

01° 2016

**mag**<sup>o</sup>  
all about ebm-papst

°14 **Breathing easy in the archives:** How the Stockholm Public Library dealt with high levels of radon

°24 **Creative heads keep their cool:** fresh breeze at MERCEDES AMG PETRONAS headquarters

# FINDING CLIMATE

Eight different climate zones need to be handled dependably in Moscow's new dolphinarium. Not an everyday job for the Austrian company Frivent.



# “WE NEED TO FOCUS ON THE CREATION OF NEW MARKETS!”

ebm-papst A & NZ Pty Ltd.  
10 Oxford Road  
3026 Laverton North VIC  
Australia  
Phone: +61 3 9360-6400  
Fax: +61 3 9360-6464  
sales@ebmpapst.com.au  
www.ebmpapst.com.au

world



## Fresh, cool air

**Thomas Borst**

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

**Dear readers,** With the summer yearning for sun and warmth comes the wish for a cooling breeze. For our customers, this wish is our command. For example, when cooling food-stuffs or electronics. But of course also for giving people the ideal environment—at work or when visiting public facilities.

That is why this issue deals with fresh and cool air—and with the way we help our customers to find the right ventilation and air conditioning solutions. Our long-standing and extensive experience facilitates knowledge transfer for the development of customer-specific concepts from existing solutions. With all the challenges posed by new projects, that helps us to achieve uncomplicated implementations quickly. This issue covers that range, including

climate control in a dolphinarium, ventilation of a radon-contaminated library, and cooling the electronics in a tabletop test apparatus.

Such transfers do not only work for new projects. For some time now, we have also been specialists at converting existing plants, concentrating on improving their efficiency and functionality. We have developed appropriate product concepts for that purpose, such as our RadiPac and RadiFit lines of EC centrifugal fans. Toto Wolff, head of motor sports at Mercedes-Benz, can confirm the importance of a good indoor climate and working atmosphere: The world-class air conditioning solution for the Formula One™ team in Brackley helps the staff there to concentrate on their work. I wish you a refreshing read. ○



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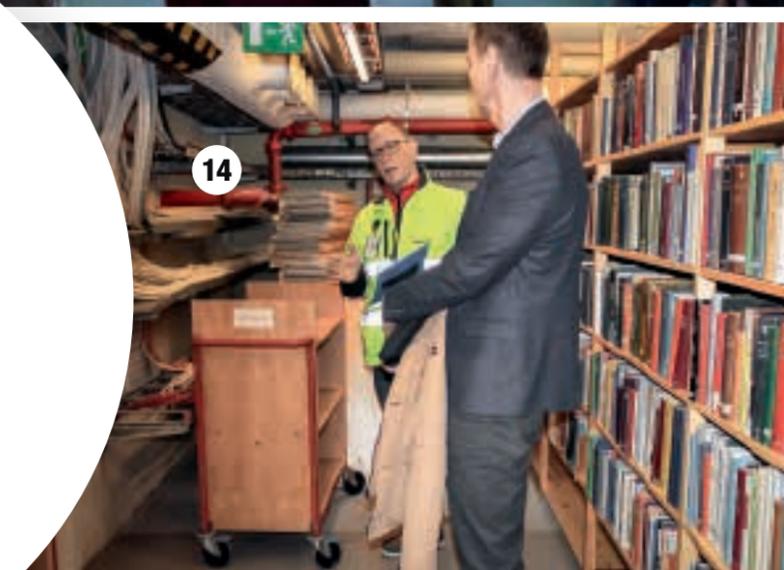


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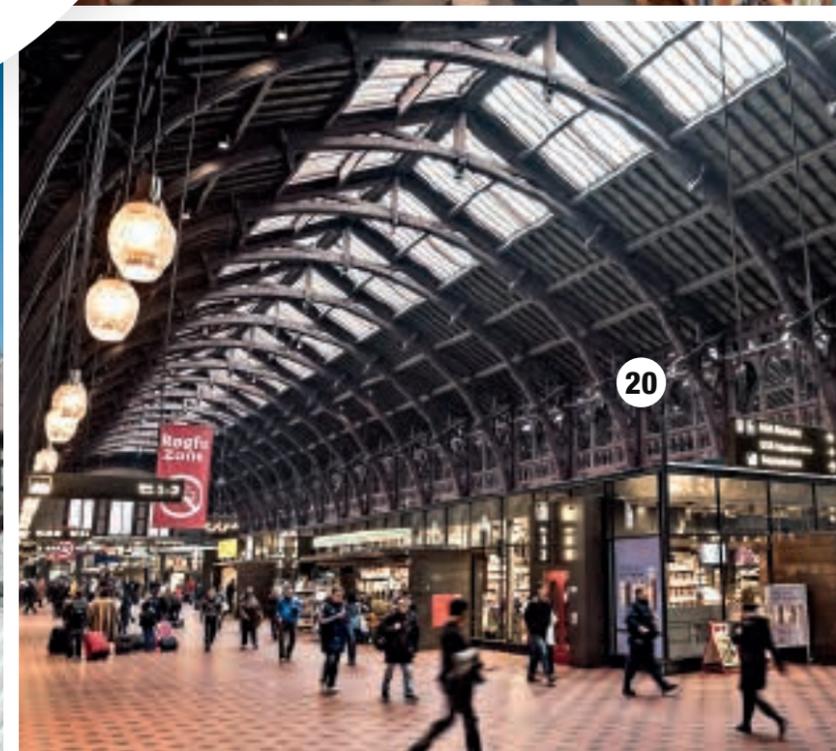
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## More space for production

ebm-papst opens new building in St. Georgen.

After twelve months of construction, ebm-papst celebrated the completion of the first phase of construction for its new plant in St. Georgen in March. The company invested about five million euros in the new electronics production facility with floor space of 3,800 square meters. Electronics modules will be produced here for the plants in Herbolzheim and Hungary, among others. Dirk Schallock, Managing Director of ebm-papst St. Georgen, the new plant offers excellent prospects for future growth. This expansion creates the necessary capacity to reach our growth targets." In addition to its completion, the cornerstone was laid for a second phase of construction — another reason to celebrate. With the investment of 15 million euros, ebm-papst St. Georgen will add another 10,000 square meters to its facilities in Hagenmoos. The building will serve to increase production capacity for the automotive and drive engineering divisions while adding more space for logistics and administration.



The completed first phase of construction in St. Georgen-Hagenmoos

## Pick up your number!

The ebm-papst Marathon in Niedernhall is on for the 21st time.



Register now and get your number: [www.ebmpapst-marathon.de/en](http://www.ebmpapst-marathon.de/en).

Attention all endurance athletes: on September 10 and 11, ebm-papst is holding its traditional marathon weekend in Niedernhall. As usual, the athletes will find the discipline to match their skills on the agenda — from a marathon, half-marathon and 10K run to contests for inline skaters and hand cyclists. However, the new marathon route is unusual, with changing scenery in the vineyards to provide the runners with renewed motivation at every step. The extensive entertainment program includes trampolines, pony rides and climbing.

