

# mag<sup>o</sup>

all about ebm-papst

02° 2010



## Aiming high

How the EU's new ErP Directive provides for higher efficiency

°10 **Calculated energy-savings:** Grant programmes for building owners °16 **Cooling with brains:** The success of the iQ-motor in Denmark °18 **No exhaust gas!** How nitrogen oxides are effectively filtered °22 **Clean and dry:** A look into the clothes dryer from Miele

**ebmpapst**



“Working where others  
are on holiday”

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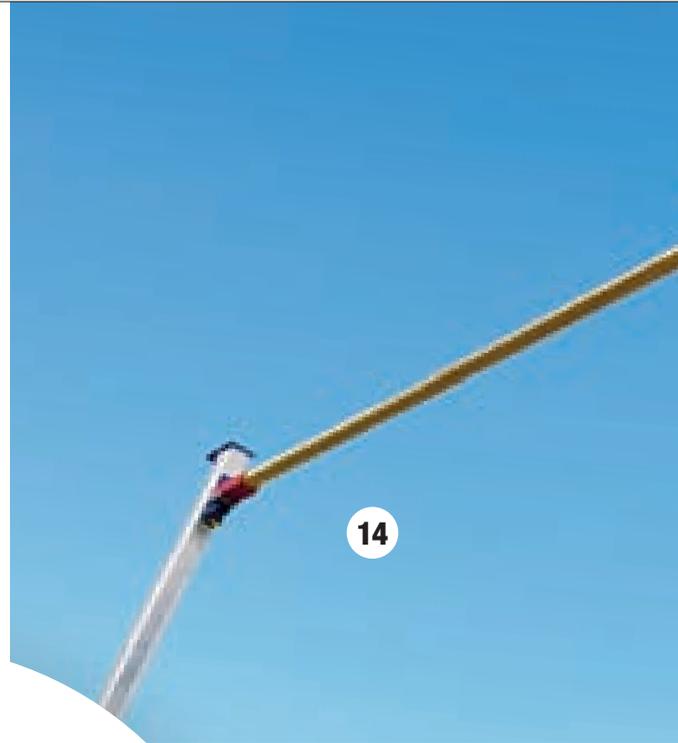
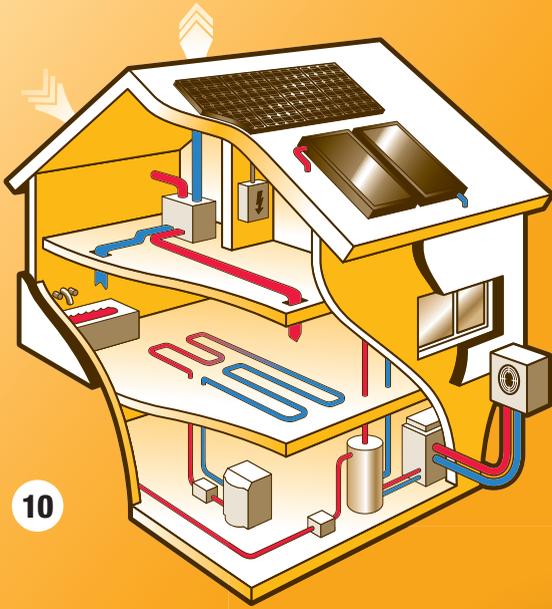


## Not a paper tiger

**Thomas Borst**  
**Managing Director**  
**Sales and Marketing**  
**Group Management**

**Dear Readers,** when the opportunity presents itself to praise a law passed by the European Union, it seems only fitting to take advantage of it. We are very pleased that the implementation directive for fans as part of the Energy-related Products Directive (ErP) has been passed by the 27 EU member states and will take effect in January 2013. This directive, numbered 2009/125/EC, is rooted in the agreements of the Kyoto Protocol and requires a minimum level of efficiency from all products that consume energy. The objective at its origin is to save energy and thus reduce emissions of climate-damaging CO<sub>2</sub>. We support this goal without qualification. For example, even today, our GreenTech EC fans meet or exceed the limits and thus provide a future-proof solution. However, like suppliers from outside Europe, we at ebm-papst know that this EU directive is not a paper tiger without any teeth. In the affected size, we have to eliminate about 50 per cent of

