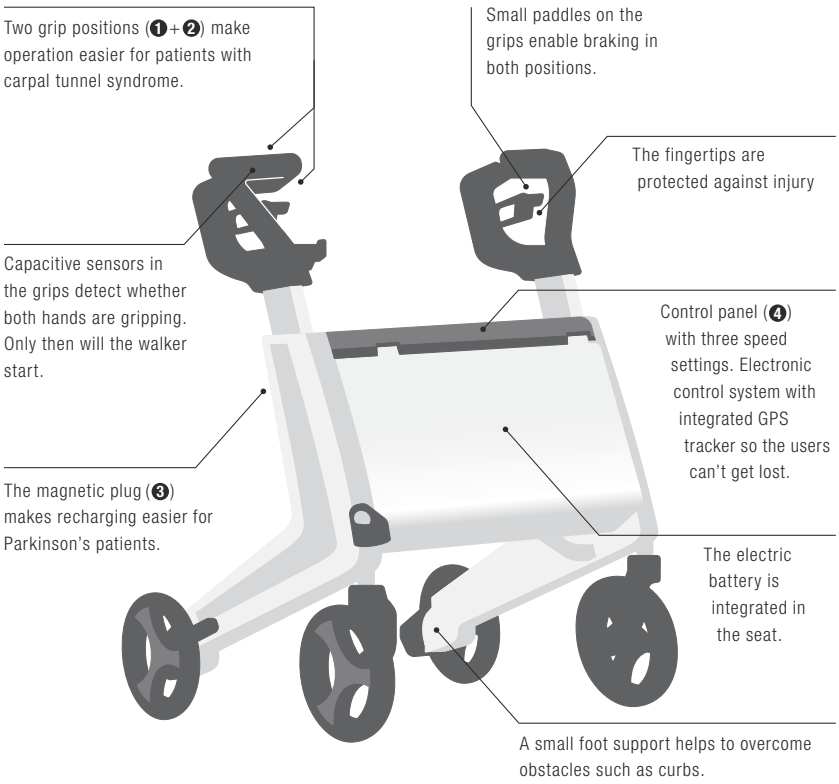
Users can select from three different speeds depending on their condition and the terrain, and therapists can program individualized exercise routines. Once programmed, they can be stored on an integrated RFID chip. With a card, the walker then adjusts contactlessly to each patient. Especially for patients with one-sided paralysis, that offers completely new opportunities, as Herrmann explains: "With a normal walker, they'd go in circles. But we can individually adjust the speed at which each wheel is driven."

During the ergonomic and technical design, the inventors had to consider the requirements for TÜV certification. "Every change directly affects the product approval," says Herrmann. And he took that seriously. "For a class 1 medical product, you can actually issue the approval yourself. But we're Swabians and want to be able to keep sleeping at night, so we agreed that things should be done right and we cooperated with TÜV Süd from the beginning." Sometimes that was difficult with a product that hadn't existed before. There are standards for electric wheelchairs and for normal walkers. But the walker from Bemotec is somehow both. "We were done with the actual development in two years, but the approvals cost us another year."

Something ventured, something gained

Bemotec's chief couldn't always play it safe. "For design protection reasons, we always showed our prototypes at trade fairs at a very early stage. We knew that if we didn't go to market now, somebody else would. And we wanted to be first," he says. The Rehacare trade fair in Düsseldorf in 2013 was to decide whether Bemotec would pursue the walker project or not. "The guests overran us. It was crazy," says Peter Herrmann, who is still impressed even today. "There was no question anymore of whether we'd continue or not. Sometimes you have to accept such business risks. It worked out for us." But as he admits, the starting situation was somewhat more comfortable than for other start-ups that have no corporate financial backing. "They have to work really hard to scratch the money together. We're proud that we were able to manage this development work costing millions on our own," he says. "We didn't get any research and development grants. For us it was clear from the beginning that if we develop anything, we'll do it ourselves."

So why did he found a start-up at all? "It was important to us to keep the speed up. We had a small group inside the company that worked on the product completely independently of day-to-day business. We would have been slower if we



LEAR MORE ABOUT THE MODULAR DRIVES KIT BY EBM-PAPST:
mag.ebmpapst.com/modularkit

hadn't done that." In addition to the "beactive +e," the "belifted" sofa lifter—another product developed by the inventors from Reutlingen—also found a home under the "bemobile" start-up brand. With the modern brand concept, Peter Herrmann wants to distance himself from the old-fashioned image of the walker. Its technical features underscore that ambition. For today's modern seniors, the "beactive +e" is equipped with a USB charging port where they can charge their smartphones.

Moving on its own soon

Bemotec is working with universities and research institutes on further innovations. "Now the walker can detect stairs, stop, emit acoustic signals and turn around. Completely on its own!" says Herrmann proudly. "It can also see whether a traffic light is red or green." The application isn't ready for production yet, but the developers are working with the University of Tübingen to change that soon. He is particularly impressed by the way the scientists work on the product. "They're not using sensors costing millions, they're constantly looking for even more economical solutions that we can use in mass production later." Tinkering in isolation is a thing of the past; Peter Herrmann is convinced that networking is the future, and he is relying on a local exchange of expertise, for example with Bosch eBike Systems, which is setting up a complete e-bike city in a neighboring industrial park. "You have to open up, and of course you always reveal a bit of expertise by doing that, but it's the only way to get such a project on its feet for the long haul."

He's also taking a new approach with an app through which the walker can be steered and programmed. "In the end customer sector, digitalization is playing an even bigger role than in machinery," he says, adding with a laugh, "My father always says it will get strange if we ever have more programmers than engineers sitting here." He has now bought himself a new golf trolley—with electric drive, of course. ●

Philipp Reinhard

COMPANY
HANSA Klimasysteme GmbH

LOCATION
Saterland, Germany

Germ-free sushi

Invisible to consumers, hygienic air curtains from HANSA Klimasysteme GmbH keep germs away from deli counters—good news for lovers of Japanese delicacies.

Sushi used to be an exotic snack, but today the rice rolls have become a standard culinary offering in pedestrian zones, shopping malls and train station food courts. The Japanese delicacy is popular for many reasons: it's low in calories and fat, tastes good and is filling. Fresh ingredients are essential, which is why sushi chefs prepare it before the eyes of their customers. What most of the customers don't know is that there's an invisible wall between them and the kitchen. An air curtain that keeps germs away from food is legally required where food is served fresh: at sausage and cheese counters and also at sushi bars.

HANSA Klimasysteme GmbH specializes in such air curtain systems and supplies them in various sizes. "Our system was patented many years ago, and we've gradually perfected it," says Frank Vorwerk, Technical Director at HANSA. So he was well prepared when a supplier for sushi stands was looking for an especially compact system. "These stands are very small. They don't need units that are designed for ten-meter-long counters. So we developed an especially compact version of our LF-Hy series."

A wall of air

In the unit, a fan draws air into a two-stage filter system that keeps dirt and germs out of the customer area. The nearly sterile air is routed through a duct system to a ventilation slot in the ceiling. "The aerodynamic design of this slot is crucial for directing the air curtain and keeping it stable. The air can't be allowed to get into contact with the food since it would dry out. And we want to achieve a closed air curtain with as little air flow as possible," says Vorwerk. Since the unit runs constantly, low energy costs were a key requirement, so HANSA needed a powerful and—because of the pressure drop caused by the two filter stages—adjustable fan that also consumes little electricity. "We decided on an EC centrifugal fan from ebm-papst. It performed best in our development tests, and we've been working with the company for many years." ●

TO VIEW A DETAILED ILLUSTRATION SHOWING THE OPERATING PRINCIPLE, GO TO
mag.ebmpapst.com/hansa

COMPANY
Schwank GmbH

LOCATION
Cologne, Germany

Heating like the sun

It takes a lot of energy to heat large buildings, making it that much more important for heat to be where it's needed and not get lost when gates are opened. To avoid such losses, radiant tube heaters are often used. They heat like the sun. But until recently, they also had room for improvement.