## Gerhard Sturm honored

ebm-papst founder receives 2015 German Mechanical Engineering Prize.

The VDMA (German Engineering Federation) honored ebm-papst founder Gerhard Sturm and Dr. Manfred Wittenstein, founder of Wittenstein AG, with the 2015 German Mechanical Engineering Prize. A panel of independent experts and the technical journal "Production" awarded the prize at the 8th annual German Mechanical Engineering Summit in Berlin. The panel praised both award recipients for carving out and constantly expanding a prominent position in the market and in their industry with decades of innovation and entrepreneurial spirit. Dr. Thomas Bauernhansl, head of the Fraunhofer Institute for Manufacturing Engineering and Automation and spokesperson for the panel, emphasized that sustainability was especially important to Gerhard Sturm in the development of new products.



Happiness shared is double happiness: Wittenstein founder Dr. Manfred Wittenstein and ebm-papst founder Gerhard Sturm receive 2015 German Mechanical Engineering Prize.

## VISIT BY THE VICE-CHANCELLOR

*Sigmar Gabriel, Germany's Vice-Chancellor and Minister of Economic Affairs and Energy, visited Mulfingen in February to form an impression of ebm-papst. After touring the plant, he gave a speech to 200 employees and answered questions about TTIP, energy efficiency and the integration of refugees in the labor market.*





**IKOR**  
specializes  
in electronic  
control and  
regulation  
systems.

ebm-papst

## A boost from Spain

ebm-papst acquires electronics specialist IKOR.

At the beginning of the year, ebm-papst acquired a majority interest in the Spanish electronics specialist IKOR. The company is headquartered in San Sebastián and employs 600 people. It has a research and development center and three modern production facilities in China, Mexico and Spain. IKOR develops and produces custom electronic control and regulation systems for industrial applications. For ebm-papst as a systems provider, acquiring the electronics specialist IKOR means a further boost for its technology expertise. Thanks to the additional production capacity, especially in China and Mexico, the company expects new market opportunities that will result in further growth.

# GreenTech worldwide

## Making the world greener: Sustainability prize for Vaillant

Vaillant was presented with the 2015 German Sustainability Award as Germany's most sustainable large company. The awards panel explained its decision by stating that as a provider of key technologies for the energy transition, Vaillant fulfills its social and ecological responsibility in exemplary fashion. ebm-papst is very pleased and heartily congratulates Vaillant, with which ebm-papst has cooperated for many years on the development of energy-efficient gas heaters. For example, in consultation with Vaillant ebm-papst improved the gas-air system comprising the NRG 77 and the electronically controlled gas valve F01 for the ecoTEC exclusive gas-condensing boiler.



*Great delight  
as the sustain-  
ability prize  
is presented  
to Vaillant*

Vaillant Deutschland GmbH & Co. KG

[WWW.GREENTECH.INFO](http://WWW.GREENTECH.INFO)

# “WE CREATE A COMFORTABLE CLIMATE FOR WORKING”

Toto Wolff, Head of Mercedes-Benz Motorsport, explains how the partnership with ebm-papst helps the team's employees and contributes to racing success.

**Mr. Wolff, the MERCEDES AMG PETRONAS partnership with ebm-papst is now entering into its third season. Give us a progress report.**

**Toto Wolff:** The partnership is highly effective. In Formula One™, it's very important that all the different parts of the team work together. And ebm-papst is a key part of the team because the company helps us in many critical areas. It makes a major contribution by effectively cooling our cars at the track with the on-car cooling fans. And our employees work more efficiently and effectively in a cooler environment in the team garages as well.

**Why are working conditions so important today?**

We have 60 or 70 mechanics working in the pit garages. When the car arrives with a hot engine and hot brakes, the temperature can become very high. Both the mechanics and the drivers perform better when the temperature in the garage is 28 °C instead of 45 °C. With ebm-papst, we have created a pleasant working climate. This provides a clear advantage in the competitive racing environment at Grand Prix.

**In Brackley, you also rely on the ventilation technology expertise of ebm-papst now ...**

Yes, we have 800 employees at our headquarters in Brackley in the UK. It is important that they work in a comfortable air conditioned buildings — not too cold or too hot and with pleasant air — so they can concentrate. As we measure and improve all aspects of our operation on a continuous basis, I can confidently say that ebm-papst help our success.

**As far as cooling is concerned, do you think you've reached the pinnacle in Formula One™?**

There's always room for improvement in Formula One™. We're always working to make the car even faster, generate a bit more downforce and find more power from the engine. It's exactly the same with cooling. We want increasingly efficient cooling systems and to constantly improving work conditions — our collaboration with ebm-papst in these areas is key.

**How did the competition react to the new supplier? Surely they are curious about what you are doing.**

Of course, Formula One™ teams are always trying to copy the innovations of others. It's obvious that we have new units and new ventilation systems in the pit. So I expect to see one or two other teams coming along with a similar solution. But we have clinched the first-mover advantage with ebm-papst and we expect a partner of this calibre to continue to give us a competitive edge. ○



**Toto Wolff (center) pictured with MERCEDES AMG PETRONAS Formula One™ Team Driver Nico Rosberg's racing car during 2016 pre-season testing.**

MERCEDES AMG PETRONAS

# FLIPPER IN MOSCOW

The Austrian company Frivent supplied all of the climate control and dehumidification equipment for a dolphinarium in the Russian capital — including reliability and efficiency.

*Left: No compromises in design. No equipment was to be visible from the outside, so the climate control units had to be installed in the cellar. Right: The pool gives off a lot of moisture into the air during the shows. The dehumidification capacity of two tons per hour is also designed to cope with that.*



The small aquarium area is just one of eight climate zones kept at a specified temperature and humidity by Frivent equipment.



Aleksey Kuzin

**F**rankfurt, March 1991: Josef Friedl greeted a man from Novosibirsk at his stand at an international exhibition for the plumbing and HVAC sector (ISH). The Russian spoke no English, the Austrian no Russian. But they got along well from the start. For Friedl, the founder of Frivent, an Austrian company specializing in ventilation and air conditioning, it was to be a very important encounter, laying the foundation for the company's first project in Russia—and many more in Eastern Europe—because Friedl recognized the huge pent-up demand for air conditioning services behind the Iron Curtain.

Since 2006, the company has had a subsidiary in Moscow, Frivent Klimatechnika, with branch offices in St. Petersburg, Yekaterinburg and Kazan. At the company's headquarters in St. Johann, Austria, Josef's nephew Andreas Friedl now runs the business. He recently completed the company's most complex project: the Moskvarium.

At this dolphinarium in Moscow, visitors can stroll through the underwater world of the oceans on 53,000 square meters of floor space and view dolphins, sea lions, orcas, sharks and the colorful diversity of a coral reef in aquariums filled with 25 million liters of water.