all non-EC fans from the product line, as they will not meet the requirements that will take effect in future. At first glance, this may not seem like cause for celebration, but the long-term objective in this case justifies the means: After 2020, the pending directive for fans is to save some 34 terawatt hours of electrical energy per year and reduce CO<sub>2</sub> emissions by 16 megatons. These kind of savings have to be earned. From the beginning, we have collaborated actively in drafting the ErP Directive and are now working just as actively to bring our product line into compliance. Some resistance had to be overcome during the work in the EU committees, but the results are worthwhile – both for our environment and for all suppliers who insist on quality and sustainability. On page 14, we have put together a few key questions and answers about the ErP Directive. I would be glad to speak with you if you have any questions or need any further information.



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# How will we work in future, Professor Bullinger?

Professor Hans-Jörg Bullinger is an expert on the future of work – and the work of the future. The President of the Fraunhofer Society knows what it will take to attract motivated employees to productive jobs in the years to come

## Why do we need to change our image of work in the first place?

Because we have to take into account trends in society regarding prosperity, working time and the relationship between work and leisure. Moreover, technology gives us an entirely different set of possibilities. With today's information and communication technologies, the need to keep employees confined in one building to ensure communication and the flow of information no longer exists.

## However, the confined space is also being broken up in another, more metaphorical sense: will anyone work at the same company from apprenticeship to retirement in future?

Surely not in the way it was in the past. Things may be a bit more conservative in certain regions, as they are at ebm-papst, for example. There, models of career paths that start and end at the same company will continue to exist for some time. In that case, though, the change takes place within the company: employees switch between departments or locations.

## What, then, is the face of the work of the future?

Tomorrow's work will be less constrained by time and space. To put it most clearly, in the past, the idea was to work in a defined place at a defined time. For those who work in what are still called office jobs, the idea in future will be: "Work where and when you want!"

## Is the service-oriented society the ideal means to this end?

Purely in terms of numbers, two-thirds of all employees in Germany already work in the service industry. However, we delude ourselves if we think that we can just cut each other's hair and deliver pizzas to each other and live happily ever after. We absolutely need value creation from production. In my view, to give that up would be the biggest mistake we could make.

## Can these two aspects be reconciled?

Yes, in what are known as "hybrid" products that combine a physical product with a service. The result is that the customer obtains more overall benefit: not just a material product, but consulting, planning and service from a single source. Therefore, I am convinced that in future, production-based companies will behave more like service providers.

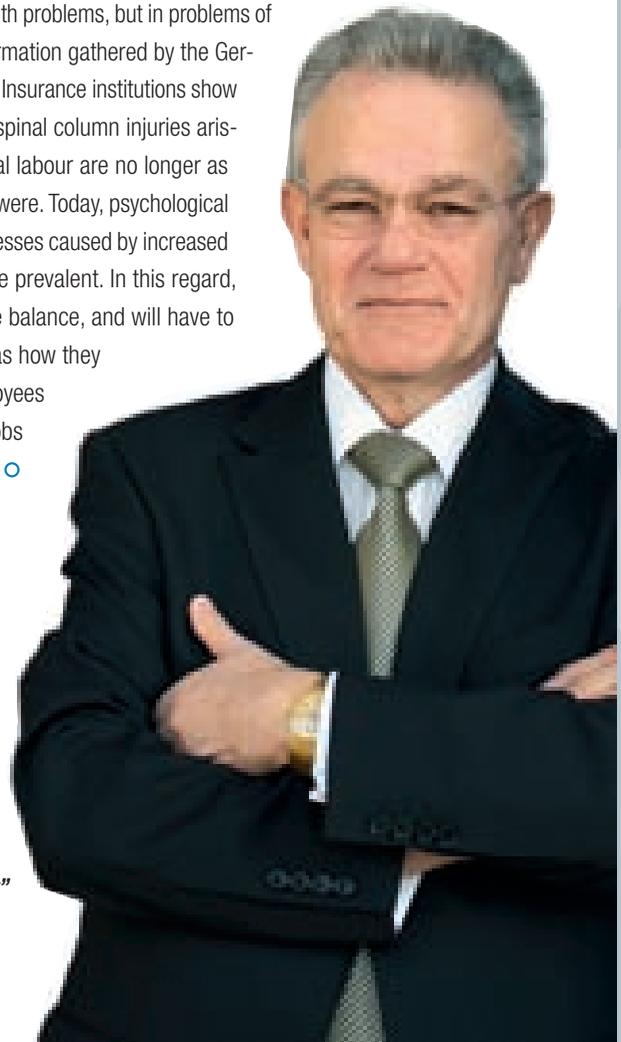
## By outsourcing production to low-wage countries, do we lose innovative strength?