Gate up, heat out. If logistics centers, airplane hangars or factory buildings used conventional heating systems, they would lose heat every time the gates are opened or when large amounts of air are extracted for production purposes. That's why they usually use radiant tube heaters that don't heat the air but instead work like the sun.

Radiant tube heaters include gas-powered heating units that produce heat with infrared radiation. They are usually suspended under the ceiling at heights of four to twelve meters and heat objects, walls, floors and also people with infrared radiation. They work by heating a heat-resistant tube to a temperature of 580 degrees. A reflector above the tube deflects the infrared radiation toward the floor and the people below.

Constant air supply

Until recently, Schwank, the world market leader in gas-powered infrared heaters, used a burner to produce a flame inside a steel tube. To produce the right air-gas ratio for combustion, a blower supplied air to the flame. The output was regulated solely through the amount of gas supplied. "If you modulate by keeping the amount of air constant and reduce only the amount of gas, at low output ranges that unavoidably leads to inefficient combustion and lower output," explains Dr. Friedhelm Schlößer, Managing Director of Schwank GmbH. "That's better than not modulating at all, but it's not in compliance with the current EU product efficiency requirements." That's one of the reasons why the company decided a year and a half ago to develop a better solution with ebm-papst.

"I've worked a lot with ebm-papst," says Schlößer. "They were always a step ahead. For our deltaSchwank radiant tube heater, we use ebm-papst's NRV 118 gas/air composite system for lower outputs and the NRV 137 for higher outputs. Both include a gas valve, an EC gas condensing blower and a gas-air mixer, the so-called Venturi tube. That makes us the first manufacturer of radiant tube heaters worldwide to use EC gas condensing blowers."

Efficiency of 95 percent

The solution has several advantages. Since the EC blower can be smoothly modulated between three and 30 kilowatts, the output of the heaters can be adjusted to the building's actual heating needs without a loss of efficiency due to excess air. The heaters can reach efficiency levels of up to 95 percent. The environment also benefits. "Modulating units do especially well in the transitional periods of spring and fall or in mild winters when 100 percent output isn't needed.

Radiant tube heaters work at heights of up to twelve meters using infrared radiation—just like the sun.

With the gas/air composite system, now we can achieve the best efficiency across all output ranges. That results in a further significant drop in gas consumption." Cleaner combustion means the heaters emit 20 percent less CO_2 and 55 percent less nitrogen oxides. Schwank thus exceeds strict EU guidelines such as the Ecodesign (ErP) Directive and can offer its customers a product that's ready for the future. Thanks to EC motors, the heaters use up to 72 percent less electricity.

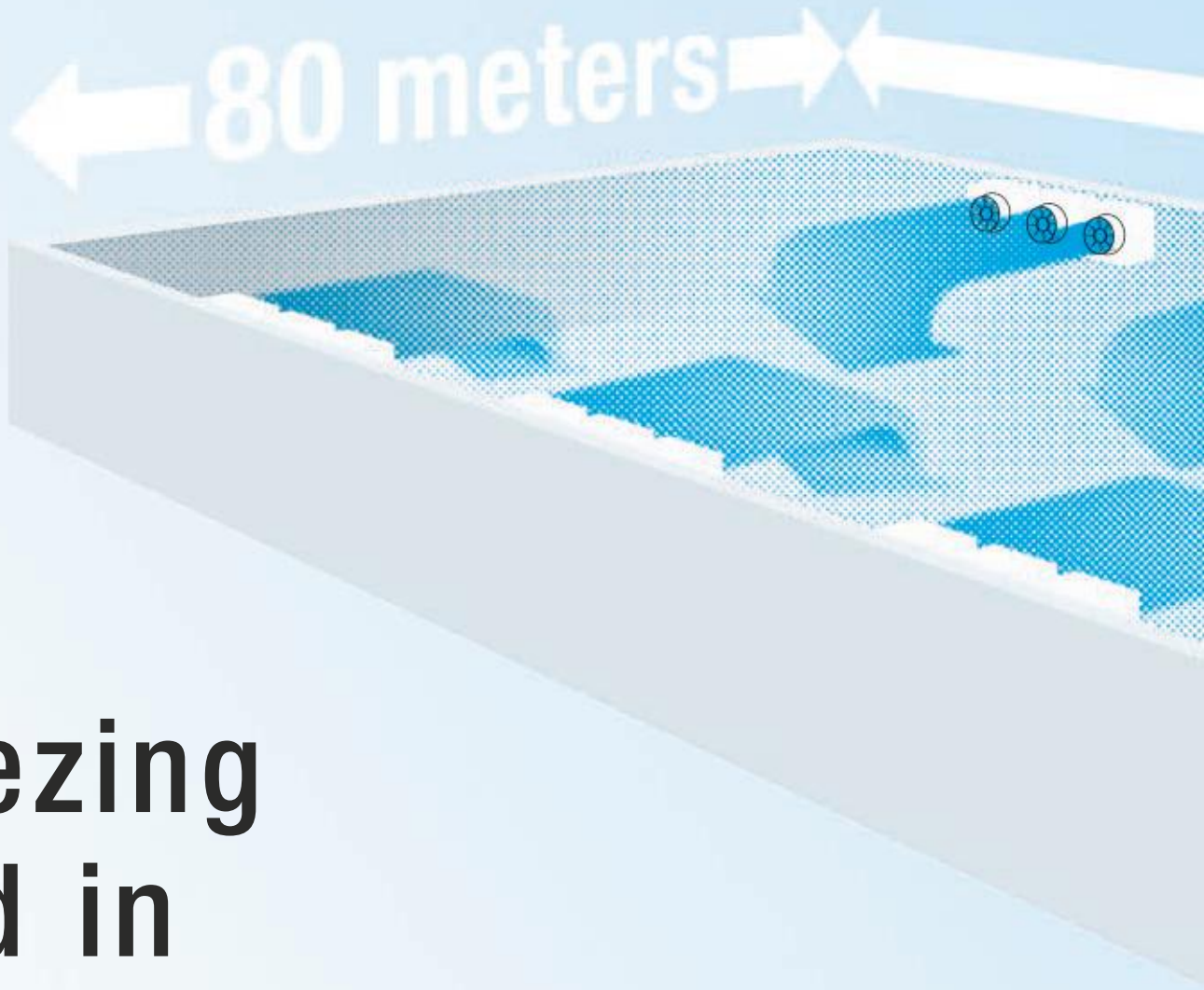
All from a single supplier

Schwank used to buy every component from a different manufacturer. Now it gets the entire gas/air composite system from ebm-papst. "That gives us more time to concentrate on the heating system," says Schlößer. "And of course on developing more new products." ●