On the stands at the show basin, young and old can marvel at the antics of Flipper and his friends. Again and again, full-grown orcas jump out of the water and splash back down to screams from the drenched audience.

**LARGE-SCALE DEHUMIDIFICATION** This is where Andreas Friedl comes into play; his company delivered the ventilation and climate control equipment for the Moskvarium. "When a big animal jumps in the show basin, it sets an

immense amount of water free." The difference in temperature between the water and the air causes the humidity to rise rapidly. The air has to be dehumidified constantly to keep the water from condensing on the walls and damaging the building in the long run. "Fine-tuning the dehumidification was tricky," recalls Friedl. "We worked through all eventualities with the planners—and then designed the units for some areas with greater capacity than originally planned." Now twelve of Frivent's Aquavent air dehumidifiers with a total dehumidification capacity of nearly two tons of water per hour are at work in the Moskvarium. Moist air flows over a cooling coil in the units and condenses there. The dry air is mixed with outdoor air, brought to room temperature, and fed back into the facility. Maintaining a consistent relation between the air and water temperatures is essential. When the air temperature decreases, more water evaporates and the dehumidification output increases immediately. "Earlier operators often made the mistake of lowering the air temperature over-

night to save energy," explains Friedl. "But the effect is the opposite, because the dehumidifiers have to work much harder."

**COMFORT IN EIGHT CLIMATE ZONES** Pleasant conditions are also called for in the other visitor areas. In the Moskvarium's cellar, 25 Thermobloc central air conditioning units from Frivent circulate up to 750,000 cubic meters of air per hour and bring it to the right temperature. The eight different climate zones in the building were a real challenge, with the great show hall having different conditions from those in the entrance area or the tunnels through the aquariums. "Balancing these different requirements and linking them with the building systems was a tricky job."

Air intake and exhaust for the Thermobloc and Aquavent units is controlled by 98 RadiPac EC centrifugal fans from ebm-papst, all of which have a corrosion-resistant coating to protect them from the salt water. They are also running in the 46 standalone air intake units, which were

the 1970s, when Josef Friedl reacted to the oil crisis by intensively investigating waste heat recovery.

**RETHINKING IN RUSSIA** When Hartl and Andreas Friedl met for the first time in 2011, EC scarcely played any role at all in East European projects. "In the last five years, Russia has also reconsidered the matter of energy efficiency," says Friedl. As a result, planning for the Moskvarium emphasized low energy consumption and the best possible waste heat recovery. Over the course of a year, every kilowatt matters with the enormous amounts of air that are conveyed, heated and dehumidified.

But high efficiency is just one benefit that Frivent takes advantage of. "The RadiPacs can also score with their compact design," says Thorsten Hartl. "That means a smaller design for the Frivent units—and space is always a major issue in a building." So is noise. "Of course nothing can be allowed to be transmitted in

the huge duct system, since that would amplify the noise," explains Andreas Friedl. So all units are equipped with noise-suppression modules. Since RadiPac fans have inherently low noise emission, less insulation was required—resulting in considerable cost reductions.

**DEMANDING AND TROUBLE-FREE** Frivent worked on the project from June to September 2014, producing the units one after another in St. Johann, Austria, according to a precise schedule. Delivering them on Russia's roads, which are not intact everywhere, turned out to be the biggest challenge.

The project is especially important to Andreas Friedl. "People didn't believe we would be able to carry out such a demanding project in such a short time." But in the end, everything went smoothly. "That was especially important because President Putin was expected to attend the opening, so everyone was very intent on making sure everything worked." ○



Frivent GmbH



ebm-papst

**Left: The Thermobloc central climate control units are installed in the Moskvarium's cellar. Right: Thorsten Hartl (left) and Frivent managing director Andreas Friedl with an Aquavent dehumidifier equipped with RadiPac.**



Jan Edlinger (left) from ebm-papst Sweden and Michael Myntelius, Chief Operations Officer from Radonkonsult on their way to the Stockholm City Library.



The archive of the library was a taboo zone for a long time. Access was forbidden due to the high radon levels.

# Breathing easy in the archives

After months of patient suffering, Radonkonsult AB solved the problem caused by radioactive gas in the Stockholm City Library — with lots of specialized knowledge and centrifugal blowers from ebm-papst.

Radon is a naturally occurring radioactive natural gas. You can't see it, smell it or taste it. Nevertheless—or exactly for this reason—the element is extremely hazardous. A common cause of lung cancer (second only to smoking), this result of radium decay is responsible every year for 20,000 deaths in the US, about 15,000 in the EU and approximately 500 in Sweden. But radon occurs naturally in many types of soils. The gas becomes a hazard as soon as it penetrates the buildings foundations and enters the buildings. It becomes concentrated in indoor air and quickly achieves dangerously unhealthy levels—which is what happened in the Stockholm City Library. A legally proscribed energy check revealed that the radon concentration in the building's archive was 2,000 Becquerel per m<sup>3</sup>. The legal limit value in Sweden is 200 Becquerel per m<sup>3</sup>.

**The last chance** The library immediately declared the archive in the basement a taboo zone. The librarians were prohibited access to thousands of books. While seeking a solution to the problem, the library management collaborated with various service providers. One company sealed all the cracks and seams in the basement and another tried to slightly over-pressurize the air throughout the library. None of these measures were successful. Through a trade fair contact, the library found Radonkonsult, a company that has specialized in protection against radon for decades. Michael Myntelius, COO at Radonkonsult, says: "After several failed attempts, the library management could no longer afford to experiment. This is why it was clear from the very beginning that we had exactly one chance to apply a viable solution." →



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The solution in place extracts the radon directly from the ground and lets the gas escape from the building through conduits.

## “The fight against radon is not an easy one — it requires plenty of know-how”

**Jan Edlinger,**  
sales engineer  
at **ebm-papst** in Sweden

know-how,” said Jan Edlinger, a sales engineer at ebm-papst. “It is wonderful to see Radonkonsult’s results.”

In order to be certain that the low radon level was not a short-term effect, the library decided to have the basement

monitored for two months before they opened it up again. The measurements showed that the system was consistently keeping the values below the limit. The librarians were able to return to their books and work without risk to their health. ○

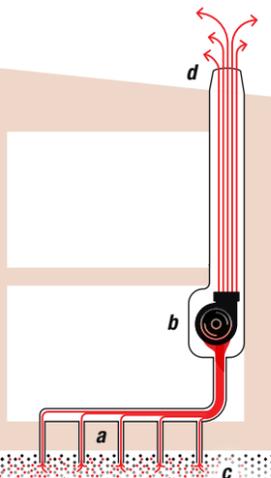
**Tiny holes, major impact** After making extensive on-site measurements, it became apparent that Radonkonsult would be able to apply a process in the library that had already mitigated the problem in over 7,000 projects. To prevent radon from flowing into the room and expanding there, it must be extracted directly from the soil. Radonkonsult drilled tiny holes with 16-mm diameters in the building’s foundation and used piping to connect them to a special radon pump. The pump contains several centrifugal blowers from ebm-papst that create a vacuum underneath the foundation. The pump siphons off the radon before it can enter the room. Next, the gas escapes from the building through conduits, mixes with the fresh air and is rendered harmless to humans.