That is a danger. I think it's a fairy tale to believe that we can develop in Germany and produce cheaply abroad. Surely, in some cases offshoring is necessary from a production cost standpoint. However, the majority of positive

offshore moves are made out of companies' desire to get closer to their markets. There, the companies adapt their products to the respective market. As a result, a portion of the product-related development will surely also relocate to these countries. On the other hand, companies are also moving to Germany and developing here.

## How can the faster pace of society and increased health consciousness at the workplace be reconciled?

The faster pace is very much related to the fact that the world has been made small by communications technologies. Development times are becoming ever shorter and companies still depend on innovations to succeed in business. To stay competitive, they have to present an increasing number of new products and services in an ever shorter time. This does not automatically result in more health problems, but in problems of a different nature. Information gathered by the German Statutory Accident Insurance institutions show that illnesses such as spinal column injuries arising from heavy physical labour are no longer as common as they once were. Today, psychological and psychosomatic illnesses caused by increased time pressure are more prevalent. In this regard, companies will provide balance, and will have to consider issues such as how they can provide their employees with relief phases in jobs with little time pressure. ○



*The future according to Professor Hans-Jörg Bullinger: "Work whenever and wherever you want"*

## News in brief 360°

Alfa Laval has distinguished ebm-papst as **Supplier of the Year** for 2009. Particular mention was given to the quality-price ratio, technical support and service. The specialist in heat transfer, separation and fluid handling has some 5,000 suppliers worldwide.

Ad van Nistelrooji, Managing Director of ebm-papst Benelux, celebrated his **25-year anniversary** at ebm-papst in 2010. In commemoration, the Netherlands native – an avid football fan – received an Oranje team jersey from Thomas Borst, Managing Director Sales and Marketing Group Management.



In July, about 10,000 visitors obtained information at the **IHK trade fair for education and training** in Heilbronn, Germany – including the ebm-papst stand. In addition to questions about vocational training programs, interest was focused on degree programs at the Co-operative State Universities and the co-operative degree program in Electrical Engineering at the RWH Künzelsau, a satellite campus of Heilbronn University.

On 12th September, the big running event was again held in Germany's Hohenlohe region: the **15th ebm-papst Marathon** in Niedernhall. 3,190 participants reached the finish line in the various disciplines for runners, the wheelchair marathon, inline skaters and nordic walkers.

ebm-papst India and China have seen **personnel changes** at the top. In India, Managing Director Atul Tripathi took over the reins from J.B. Kamdar in May. In Shanghai, Mark Shiring became the Managing Director of Marketing, Sales and Shared Services back in April.

Things are on an upswing again at ebm-papst **St. Georgen**: Due to drastic slowdowns in the IT/telecommunications and mechanical engineering sectors, the company had encountered difficulties in 2009. Since the beginning of this year, however, the volume of orders received has been good, indicating that the situation is easing.