Schwank GmbH

COMPANY
Bohn SA de CV

LOCATION
Mexico City, Mexico



Freezing Cold in Mexico

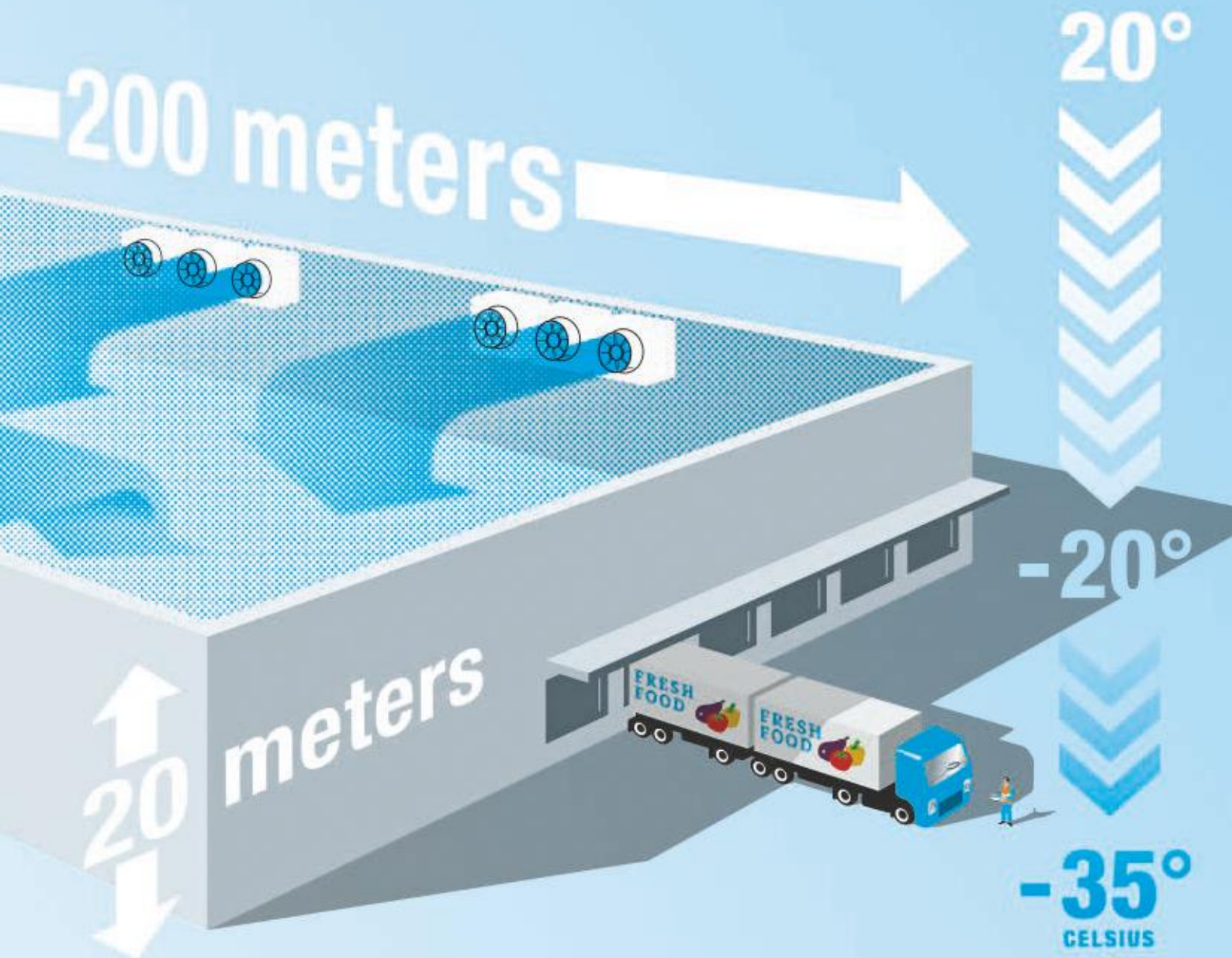
Bohn is a refrigeration technology expert in the Mexican market. In its latest generation of blast freezers, the company relies on EC technology.

Music fills the background, the appropriately colored lighting softly illuminates the flashy product packaging. The supermarket freezer cabinet hums reliably—after all, the temperature must not exceed minus 18 degrees Celsius. This is how a refrigeration chain must function to deliver on its promise to maintain the food's quality. Fresh food is used to produce frozen food. Meat, fish, vegetables and fruit. In order to maintain their quality over a longer period of time, the blast freeze process is used. The food is chilled to below –18 degrees Celsius in a very short time. In the case of flow freezing, icy air currents with temperatures as low as –40 degrees Celsius are used.

Bohn manufactures the components for refrigeration circuits like these for its customers. In Mexico, Bohn is a specialist in the refrigeration technology sector and sells various systems for warehouses and cold-storage rooms, containers and vehicles to food logistics companies. In the process, Bohn is faced with the technical challenge of bringing large rooms down to frost temperature to produce frozen foods. Lots of air has to be chilled quickly.

For example, the temperature in a hall measuring 320,000 cubic meters—200 meters long, 80 meters wide and 20 meters high—must be chilled from +20 degrees Celsius to –20 degrees Celsius in less than two hours. The room must be chilled for three more hours until the temperature is –35 degrees Celsius. Then the room temperature must be maintained.

Since 2016, Bohn has equipped its blast freezer evaporators with EC fans from ebm-papst. The medium pressure axial fan has proven to be the most suitable variant because



320,000 cubic meters in less than five hours until minus 35 degrees Celsius.

it is large, efficient, has an extremely high throw and can be controlled. With a diameter of 1,120 mm, it can transport an air volume of up to 50,000 cubic meters per hour at a back pressure of between 200 and 550 Pa.

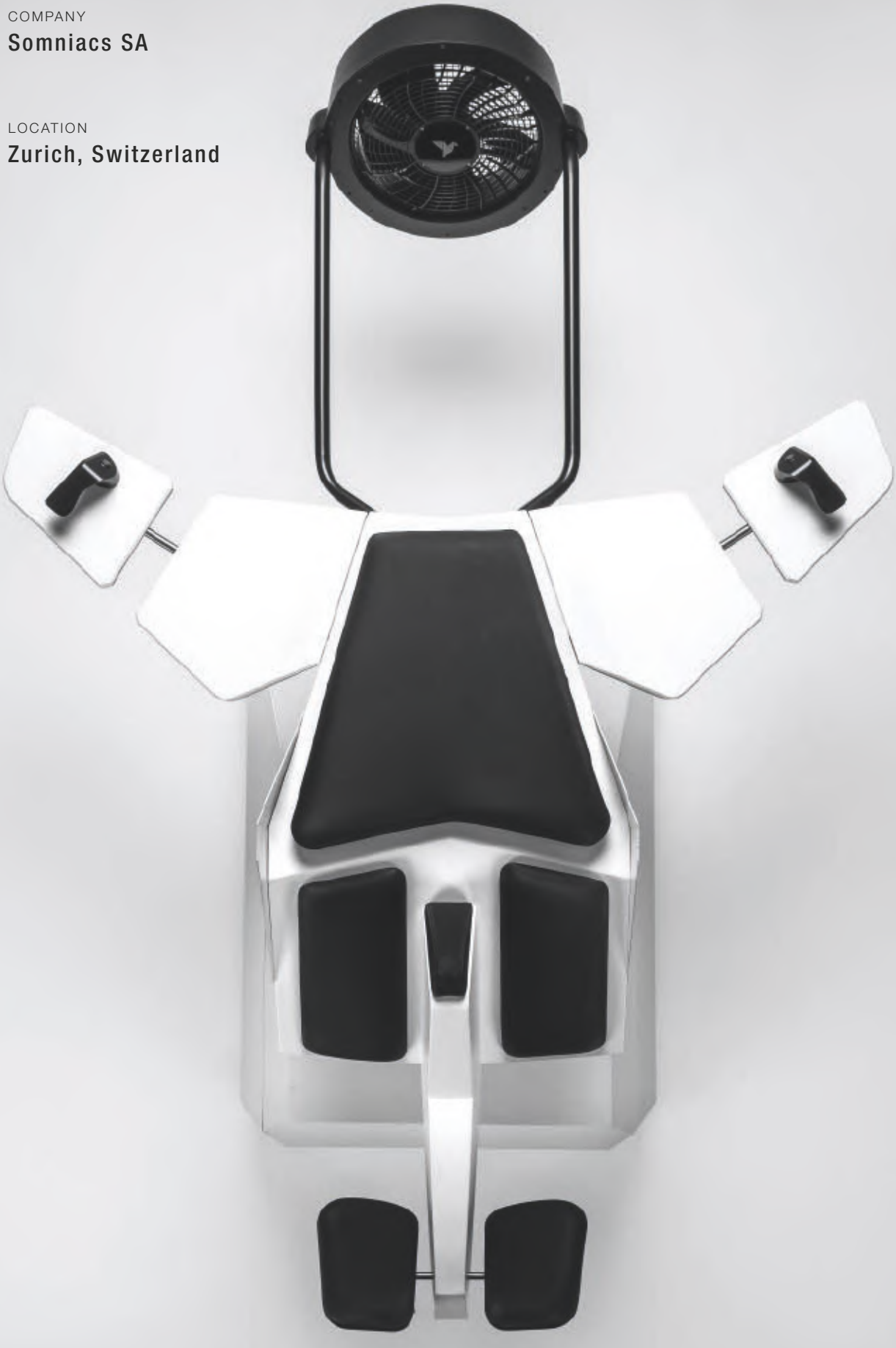
To move the air in the gigantic warehouse, three evaporators are installed directly under the ceiling on each side of the building. Three fans turn in each evaporator, yielding a total of 18 fans. They are opposite each other in order to reach every corner of the hall and each one has a throw of 40 meters. Temperature sensors control the fan speed in order to keep the temperature stable.