When asked why he uses blowers from ebm-papst in the system, Myntelius answered: “One word: quality. We have already built these systems with fans from China and with products from the Swedish competition. They simply cannot compare to the quality and durability of the ebm-papst products. In some systems, they have been running for over 20 years.” In the library, Radonkonsult installed four radon pumps with seven blowers each. The result: The radon concentration dropped from 2,000 Becquerel per m<sup>3</sup> to 50 Becquerel per m<sup>3</sup> within a very short time.

“The fight against radon is not an easy one—it requires plenty of

### How radon protection works

Through little holes (a) in the foundation, the radon pump (b) creates lower pressure below the foundation (c). The gas then escapes from the building through conduits (d).



ebm-papst

While performing tests, Klaus Kramer also took a closer look at the tabletop test machine itself.

## The inspector’s critical eye

In R&D at ebm-papst, tabletop test machines from Zwick help make better products. And they were made better themselves.

Top product quality can only be had when one has it in mind from the start. Klaus Kramer is convinced of that. He works in the department responsible for reliability and testing in Central R&D in St. Georgen, where he tests the mechanical connections in motors and fans. He has a variety of test and measurement equipment to help him with his work, including two Zwick tabletop test machines. They can precisely measure forces from 0.4 newtons to a maximum of 20 kilonewtons and are actually intended for materials testing. “But that’s only one area that we use them for here,” says Kramer. The department uses the AllroundLine machines to test adhesive bonds, pressed fittings and welds, springs, motor braces, strain reliefs and breaking strengths, or to perform bending tests during basic inspections of rubber magnets.

As an example, when a new motor is developed, Kramer and his coworkers measure how strongly the magnets are glued and at what force the press-fitted shaft detaches from the rotor or ball bearing. On the one hand, these measurements help designers to optimize the designs of new products. On the other,

they are essential for production so that the staff there can make precise settings for the pressing force limits on their machines. In close cooperation with the project teams, both activities ensure that ebm-papst can supply products that fulfill customer requirements.

But Kramer’s exacting eye does not stop with the products. He noticed that the fan that cools the test machine’s control electronics switched on frequently—and loudly—during the testing procedure. The next time a Zwick representative visited, they discussed the problem, worked out some proposals and tested solutions in the ebm-papst acoustics laboratory. Now the new generation of controllers uses an ebm-papst 3414 NG fan for ideal flow; it sucks in air from below to cool the electronics and removes the waste heat with the rising hot air.

The improved tabletop testing machine now contributes to top quality at another point in the value stream: For new automotive projects, ebm-papst recommends that its customers and suppliers use a Zwick machine in order to have verified quality and comparable test results for supplied parts. ○



### EFFICIENCY HIT

The new champs in the AxiCool series excel with 30 percent higher efficiency and a 12 percent improvement in air performance, with a noise emission decrease of 3 decibels, which is achieved by integrating a diffuser and guide vanes. The new sizes are especially suitable for high-performance evaporators and air coolers for commercial and industrial refrigeration.

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Rapid availability of the required air volume after activation is important for applications like air locks and air curtains. With a start-up time of only 3 to 4 seconds, our new series of EC centrifugal blowers reaches an air flow of up to 3,300 cubic meters per hour—with considerably greater energy efficiency than comparable AC fans.

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### OVERLOAD CAPACITY

Combined with a powerful ECI series motor, the Optimax 63 planetary gear is suited to almost all applications in industrial automation, intralogistics systems or mechanical engineering. With continuous torque of up to 65 newton meters (depending on the selected gear reduction) and peak loads of up to 150 newton meters, it has high overload capacity and is very efficient—ideal for continuous operation and short-term peak loads.

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### POWERFUL PUMPS

Cars with automatic transmissions need a constant level of oil pressure for their electrohydraulic control systems. For modern energy-saving approaches like automatic start/stop and hybrid drives, pumps driven by combustion engines are out of the question. Our new, integrated auxiliary oil pump is the ideal alternative. Compact, rugged and extremely powerful, it only runs when oil is really needed, saving even more energy.

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



### HIGH-RISE HEATING HELPERS

With the new G3G 315, ebm-papst has added to its product range a high-performance gas blower for industrial applications. Intended for use with premixing gas burners with heating output of up to two megawatts, it can heat a high-rise building or an entire housing development. It is extremely compact and provides the benefits of efficient GreenTech EC technology.

[www.ebmpapst.com/g3g315](http://www.ebmpapst.com/g3g315)



# New fans for an old station

Cramped equipment rooms and regulations affecting alterations to historic buildings prevented the installation of a new ventilation system in the Copenhagen train station. But ebm-papst had another good solution up its sleeve.

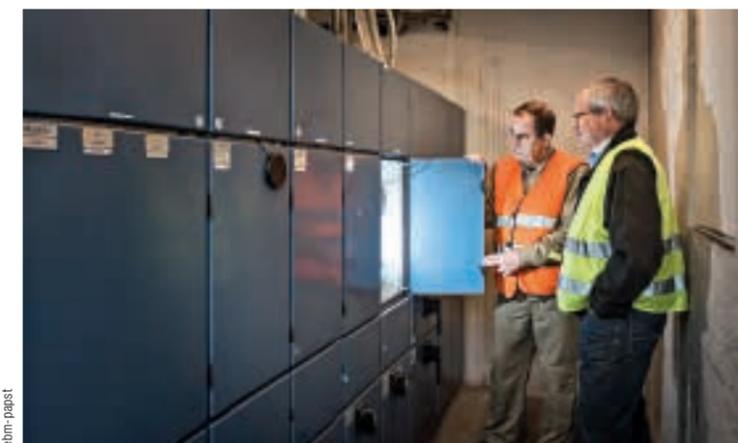
The century-old concourse in Copenhagen's central train station is an attractive Art Nouveau building in the city center. To preserve the building for posterity, the Danes subjected it regulations that limit modifications to historical buildings. But that step taken to ensure that both locals and tourists could enjoy the building for a long time to come caused problems for the operator of the approximately 20 stores and restaurants in the station. When Steen & Strøm looked for solutions to reduce their energy consumption, measures such as additional insulation or installing a ventilation system in the ceiling were out of the question as they were not allowed to make changes to the building. The ventilation system had to stay in the two cramped equipment rooms between the tracks.

Steen & Strøm asked the service provider Energi & Miljøteknik for help; the latter called in ebm-papst. "Installing a new system was impossible because of the small rooms," says Kim Jensen,

a facility manager with Steen & Strøm. Henrik Dahl Thomsen, product manager at ebm-papst in Denmark, suggested another way: modernizing the old fans. Energi & Miljøteknik removed the old AC fans and replaced them with five new EC fans. "The solution from ebm-papst is brilliant," says Jensen enthusiastically. "After all, what's a ventilation system made of? Just boxes, and when you put new fans in them, you basically get a completely new system."

With the EC technology, Steen & Strøm has cut its energy costs in the station by 66 percent, so the investment will pay for itself in less than a year. It also helps that the output of the fans can be regulated. Whereas the AC fans ran at full power 24 hours a day, now the operators can regulate the output as needed. Thanks to the good results in the Copenhagen station, Steen & Strøm have since engaged ebm-papst to modernize the systems in two shopping centers. ○

**Installing a new system in the cramped equipment rooms was impossible. But modernizing the old fans has resulted in energy savings of 66 percent.**



Henrik Dahl Thomsen, product manager at ebm-papst in Denmark, is satisfied with the new solution for Copenhagen's train station.



Richard Drinkrow, managing director at Mainstream Refrigeration, on the warehouse roof, where 32 EC fans with AxiTop diffusers are installed.

OUTSIDE 40 °C

REFRIGERATION  
INSIDE 2 °C

Inside the facility, 36 EC fans with AxiTop diffusers provide efficient cooling.

# Efficiency: not just a choice

In South Africa, energy prices are increasing rapidly and water is in short supply. When the Woolworths retail chain expanded its cold storage facility in Cape Town, an efficient air conditioning system was anything but optional.

A hot summer day in Montague Gardens, an industrial zone in Cape Town's suburbs. Under the blazing sun, a thermometer shows over 40 degrees Celsius around noon. But in the new cold storage facility recently built here by the Woolworths retail chain, the workers are processing fresh food at a frosty two degrees. They receive large quantities of cooled produce from regional suppliers and repackage it in smaller units for delivery to the individual Woolworths stores. While they work, the cold chain has to be maintained at all times. An efficient air conditioning system sees to that, and fans from ebm-papst play an important role.

**Expensive electricity** Where cooling and air conditioning are involved, Mainstream Refrigeration has been Woolworths' established partner for all projects in southern South Africa in recent years. Richard Drinkrow, Managing Director at Mainstream Refrigeration, explains what was most important to Woolworths during the expansion of its logistics center: "Sustainability is an important component of the corporate philosophy at Woolworths, so we designed the entire cold storage facility for maximum efficiency. Water is a scarce resource in South Africa, and the energy prices rose about 20 percent in the last five years—annually!" To cool the new ware-

house as cleverly as possible against this backdrop, Mainstream Refrigeration chose its coolants and compressors very carefully and also focused on efficiency in the fans it used. In each of the twelve evaporators that supply cold air to the facility, there are three size 800 EC fans mounted with AxiTop diffusers. "A low noise level inside the warehouse is extremely important," says Drinkrow while elaborating on the requirements. "If we were using 36 conventional fans without AxiTop here, it would constantly sound as if a Boeing was landing. We can't expect people to work in a place like that." And the good air throw from the fan-diffuser combination

pays off very nicely in the warehouse. The fans blow the cold air over nearly 50 meters from one side of the building to the opposite wall. Mainstream Refrigeration placed temperature sensors there; with them the speed of the fans and the output of the compressors can be controlled automatically.

**Only as much as necessary** Since the EC fans can be easily addressed and controlled via MODBUS, their output can always be exactly adjusted to current needs. So when nothing is happening in the warehouse at two o'clock in the morning, the control system slows the fans down for immediate energy savings. Woolworths also uses eight efficient EC fans with AxiTop diffusers on each of the four condensers on the roof. Here, too, adjustability and quiet operation play a crucial role. "There are offices near the roof,

so there it's also important that the fans don't make any noise," says Drinkrow. In spite of their low noise output, the EC fans combined with the AxiTops generate such a strong air flow that Mainstream Refrigeration was able to use air-cooled condensers. "The alternative would have been water-cooled condensers," says Drinkrow. "But since we also wanted to save as much water as possible, that wouldn't have been the best choice." In addition, energy consumption can be further reduced thanks to the adjustability of the EC fans. "We have seasonal temperature variations between zero and over 40 degrees.

**"If we were using conventional fans without AxiTop here, it would constantly sound as if a Boeing was landing."**

Richard Drinkrow, managing director at Mainstream Refrigeration

A fan that can only do 'on' or 'off' doesn't help us much there. We can control the EC fans precisely to adjust their output to the outside temperature." For Drinkrow, the good adjustability of the fans and the overall system is the key to sustainable air conditioning in the future. "I always compare it with a car. The main difference between a car from 15 years ago and one from today is the engine management system. That's also how I see it with air conditioning. With smart control systems, we can still save a lot of energy in many ways." ○

Temperature fluctuation and white noise was a real nuisance for the staff working in the MERCEDES AMG PETRONAS Formula One™ Team paint shop in Brackley. The atmosphere has been much better since the air conditioning system was upgraded with EC fans from ebm-papst.

# CREATIVE HEADS KEEP THEIR COOL

The MERCEDES AMG PETRONAS headquarters in Brackley, UK is where hundreds of engineers, technicians and designers contribute to the success of their World Championship Formula One team — seven days a week, all year round. In their number are 15 employees who staff the paint shop, responsible for adding the final layer of preparation to the race cars and equipment that lends the team its moniker of the Silver Arrows. However, working in the paint shop during the hot summer months has never been much fun. Why was that? Following complete re-organization of the premises and workplaces, the air conditioning system no longer met the requirements of the employees. And the AC fans were difficult to regulate. The air was propelled through the ducts at such a rate that it literally whistled through the ceiling vents in the paint shop, creating a permanent background noise. To combat the noise nuisance, the employees would close or block the air outlets near their work stations. The consequence was that the atmosphere was hot and sticky in summer, despite having the air conditioning system operating at maximum output.

**Too noisy, too inefficient, too expensive** This was an unsatisfactory situation for MERCEDES AMG PETRONAS. “Our air conditioning system was too noisy, the temperature was erratic and what’s more, the operating costs were going up and up,” explains Robert Yeowart, Director Business Development & Logistics at MERCEDES AMG PETRONAS. “With their concept for cooling our racing cars in the pits and for cooling the trackside garages, ebm-papst had already shown that they were capable of developing innovative solutions at a reasonable cost. So we consulted our team partner again with our latest problem.” ebm-papst product manager James Cooper took the matter in hand. His first step was to visit the Brackley headquarters to have a look at the system

*Pleasant atmosphere: Even on hot summer days, the paint shop in Brackley is now cool and quiet.*

*RadiPac EC fans are quiet and efficient.*

ebm-papst

MERCEDES AMG PETRONAS

and take some initial measurements. In doing so, he discovered an extremely high pressure of 1,366 pascals, but at the same time an average air flow of only 6,000 cubic meters per hour. This was caused by the air conditioner outlets being almost completely closed. “The system was using a lot of energy without the employees actually having much benefit from the cooling output,” Cooper recalls.