The food in the supermarket freezer cabinet reveals nothing about this technically sophisticated task and consumers learn about it only indirectly. They can enjoy products full of vitamins, nutrients and aroma. ●

Gernot Walter

COMPANY
Somniacs SA

LOCATION
Zurich, Switzerland



»Flying through the urban jungle as a bird is a very special kick«

Max Rheiner is making the dream of flight a virtual reality. In an interview, the head of the master's degree program for design interaction at the Zurich University of the Arts explains how it's done and why moving air plays an essential role.

How did you come up with the idea of building a simulator that lets people fly?

We wanted to do research on how immersion in virtual reality can be expanded to involve the entire body. To do that, we needed a fictional starting situation; usually simulators just simulate machines like a tractor or an airplane. We wanted to build a simulator where you feel like a different creature and don't notice that you're operating a machine. From a design perspective, I found flying to be extremely interesting because it's one of humanity's most emotional dreams, and I've been involved in it a lot myself through paragliding and drone flights.

And how did you actually start the project?

It's funny, while I was thinking about these ideas, a bird advocacy group contacted me. They wanted to set up an exhibition about bird flight. So we started a project with the goal of being able to fly like a bird with help from virtual reality. The important thing was to involve as many senses as possible. Virtual reality usually addresses the eyes and ears, but I was determined to include sensomotoric and tactile experiences. So we got to work with a small team and put together the first prototype.

How does the system work?

The user lies on his belly on a machine that has three degrees of freedom. It can go up and down, forward and back, and can tip to the side when it takes a curve. The arms are attached to wings that the user can flap to move forward. Steering is done with the wrists; we made a conscious choice in favor of very intuitive steering since many people have limited motor skills and we can't expect the coordination of a drummer. The user also wears VR glasses and headphones and faces into a headwind produced by a fan. For the headwind, we chose fans from ebm-papst because their speed can be adjusted to simulate different flight speeds. They're also extremely quiet. Simulating wind plays a crucial role for the experience with the simulator. Along with visual impressions, the wind or wind resistance is a very

YOU CAN SEE THE BIRD FLIGHT SIMULATOR IN ACTION IN A VIDEO AT:
mag.ebmpapst.com/birdly

important way for people to experience speed. Our senses pick that up through our skin and our hair.

What kind of feedback have you received about your prototype?

It was put into service for the first time at the exhibition by the bird advocacy group in 2014. Guests got to fly as red kites through the kite's natural habitat, and the feedback was entirely positive. Then we got the opportunity to present the project in Silicon Valley, which was also a great success. That was at the time when VR wasn't really on the market yet, so the timing was really good. Other invitations followed, for example to the Sundance Festival, to research conferences and the Cannes Film Festival.

Were you still able to manage all that from the university?

Not really; that's why we founded a separate company called Somniacs in 2015. The name is a combination of "somnia," which stands for dreaming or sleeping, and "maniacs" because you have to be a bit crazy to do something like this. In 2016 we began commercial production of the simulator, which we now call "Birdly." Our customers primarily include research museums working in fields like ornithology, natural history and technology. But entertainment parks are slowly putting out their feelers toward VR and getting interested in our product.

What kind of environments can customers fly in?

That depends on the customers. We're flexible because we develop both the hardware and the software completely on our own. For most simulations, we've moved from the red kite to the eagle because it simply works better internationally. Besides natural landscapes, we quickly set up cities like New York and San Francisco, and we want to do that more in the future. Flying through the urban jungle as a bird is a much different kind of kick than gliding over fields and trees.

How much are you still involved with Somniacs today?

I juggle things a bit to balance my work in the company and at the university. I've also made some changes to the subject area that I lead. The master's program is now strongly focused on immersive experiences because I believe that's a huge and interesting market. It's also an exciting social and technological phenomenon. And it's not only about VR, it's also about augmented reality, overlaying reality with virtual elements.

Besides design and conception, such ideas need a lot of technical expertise. What role does that play for you?

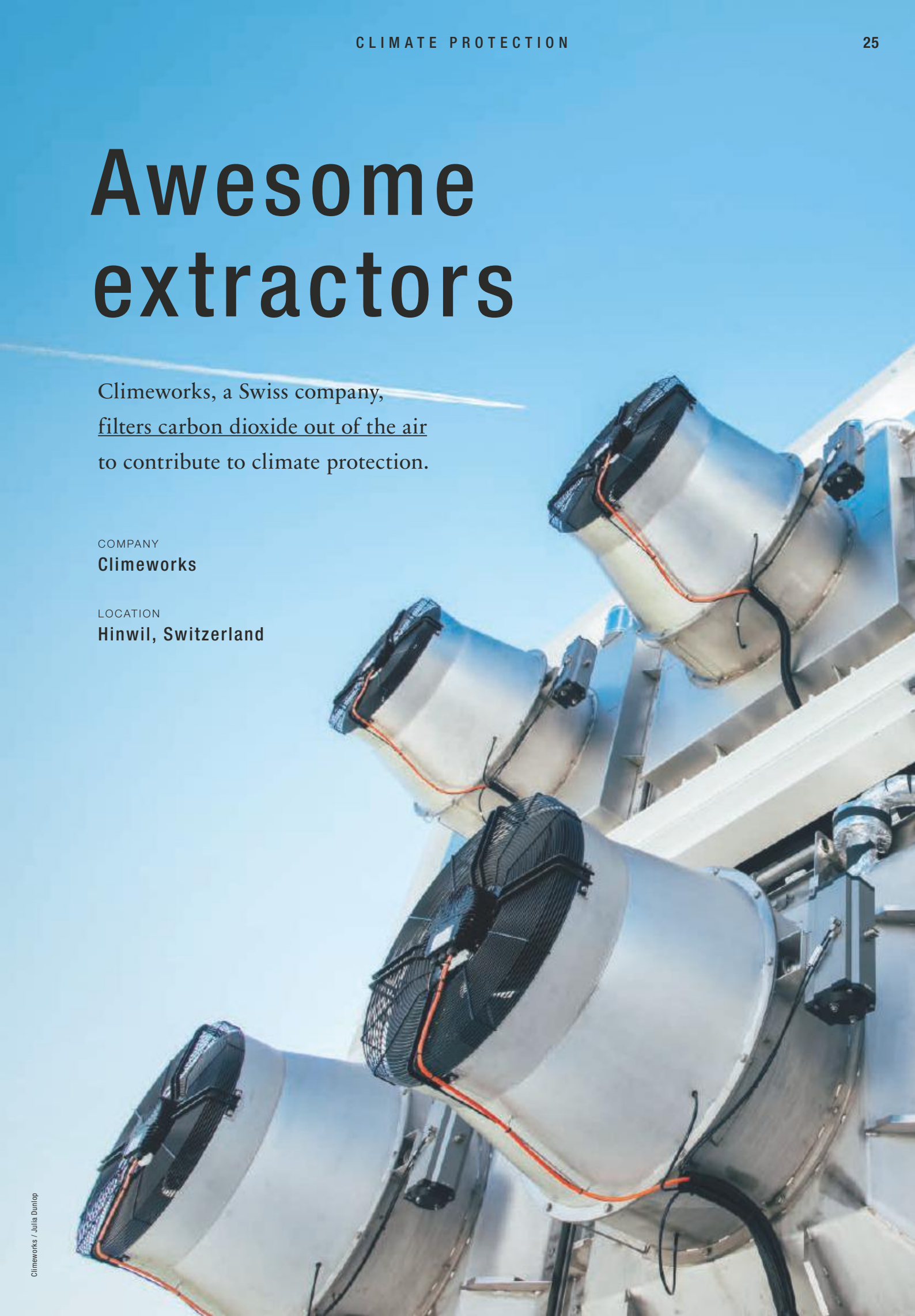
Especially at a design school, it's important to me that people get insights into the technology—not just as an end in itself or a way to solve problems but as a means of expression. When I use technology, I can solve a problem like getting from A to B, but I can also shape the experience of travel, I can define how I get from A to B. That takes both: technology and design. With respect to Birdly, I really like a quote from the aviation pioneer Otto Lilienthal. It goes roughly, "Inventing a flying machine doesn't mean much. Making one means more, but flying one is what really matters." It's simply about the feeling of flight, everything else is secondary. ●

Awesome extractors

Climeworks, a Swiss company, filters carbon dioxide out of the air to contribute to climate protection.