**Go-ahead for testing** To improve the system, Cooper proposed replacing the AC fans with EC fans, which are easy to adjust to the required speed. He further suggested fully re-opening the ceiling vents to optimize the system. The Fitting of user-friendly fan control would also enable facility managers to exactly adjust the system to any future requirements. The aim was to provide quiet-running, efficient and easy-to-adjust air conditioning for the paint shop. Robert Yeowart and his colleagues were convinced by these suggestions and gave the go-ahead for conversion of a trial unit in the paint shop. Together with an external partner, ebm-papst upgraded the A/C unit and replaced an old AC fan with two RadiPac EC fans from ebm-papst. These new fans were mounted in anti-vibration housings to keep the noise nuisance to an absolute minimum.

The next step involved the retrofit team opening all the overhead air vents to be able to set the air conditioning system correctly. With an air flow

**“We got extremely positive feedback from the paint shop personnel because the system is quiet and keeps them pleasantly cool.”**

*Robert Yeowart,  
Director Business Development & Logistics  
at MERCEDES AMG PETRONAS*

of 8,000 cubic meters per hour at a pressure of 450 pascals, the air flowed almost noiselessly to the workplaces after a few adjustments and created a pleasant temperature. “For simple regulation, ebm-papst fitted a fan control system with a safety mechanism,” says Cooper. “The cold air for the air conditioner is generated by an evaporator coil. To stop this icing up, the air always has to travel through the system at a certain velocity. We programmed the control system in such a way that speeds below this minimum value cannot be set.”

**Baptism of fire in a heat wave** As soon as the retro-fitting work was completed, the UK experienced one of the hottest weeks of the year—a real test for the converted air

conditioning system in extreme conditions. “We received extremely positive feedback from the paint shop personnel, as the atmosphere was now pleasantly cool and quiet,” says Yeowart. “A further bonus is that freshly painted parts now dry better as the air is circulated evenly around the room.” The upgrade was a worthwhile investment in financial terms as well. MERCEDES AMG PETRONAS can now save 64 percent of the energy required for operating the air conditioning system. Which means that it will have paid for itself in just two years. And finally, the upgrade had another unexpected benefit, as Yeowart explains: “Prior to the upgrade people used to open the doors to create a draft. Now these doors remain closed we have eliminated an unnecessary safety risk.”

In view of the results obtained, MERCEDES AMG PETRONAS decided to convert all the units in the paint shop and to consider further retrofitting across its sites in the future. “We are currently taking a look at the air conditioning systems throughout the plant,” says Yeowart. “We are keen to do the same sort of upgrade wherever it makes sense.”

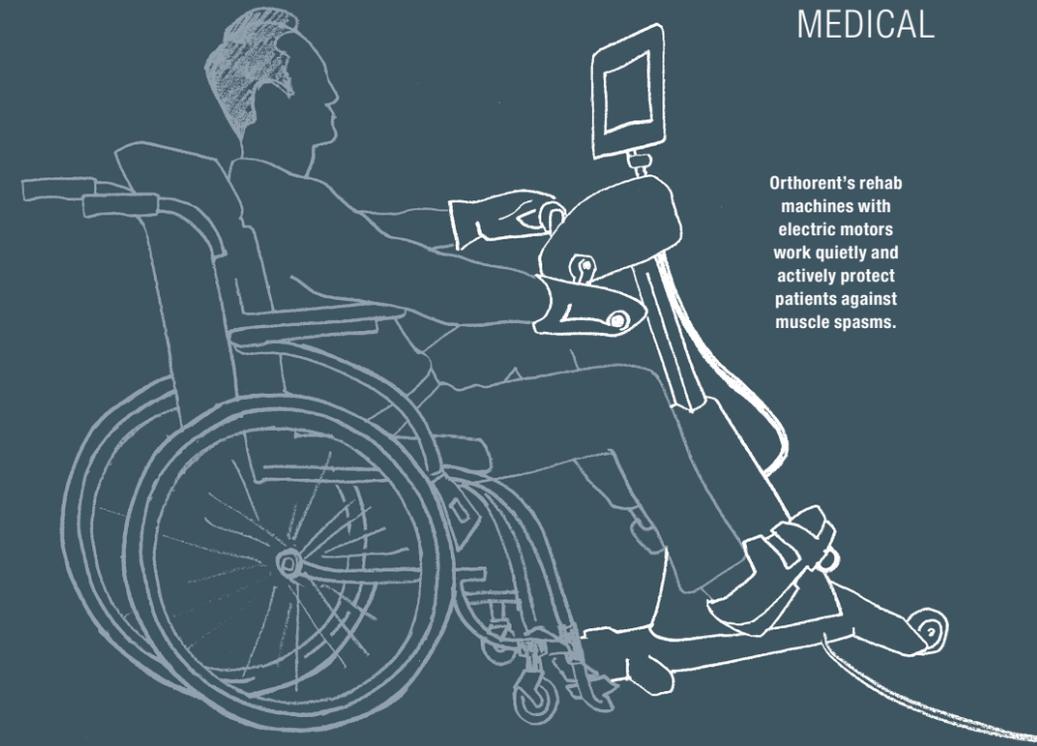


▶ Watch the video about this topic at [mag.ebmpapst.com/upgrade-brackley](http://mag.ebmpapst.com/upgrade-brackley)



MERCEDES AMG PETRONAS

The paint job on the current car is also from headquarters in Brackley.



Orthorent's rehab machines with electric motors work quietly and actively protect patients against muscle spasms.

# Healing with exercise

Machines made by Orthorent assist in the recovery of patients suffering from paralysis. Their essential components include a sensitive gear motor and an Internet connection.

Exercise is important for patients suffering from paralysis. “Patients suffering from paralysis, such as stroke victims, lose muscle mass quickly if they remain immobile,” says Rovshan Makhmudov, a physician and managing director of Orthorent, a Russian producer of rehabilitation equipment based in Moscow. “That impedes their recovery and often leads to complications. Exercise is good medicine!” Exercise machines like those made by his company can help. With the “Moto” model, patients practice moving their arms and legs at three levels, with the electric motor moving the limbs either entirely on its own or in support of the patient’s own movements. In the latter case, the motor exerts an adjustable resistance against which patients act to develop their strength.

**Motor protects against muscle spasms** While developing the Moto, Orthorent made use of technical advice from ebm-papst in Russia. “First and foremost, we’re doctors and not engineers. So we were glad to have ebm-papst as a project partner. All we had to do was name our requirements and we got what we needed right away.” An important requirement was for the motor to work with the control system to reliably detect muscle spasms in the patient. In such cases, the motor has to stop the movement immediately to prevent injuries from occurring. “The Variodrive Compact from ebm-papst was a safe solution here since the control inputs for the motor electronics can be used to slow down or stop the motor

or to change its direction of rotation,” says Makhmudov. Another important criterion was the noise level. When several patients are using a rehab facility, high noise levels there mean stress for them. “Some of them already suffer from nervous conditions,” notes Makhmudov. “Quiet operation is an important and often underestimated factor in successful rehab.”

**The network doctor** Makhmudov says, “One of our main requirements was for the motor to be powerful yet light and compact as well, because our machines get transported a lot.” Especially since the Russian ministry of health launched the world’s first program for remote home rehab in 2015. Russia is a huge country, so it’s often a long way to the nearest rehab practice. For many patients, being able to rent a machine and use it at home is important. The Moto has an Internet connection so that such patients can still get medical supervision in spite of the distance. Using detailed exercise protocols, doctors can follow a patient’s progress from their desks. They can even adjust the machine’s settings for the patient during an exercise session. The motor also plays an important role here, according to Makhmudov. “Many of our competitors’ products still work with mechanical resistance. That makes them more difficult for immobile patients to operate, and there’s no way to adjust their resistance parameters via the Internet,” he says.

More information at [mag.ebmpapst.com/orthorent](http://mag.ebmpapst.com/orthorent)



## A pure island for athletes

During the Olympic and Paralympic Games in Rio de Janeiro, around 18,000 athletes and others involved in the Games will be living in Ilha Pura, the Olympic Village in the Barra da Tijuca neighborhood. The 31 buildings with a total of 73,359 m<sup>2</sup> residential area are divided into seven complexes. Each of the complexes features an underground garage with between 270 and 450 parking spaces. To keep the air in the parking levels as clean as possible, a total of 138 efficient and quiet HyBlade® EC axial fans take care of the required incoming and exhaust air. The sensors that measure the carbon dioxide and carbon monoxide levels in the air in the garages can control the amounts of air exactly as required.

Gabriel Haus... HausAction

Take a virtual tour through the Olympic Park: [bit.ly/1UwLj5e](http://bit.ly/1UwLj5e)



# Ready for a wave of orders

The European Union's Ecodesign Directive 2009/125/EG and an energy efficiency label are now roiling the heating industry. ebm-papst got ready for it with a new production facility.

Condensing or conventional heating? This question has been moot since September 26, 2015. That was the day on which a further measure in the implementation of the European Union's Ecodesign Directive took effect. The directive, in force since 2009, is intended to drive the fight against climate change by gradually eliminating energy-wasting devices. Now that the new measure has come into force, considerably stricter standards apply for oil and gas boilers, heat pumps and heat storage units, and combined heat and power units. Manufacturers are not allowed to market new conventional heaters because they waste too much energy. Heating systems using condensing technology are an entirely different matter; they use the energy from the steam contained in the exhaust, which goes unused out the chimney in conventional systems. Condensing technology is really nothing new; ebm-papst has been developing and producing efficient blowers for the heating industry since the 1990s. "Condensing technology is the key to efficiency improvements in heaters. It en-

ables savings of up to 35 percent compared with outdated conventional heating, and its emissions are lower," says Stefan Brandl, Managing Director ebm-papst Landshut. So it was clear that the deadline would bring a jump in demand for condensing boilers—and their components as well.

**The company wanted to be ready** so it began construction on a new facility for the production of gas blowers and valves in November 2014. "We see it as our duty to supply our customers reliably and on time. But the space we had available for production wasn't enough for the expected capacity increase," says Landshut plant manager Karl Ruhland. Only nine months after the groundbreaking, people and machinery were able to move into the new plant, which houses three assembly lines, offices and R&D areas on total floor space of 5,000 square meters. Enough room to satisfy the expected increase in demand. "After the directive came into force in September, a regular wave of orders

swept over us. Without new production capacity, we wouldn't have been able to deal with it," says Ruhland.

Demand for the energy-efficient condensing units will also increase in the long run as there is huge untapped potential in Germany's households. According to Germany's Federal Ministry for Economic Affairs and Energy, 40 percent of the country's energy consumption is attributable to buildings, and much of that is due to heat generation. There is a substantial backlog of heating systems in need of modernization. More than five million of them are obsolete and inefficient. As a result, concurrently with the Ecodesign Directive, the German government has also introduced the familiar EU energy efficiency label for heaters. Its intent is to motivate consumers to replace their old heaters with more efficient units. As it does for appliances such as refrigerators, the label indicates the energy efficiency class with a colored scale. Green stands for efficiency, dark red for the opposite.

Since January 1, 2016, heating installers and chimney sweeps have been authorized to affix the labels to boilers that are over 15 years old. Starting in 2017, they will even be obligated to do so. Then consumers will see at a glance whether they are wasting energy unnecessarily. Brandl is convinced that "The energy efficiency label will do its part to reduce the modernization backlog in heating systems." For its part, ebm-papst will be able to easily deal with further increases in demand with the new plant in Landshut. Ruhland is also confident, saying "Right now we're still working two shifts. If more orders come in, we can add another shift to increase production even more." ○



**Since September 2015, Plant 2 in Landshut provides the capacity required for producing efficient gas blowers and valves.**





**Dr. Jan Dannemann**  
Head of Pre-Development  
Function  
ebm-papst Landshut

# How much does air weigh?

How mass flow sensors measure the exact amount of air.

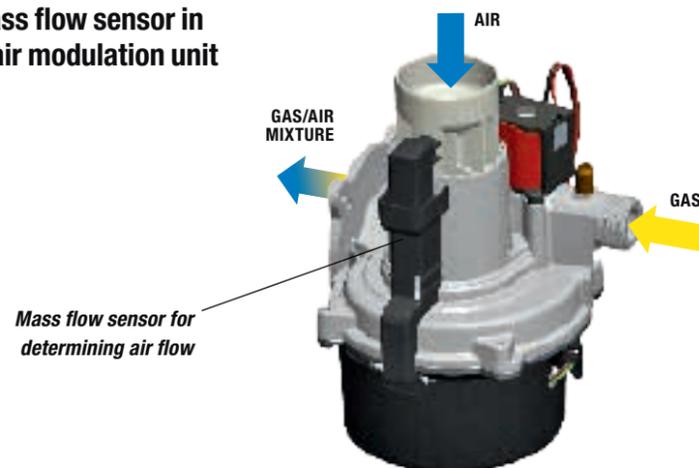
The right gas/air mixture is essential for efficient combustion in an instantaneous water heater, so it is important for the blower in a gas/air modulation unit to always supply exactly the right amount of air. The unit of measurement used for describing this is the mass flow, which specifies how many grams of air flow through a defined cross section every second. The mass flow conveyed by a fan can be controlled by the fan's speed. For example, a speed of 8,000 rpm generates a mass flow of nine grams of air per second, which is needed for heating output of 20 kilowatts. However, these figures only apply for constant ambient conditions. If the pressure or temperature change, then the mass flow no longer depends directly on the speed and the desired output of the water heater can only approximately be reached. This means that if an exact output value is to be achieved independently of the ambient conditions, exact control of the mass flow is required.