COMPANY
Climeworks

LOCATION
Hinwil, Switzerland



Climeworks / Julia Dunlop

Useful CO_2

The carbon dioxide filtered out of the air by the direct air capture plant can be used for many things, such as renewable fuel, fertilizer and carbonation in beverages.

W

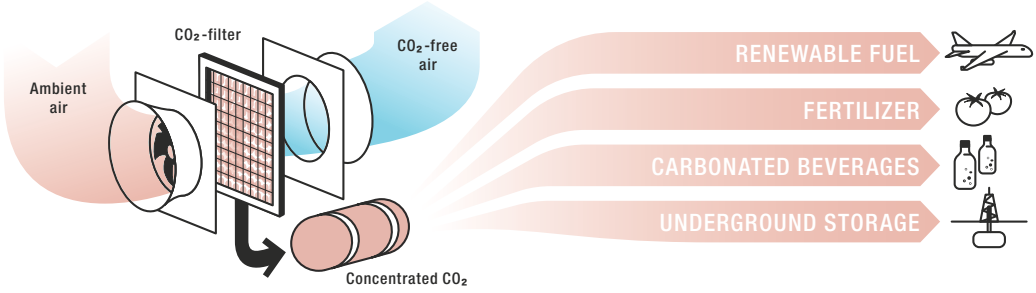
Waste incineration is not exactly something that makes people think of improved air quality. But in the community of Hinwil in the Swiss canton of Zurich, the two aspects are being combined in a project that's unique worldwide. On the ground, a local waste management authority converts trash to slag by burning; above, Climeworks turns carbon dioxide into plant food. It's an efficient cycle as the waste incineration provides energy for the CO_2 extractors on the roof. They bring the greenhouse gas via a pipeline to a greenhouse 400 meters away, where a nursery uses it to boost the growth of cucumbers and tomatoes. The process turns 900 tons of CO_2 from a climate nemesis into a growth booster.

From dream to climate target

The technology is called direct air capture (DAC) and the plant was developed by Christoph Gebald and Jan Wurzbacher. The two engineers became acquainted early in the

> "Removing CO_2 from the air is indispensable for reaching the two-degree target."
>
> **VALENTIN GUTKNECHT** ——
> MARKETING MANAGER AT CLIMEWORKS

The 18 extractors in the Hinwil plant supply the neighboring greenhouse with 900 tons of concentrated carbon dioxide per year. The nursery operating the greenhouse was able to increase its harvest by 20 percent.



millennium during their studies at the Swiss Federal Institute of Technology in Zurich. "We decided on the first day to found a company together," says Wurzbacher. "That was our big dream." In 2007 they began research on technologies for extracting carbon dioxide from the air. Just two years later, they founded Climeworks.

The company has set itself some ambitious goals: "Technologies for removing CO_2 from the air are indispensable for reaching the two-degree target," says Valentin Gutknecht, Marketing Manager at Climeworks. The company would like to see one percent of worldwide CO_2 emissions being filtered out of the air by 2025. Doing that would take 250,000 plants like the one in Hinwil. It consists of 18 extractor units that are controlled and monitored together. The advantage of its modular design: It needs little space, is easily scalable, and can therefore be used anywhere.

The basic principle of the CO_2 extractor is actually quite simple. A fan draws in air through a filter that captures the CO_2. When the filter is saturated, the carbon dioxide is separated at 100 degrees Celsius. Of course choosing the right process and components was somewhat more complicated. "Energy efficiency was a very important aspect for us; we had an eye on it from the beginning," says Wurzbacher. That was a reason for Climeworks to choose large axial fans from ebm-papst. They have to transport very high air flow with low pressure losses and also be very quiet. "We benefited from being able to set up and measure the entire system at ebm-papst in Mulfingen. That helped us to maximize the efficiency."

Climeworks is also working on the efficient use of the carbon dioxide. Growing vegetables as in the initial project in Hinwil is only one of several possibilities. The CO_2 harvested in the DAC plant can also be used for the production of carbonated beverages or climate-neutral fuels and materials. The main thing is that it disappears from the atmosphere. ●

Climeworks / Julia Dunlop; Gernot Walter

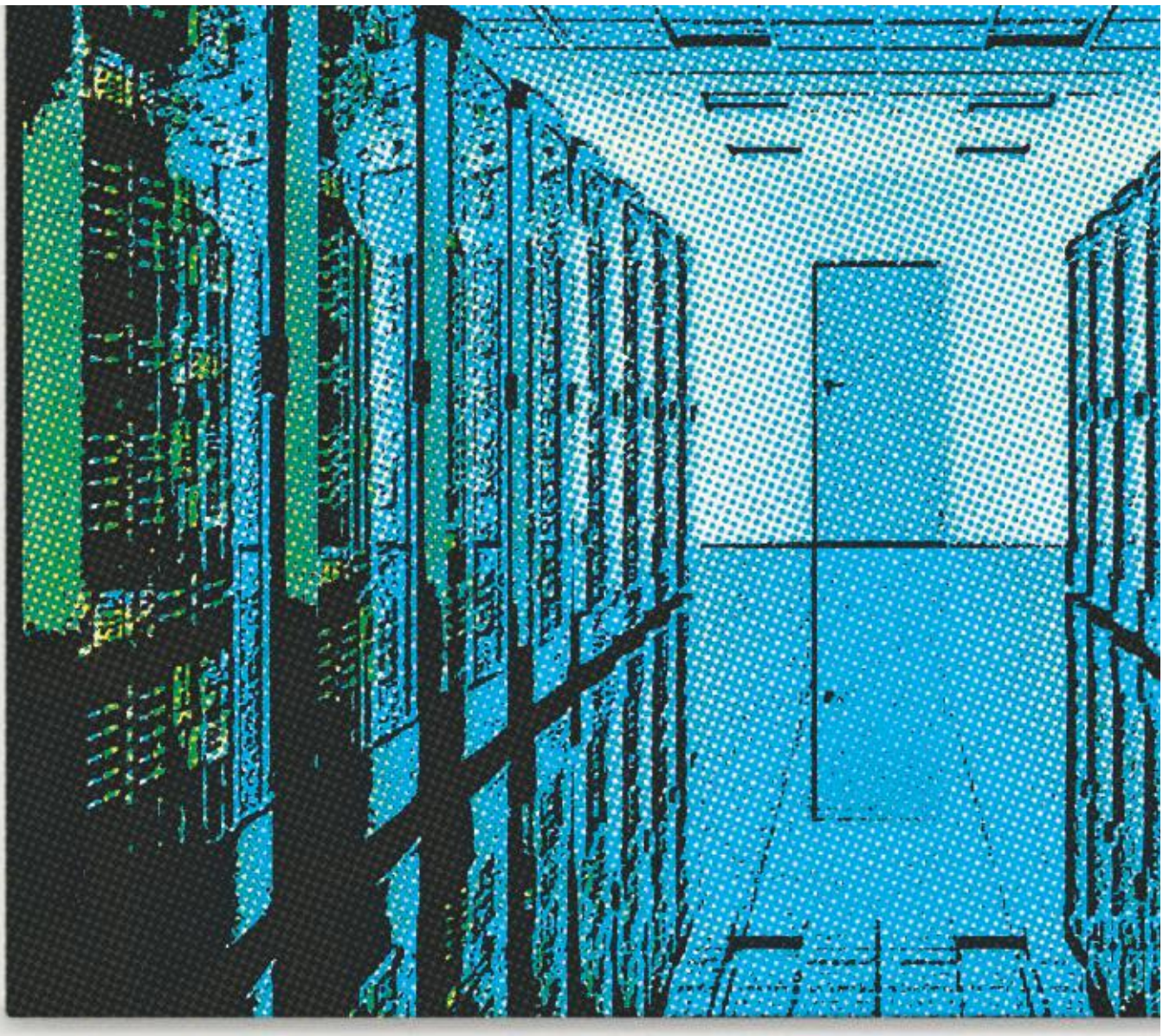
The art of air conditioning

Jake Belcher

COMPANY
ENGIE Services U.S.

LOCATION
Norwell, MA, USA

ENGIE Services U.S., a division of global energy leader ENGIE, has a clear mission: helping its customers to save energy. It manages to do so at a large data center thanks to careful preparation and an eye for detail.



Danielle Owen of ENGIE Services U.S. knows:
The air conditioning of a data center is an art in itself.

For Danielle Owen, sound planning and detailed analysis are the essence of her work: key factors for the success of all her projects. Owen is Director of Business Development Engineering at energy service provider ENGIE Services U.S. (formerly OpTerra Energy Services). Her work consists of showing clients opportunities for saving energy in the management of all types of buildings—whether involving air conditioning, lighting or heating. A project for a major operator of colocation data centers (see box) started with a detailed infrastructure review. "Our client has data centers at over 40 sites throughout the US," says Owen. "They wanted to know from us what measures would be the most worthwhile, and where."

Owen and her team set about analyzing electricity bills, existing hardware and software configurations, and consumption data from all the computer centers. They compared this data against the energy prices and energy-saving programs in the different states. "There's enormous variation here, so it's important to know exactly what rebates are available for energy-saving projects in which states, and how to get them." ENGIE identified three data centers where modifications for greater energy efficiency would especially pay off, with one based in the US state of New Jersey. And then the work really got under way.

Careful examination

ENGIE collected further data on-site, taking a closer look at the existing hardware, as well as the control system. Proceeding on this basis, the company developed a proposal that encompassed a range of passive and active measures for cooling the data center, in addition to replacing all lights. ENGIE backed up the entire plan with figures documenting the expected savings. "This step is particularly important on projects where we're applying for rebates on behalf of our client," explains Owen. "The entire proposal including all figures undergoes scrutiny by an independent third party ahead of the project. And even after approval of the subsidy, it will be paid out only when the savings are actually achieved later on."

Once the project had been authorized by both the client and the auditing agency, ENGIE's installation teams got down to business, implementing different measures in parallel. First, the lighting system throughout the data center was switched to LED lights. Improving the air flow through the center was a bit more complex. ENGIE made use of both active and passive measures here. The passive measures included setting up cold aisles and fitting barriers that were installed wherever partially filled server racks would otherwise result in gaps in the cold aisles. The most important active measure was the introduction of so-called active floor tiles. These perforated floor panels feature fan trays each equipped with four EC fans, which selectively channel

"In our projects, we have to back up all measures with hard data of the expected savings. All numbers are checked for their accuracy even after the project is done."

DANIELLE OWEN

DIRECTOR OF BUSINESS DEVELOPMENT ENGINEERING AT ENGIE SERVICES U.S.

cold air from the underfloor at specific points to the server racks. All told, 324 of these elements were installed by ENGIE in the data center.

Tailored to needs

"Controlling the air flow through a data center is an art in itself," explains Owen. "Particularly data centers with lots of customers result in a huge variation in loads, which are also distributed over the building's footprint. Investing in active floor tiles pays off here because they can be used to control the air flow far more precisely, allowing us to switch off consumption heavy air conditioners." To make this process as efficient as possible, ENGIE equipped each floor tile with three temperature sensors which, like the Computer Room Air Conditioner (CRAC) units, are connected to the building control system. If the temperatures measured by the sensors are lower than required, the fans in the floor tiles slow down. When a rack starts to get too hot, the fans in the tile speed up again. If this is not sufficient, a nearby CRAC unit is brought out of standby and supplies more cold air. "Installing extra energy consumers in the form of fans may initially sound like a contradiction if you want to save energy. But the active floor tiles function so efficiently, using them really pays off," explains Owen.

While one team of ENGIE's technicians was busy modernizing the interior of the data center bit by bit without interfering with ongoing operations, another was hard at work on the roof. There they removed the fans in the condensers, replacing them with 224 energy-efficient EC fans featuring AxiTop diffusers from ebm-papst. Owen comments, "One major advantage of this replacement was the ability of ebm-papst to supply us with fans tailored to the units. The company also delivered small consignments of fans to the work site once a week. That was a great help as our client only gave us limited storage space on site." Once all measures had been implemented, ENGIE's staff remained on the spot for a few weeks to commission the systems one by one and fine-tune them. "We adopt a successive approach here, finding the optimum settings for all components step by step. We're happy to spend time on this, because the details of the settings also decide whether operation will be efficient."

That there has been a marked rise in efficiency is demonstrated by the figures for the project at the data center in New Jersey: Annually, the operator is now saving 7.3 million kilowatt hours. This means that the modification work will pay for itself in less than two years. Thanks to the improved air flow at the data center it has been possible to put 53 of the 112 air conditioners into hot standby mode. Danielle Owen comments that awareness for improving efficiency is also constantly being reinforced by such projects: "During the last five years, operators have been thinking more and more about the efficiency of their data centers. Improving their efficiency also hits their bottom line directly, and in some cases, can free up capacity to serve more customers." ●

Jake Belcher

Measures with big impact: The upgrade with ebm-papst fans in the condensors on the roof and ebm-papst active floor tiles help save energy.

A home for servers

Colocation data centers offer customers a way to install their own server hardware in an optimum infrastructure. Companies without a data center of their own can still store their data securely and on their own hardware. For the operators of colocation data centers, this business model means they need air conditioning systems that offer a fast, efficient and flexible response to different load levels.

Happy hemp

Since cannabis with THC content under one percent was legalized in Switzerland, the sector has been booming. BioCan AG got in on the ground floor of hemp cultivation. Thanks to good ventilation, its harvest is better than that of its competitors.

COMPANY
BioCan AG

LOCATION
Thayngen, Switzerland

Hemp is truly a multitalented weed, with applications in numerous industries and physicians more and more frequently relying on the effects of its blossoms. The consumption of hemp is illegal in most countries. But not in Switzerland; its sale has been legal since 2016 as long as its concentration of the psychoactive substance tetrahydrocannabinol (THC) is below one percent.

Since then, business has been booming for BioCan AG, the first Swiss company permitted to produce and sell cannabis legally. Philipp Schennach, technical director for indoor production, says "We also plant hemp outdoors, but indoors we're independent of the seasons. But we imitate nature as well as we can."

In the industrial park in Bassersdorf near Zurich, visitors can see how they do it. Several thousand hemp plants sway back and forth in the artificial wind. Two RadiPac centrifugal fans from ebm-papst are responsible for intake and exhaust, and 20 AxiCool fans are suspended from the ceiling of the production facility. "Good ventilation is very important for the plants. For one thing, it dissipates heat and humidity. And the wind strengthens the stems of the plants," explains Jorma Lori, facility manager for cultivation, who designed the ventilation system with Schennach. BioCan AG can harvest six crops per year this way. Only one crop per year is possible outdoors. The hemp experts are satisfied. "Our facility is superior to many others simply because we have good fans," says Schennach. ●

READ THE COMPLETE STORY AND LEARN MORE ABOUT HEMP CULTIVATION AT
mag.ebmpapst.com/biocan

Janosch Abel

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China Refrigeration, *Bejing*, *April 9 – 11 2018*

Nordbygg, *Stockholm*, *April 10 – 13 2018*

ARBS, *Melbourne*, *May 17 – 19 2018*

SPS / IPC / Drives Italy, *Parma, May 22 – 24 2018*

InnoTrans, *Berlin*, *September 18 – 21 2018*

Mostra Convegno, *Singapore*, *September 18 – 21 2018*

IAA Nutzfahrzeuge, *Hanover*, *September 20 – 27 2018*

Chillventa, *Nuremberg*, *October 16 – 18 2018*

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Constant volume plays a major role in many applications, but in residential ventilation it's essential.

$$\dot{V}=\int_A c(r,\varphi)\cdot \mathrm{d}A$$

Efficient residential ventilation calls for exact control of the amounts of air supplied and extracted by the fans. Otherwise, under- or overpressure can arise in a room, which can result in moisture in the walls or exhaust emissions from a chimney into the living quarters.