**Measurement principle** This task is performed by a calibrated mass flow sensor, also called a thermal anemometer. How the measurement principle works: A heating element about

three by five millimeters in size is electrically heated to a temperature that is always 15 degrees Celsius above the ambient temperature. This heating element is positioned in the gas/air modulation unit so that the air flows over it on its way to the burner. The heating element gives off more heat to the surroundings than it would with no air flow. In principle, just as with hot food, which also cools off faster when one blows on it. In order for the heating element to maintain the temperature difference of 15 degrees Celsius, it needs to be heated more. That requires extra electrical energy, which is measured by a microcontroller. The measured voltage provides information about the mass flow. For example, at a voltage of four volts, 16 grams of air per second flow through the tube.

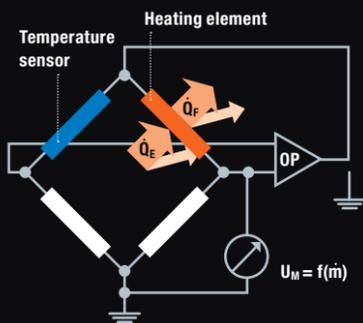
Such data can be used by the manufacturers of heating systems to set the mass flow exactly. Based on this information, the impeller speed in a pneumatic unit can be precisely adjusted. In an electronic unit, the measurement data can be used for regulation strategies. The signal can also be analyzed to find the causes of errors. For example, if no mass flow is measured even though the blower is working, that is an indication of an obstructed exhaust pipe. ○

## The mass flow sensor in a gas/air modulation unit



Mass flow sensor for determining air flow

### How a mass flow sensor works



OP regulates the bridge voltage so that the overtemperature of the heating element with respect to the ambient temperature is constant.

$Q_E$  is the heat added by electric power.

$Q_F$  is the heat flux given off to the passing fluid by the thermal element.

$U_M$  is the voltage measured by the microcontroller and converted to a mass flow (calibration required).

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www.ebmpapst.com

*Responsible for content:*  
Thomas Borst

*Editor-in-chief:*  
Kai Halter

*Project co-ordinator:*  
Katrin Lindner

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*Authors:*  
Steffen Beck  
Thomas Borst  
Florian Burkhardt  
Dr. Jan Dannemann  
Tina Hofmann  
Sebastian Stamm  
Julian Stutz  
Katharina Walz

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## Find us here: Trade fairs & dates

- Trade fairs**  
ISH, Beijing, 30 May – 1 June 2016  
CeMat, Hanover, 31 May – 3 June 2016  
Sindex, Bern, 6 – 8 September 2016  
InnoTrans, Berlin, 20 – 23 September 2016  
IAA Nfz, Hanover, 22 – 29 September 2016  
Chillventa, Nuremberg, 11 – 13 October 2016  
FinnBuild, Helsinki, 12 – 14 October 2016

For more trade fairs dates visit: [www.ebmpapst.com](http://www.ebmpapst.com)

### Events

- Green Day**, Mulfingen, 6 June 2016  
**21. ebm-papst Marathon**, Niedernhall, 10 – 11 September 2016



## Technology for further reading

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

**A fresh breeze for the dairy case: NiQ — the new generation of energy-saving motors**

**EC fans for air conditioning: Garage cooling for hot races**

**EC drive: Making the most of EC-drive output**

**Focus on psychoacoustics: How is a fan supposed to sound?**

**ECl motor: Perfect control pressure in transmissions**

The **tech.mag 1/2016** is available. Contact our sales team or e-mail [Katrin.Lindner@de.ebmpapst.com](mailto:Katrin.Lindner@de.ebmpapst.com).



# Engineering artistry on four wheels

With parts and expertise, ebm-papst supports student teams competing in the “Formula Student” international design contest.

When the first sponsoring requests from “Formula Student” teams arrived about six years ago, ebm-papst was quick to support the students in developing their racing cars. Formula Student is an international design competition in which over 600 university teams compete on the world’s racecourses. Since then, ebm-papst has supplied fans and motors. When needed, a development engineer gives the students advice. Natasa Kopp, who is responsible for university marketing in St. Georgen and takes care of the requests, says “It’s important to us to promote projects like Formula Student and support the next generation of engineers. We see a lot of potential for the development of electric vehicles in particular.” The program also acquaints students



**Florian Brunner is active in the KA-Racing team.**

with the company; maybe one of them will decide on a career at ebm-papst after graduating.

**Second place in the world rankings** The members of the 80-strong KA-Racing team from the Karlsruhe Institute of Technology (KIT) come from a wide variety of disciplines such as mechanical engineering, industrial engineering, electrical engineering or information technology. It has been taking part in the contest for ten years and presented its two newly designed cars in April. Over 700 students, faculty and sponsors streamed into the school’s largest lecture hall to see the presentation. For months, the students put their time and inventive talent into the development of the cars.

Now the KIT16e and the KIT16c are in the spotlight — along with all the company logos affixed to them. “It’s only thanks to our sponsors that we can make Formula Student work,” says Florian Brunner, a 20-year-old industrial engineering student at KIT, who has been involved in the team’s marketing since last year. “Right now we’re in second place in the world rankings with our electric car.” Three axial fans from ebm-papst are installed in the KIT16e to cool its motors and power electronics. They are also installed in its combustion counterpart, the KIT16c. They suck in air through the intercooler and cool the turbocharger. “The parts from ebm-papst have always kept their promise,” says Brunner. Again this year, we are keeping our fingers crossed that the KA-Racing cars convince the panelists and cross the finish line first at the racecourses in Great Britain, Austria, Germany and Spain. ○



The KIT cars from the last ten years.

## Tinkering, building, driving

Formula Student is a design contest with over 600 teams participating from universities all over the world. Before the racing cars are built and driven, the students construct CAD models of them on computers. A special aspect: The rules are revised every two years and are kept very flexible to promote innovation. That keeps the contest exciting and the teams challenged.

KA-Racing e.V.

“The culture at ebm-papst Australia & New Zealand is a very important part of our business. It includes excellent partnerships, a strong brand and a focused leadership team. These factors help us to succeed in our growth markets. Due to the decline of our traditional manufacturing base in Australia we need to focus on the creation of new markets, like EC upgrades and agriculture. This is where strong partnerships come into play. That also applies to our evolution into a supplier of total system solutions, e.g. through our partnerships with controls manufacturers in the air-handling unit and air-conditioning markets. The expansion of our distributor network through brand reinforcement and point of sales support adds other pillars to our growth plans.”



**Simon Bradwell**  
Managing Director  
ebm-papst A & NZ Pty Ltd.  
Phone: +61 3 9360-6400

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AMG  
PETRONAS  
FORMULA ONE TEAM



# On track for success with ebm-papst.



At ebm-papst, we innovate at full speed, delivering solutions for ventilation, air-conditioning and technologies for the automotive sector. In fact, we've taken our expertise to Formula One and since 2014 ebm-papst has partnered the MERCEDES AMG PETRONAS Formula One™ team, providing solutions that ensure the coolest heads in the pitlane and at the team's headquarters. Our technical know-how puts our customers in the fast lane. Interested to know more? Then stop by [www.f1.ebmpapst.com](http://www.f1.ebmpapst.com)

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