To determine the exact air volume, the transported air flow must be measured. With the continuity equation, it can be expressed as the integral of the velocity distribution over the area through which the transported material flows within the exhaust nozzle. This can be visualized as a net stretched over the exhaust opening, with the product of partial velocity and area being taken at every knot and summed over the surface. For forward-curved centrifugal fans, the transported air volume can be determined relatively easily from a characteristic curve using the fan's speed and current draw. But these fans have efficiency deficits when compared with those with backward-curved impellers. For backward-curved centrifugal fans, however, it's impossible to unambiguously determine the air flow from these parameters.

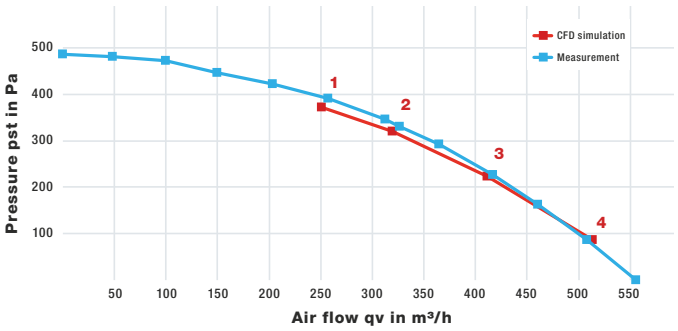
Simple and efficient measurement with vane anemometer

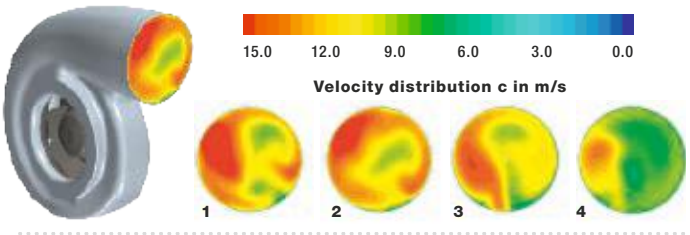
To determine the air flow for backward-curved centrifugal fans, manufacturers use various systems. Frequently a differential pressure measurement is used, for example. But here the measurement accuracy is reduced for low air flow by the quadratic relationship between air flow and pressure, and the measured value can be distorted by the conditions of the fan's installation in the customer equipment.

We sought a more exact solution that could be integrated in the fan. Thanks to close cooperation between our design and aerodynamics specialists, we have developed a simple and efficient solution for the new RadiCal in a scroll housing with EC technology. A vane anemometer positioned in the outlet records the flow velocity—and thus the actual air flow—continuously across the entire cross section without producing disturbing noise or significant losses. The precision is much better thanks to the linear relationship between air flow and anemometer speed and the averaging of the flow velocity over the cross section.

The anemometer transmits the data to the fan's integrated central control electronics, which adapt the speed of the EC motor and regulate the air volume. With this method, the air flow can be regulated with a precision of ±1 percent. The EC fan can put its advantages to full use here as its precision control and high efficiency are maintained even in partial-load operation. ●

VELOCITY CURVE IN OUTLET, DEPENDING ON OPERATING POINT





Electricity for 25,000 homes

ebm-papst Inc. was a solar power pioneer in the United States six years ago—with great success.

It happened last year: the 1-gigawatt-hour milestone was reached. The ebm-papst subsidiary in the United States installed the first photovoltaic panels on its roof in 2011. "Back then that was something really unusual," says Scott Beauchemin, Vice President Engineering at ebm-papst Inc. "Solar power systems weren't nearly as widespread as in Europe, and especially not in our area." Farmington, Connecticut, is not exactly known for having the most hours of sunlight.

But it was time for a major renovation of the company's premises, and a pioneer project was a perfect fit with its self-image. "Our GreenTech philosophy isn't just about our products, it's about how we use energy and resources every day."

The original 50-kilowatt system wasn't the end of the story. The next 50 followed in 2012, and another 100 kilowatts in 2014. "We were very happy with the performance of the first system," says Beauchemin. And when the Obama administration granted support for the installation of solar power systems, expansion became more attractive. One neighboring company has meanwhile installed solar panels as well.

Now the company feeds about 250 megawatt-hours per year into the power grid, enough to supply 25,000 homes. "And there's still quite a bit of space on our roof…" ●

ebm-papst

ICE-FREE!

Thanks to “NoFrost,” annoying layers of ice in freezers and refrigerators have been a thing of the past for some time. The DE 20 is the latest EC motor for these applications. It’s light, smooth-running, rugged and extremely quiet, has a service life of over 80,000 hours, and is easy to install. That also makes it perfect for retrofitting old AC motors to make older appliances much more efficient.

BUS DRIVER

The machinery and plant engineering sector wants compact drive systems that can be integrated into a network through standard bus interfaces. The ECI 63.XX K5 from ebm-papst is one answer to that need. Thanks to integrated programmable sequence control, it can be used to implement technology features directly in a drive. The previously required PLC is relieved or can in ideal cases be dispensed with entirely.

www.ebmpapst.com/eci63

COOL TRANSFORMER

For large power transformers, oil cooling alone is often not enough. To prevent damage from overheating, fans cool the radiator. The special EC transformer fans from ebm-papst are designed for demanding tasks accordingto DIN EN 50216-12, so they are also suitable for use in coastal environments. They work in partial-load operation, thus ensuring more uniform air flow—and they produce less waste heat.

www.ebmpapst.com/transformercooling

»Gets up to speed fast«

The EC centrifugal blower is making inroads into some unusual applications. Uwe Sigloch, Head of Ventilation and Air Conditioning Market Management at ebm-papst, tells us how.

What characterizes the EC centrifugal blower?

The EC centrifugal blower combines energy efficiency and high power density with fast start-up. Its control electronics are optimized so that it gets up to speed in a very short time. It's up to speed in only three to four seconds, reaching air flow of up to 3,000 m^3/h. Its power consumption is up to 30 percent lower than that of comparable AC fans.

Where are such fans in demand?

Anywhere where fans with a fast start-up are needed, especially in air locks outside clean rooms in electronics production and in air curtains such as those in truck loading ramps. But they can also be used for cooling power electronics. Usually AC fans are used in these applications, but in many cases they no longer satisfy the requirements of the ErP Directive.

What advantages does the EC centrifugal blower have?

Thanks to the many forward-curved blades in the impeller, it's quiet. Its noise is more pleasant than that of comparable fans, especially in the low-frequency range. And it's very rugged and durable, thanks to its housing made of sendzimir galvanized sheet steel. The control electronics installed on the scroll housing are protected against moisture and dust. The electronics housing is made of die-cast aluminum and partly extends into the fan's air-conducting scroll housing. That cools the electronics very well, which significantly increases the power density and service life.

Fans for air locks and air curtains are often operated in parallel connection. Isn't that a problem for EC fans?

Until recently, that could be difficult due to disturbing harmonics. It was only possible to operate EC fans in parallel with additional measures such as interference suppression filters. Now we've developed a solution with integrated power factor correction. Active PFC reduces the harmonics and ensures that the requirements can be complied with without additional measures.

What about monitoring?

Our bus connection offers major advantages, especially when multiple fans are in use in air curtains. The fans can be controlled and monitored through the bus. For example, the operator has access to the fans from a central PC and can monitor their operating status, detect and diagnose faults, and initiate any necessary maintenance work. There is also smartphone-capable monitoring software available for wireless monitoring of the networked fans. ●

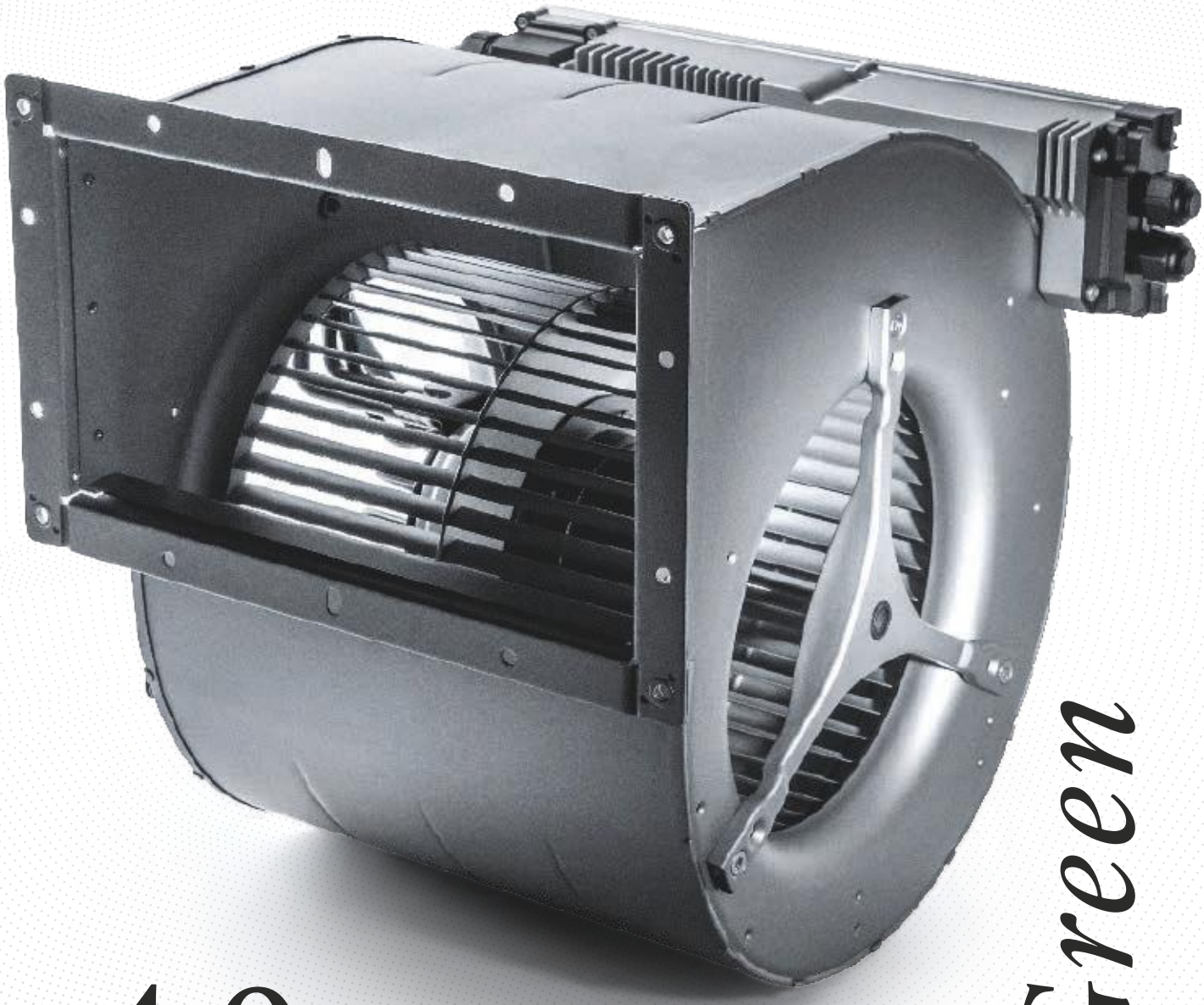
FIND MORE INFORMATION ABOUT THE EC CENTRIFUGAL BLOWER AT:
ebmpapst.com/forwardcurved

30%

is how much energy the EC centrifugal blower saves in comparison with AC fans.

NET WORKED

Bus connection enables multiple fans to be controlled from a central location.



<4.0s

start-up time

The EC centrifugal blower needs only three to four seconds to start up.

The EC fan reaches air flow of

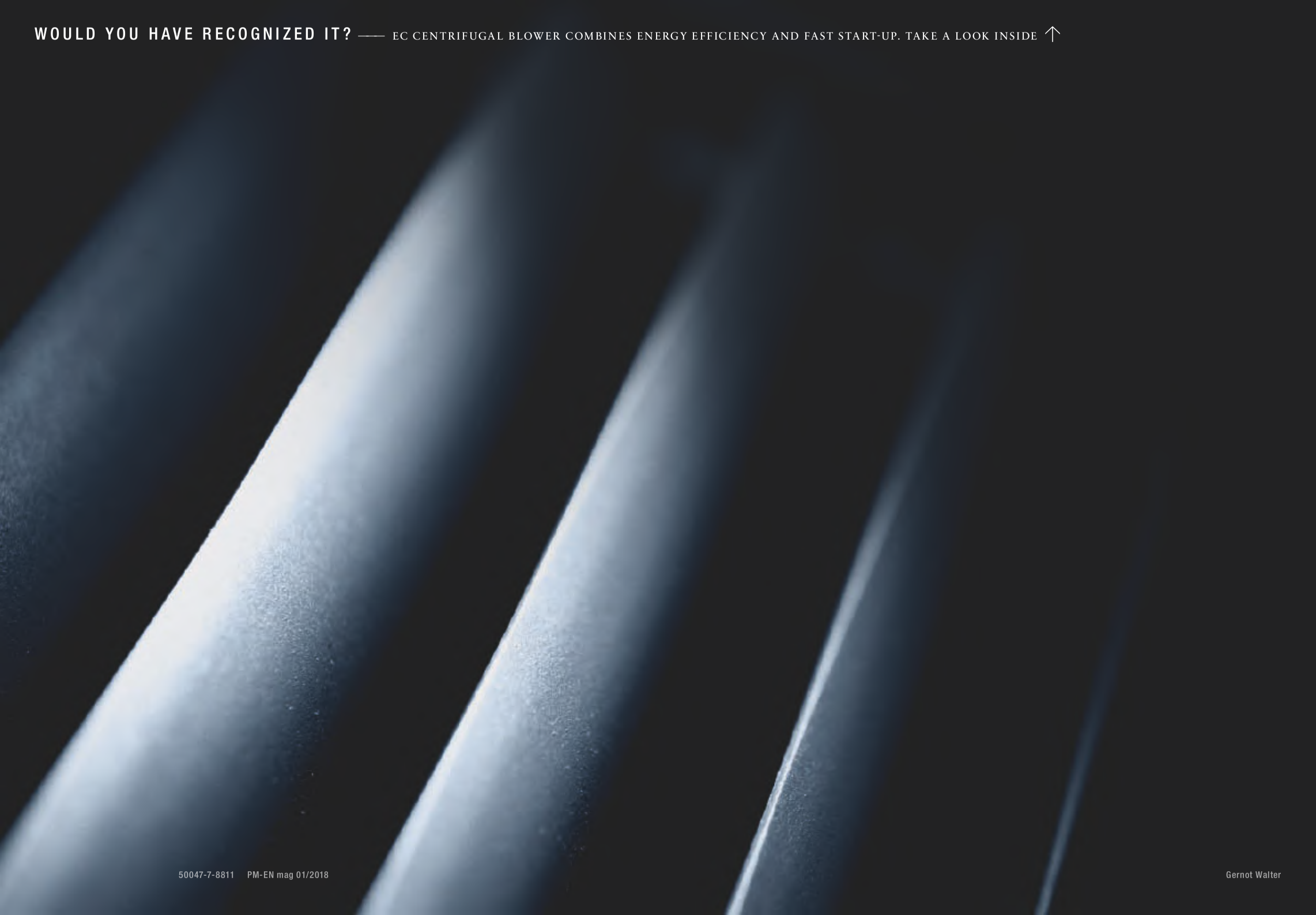
UP TO

3,000 m³/h

Green

The heart of the centrifugal blower is a GreenTech EC motor with 0.75 kW output.

WOULD YOU HAVE RECOGNIZED IT? —— EC CENTRIFUGAL BLOWER COMBINES ENERGY EFFICIENCY AND FAST START-UP. TAKE A LOOK INSIDE ↑



Gernot Walter