The 32nd International **High Jump Meeting**, sponsored by ebm-papst, was held in Eberstadt (see title: Matthias Haverney) on the last weekend of August, drawing thousands of visitors. Among the ladies, Ariane Friedrich won with a height of 2 meters; among the men, Raul Spank defended his title with a height of 2.30 meters.



*On his new hybrid scooter, Boreggio will stop by in Mozzate in future, too*

## Change in Italy

### Giuseppe Boreggio enters retirement

Giuseppe Boreggio is retiring after 32 years as Managing Director of ebm-papst Italy. He founded the subsidiary in Mozzate near Milan himself in 1979. Over the years, he made what was then an insignificant competitor into the Italian market leader. Thomas Borst, Managing Director Sales and Marketing Group Management, emphasises, "His high level of dedication, specialised expertise and far-reaching vision over the last three decades are outstanding."

Boreggio, a technician by training, never shied away from mucking in. On occasion he repaired motors himself or travelled to Germany in his own car to get badly needed fans. For his farewell, his colleagues gave him a hybrid scooter, which also uses GreenTech the future-oriented EC technology from ebm-papst. Since the 1st of May, the new Managing Director is 39-year-old Alessandro Masotto, who has been on Boreggio's team for ten years.

## Far in the lead

### Electric fireball with cooling from ebm-papst succeeds

Students of the University of Stuttgart won the Formula Student Electric competition in Hockenheim with their electric speedster. The car named E 0711-1 was designed and constructed by the young engineers themselves. The engine is cooled using an ebm-papst fan that guides the crosswind to the water cooler. The "GreenTeam" was able to prevail against 14 other electric cars and 76 cars with a conventional combustion engine and, in addition to winning in five categories, also brought home the overall victory in the Formula Electric.

*The E 0711-1 in use*



## At the cutting edge

### Mulfingen-based employee does research at the DLR

For three months, Katrin Bohl was a guest scientist at the German Aerospace Centre (DLR) in Braunschweig. The computational fluid dynamics (CFD) engineer at ebm-papst in Mulfingen works in the area of aerodynamic development, specialising primarily in impeller simulations. She spent the period from February to April 2010 at the DLR studying ways to optimise the RadiCal fan series, while also testing the Centre's tools. The project benefited both ebm-papst and the DLR: The research centre was able to gain initial experience in the fan area, while ebm-papst could familiarise itself with the latest research facilities of the DLR. Plans call for the co-operation to continue.



***In the eye of the storm:  
Katrin Bohl in the wind tunnel of the DLR***



***The trainees greet their prominent visitor at the Hannover Messe***

## A clear commitment

### Trainees represent ebm-papst at the HMI

Twelve ebm-papst trainees represented their company at the Hannover Messe (HMI) trade fair. On the first three days, the young team presented products and technology to visitors including German Federal Chancellor Angela Merkel before being replaced by the experienced trade fair team. The program underscored the company's commitment to apprenticeship and highlighted the expected shortage of workers in technical fields, which ebm-papst is already seeing evidence of: At the company's headquarters in Mulfingen, for example, the number of applicants fell to approximately 730 from the previous year's level of 1,000.

The appearance had benefits for the personal development of the trainees too. "We have made a contribution to further motivating the trainees and have shown them that committed employees can achieve a great deal," relates Hans-Jochen Beilke, CEO of ebm-papst Group.

## Planting a greener world

### ebm-papst Brazil helps maintain the tropical rain forest and its diversity of species

At ebm-papst, working in an environmentally responsible manner is a matter of course. But how does an international location implement GreenTech if no production takes place there? As a pure sales location, the subsidiary in São Paulo has found an individual way to implement the green philosophy for Brazil: Working together with environmental organisation Green CO<sub>2</sub>, ebm-papst Brazil is planting teak, rubber trees and acai palms in the tropical rain forest. A percentage of the profit from each product sold is set aside for reforestation of destroyed areas. "This allows us to contribute to protecting the environment — even without production," enthuses Managing Director Adriana Belmiro da Silva.



***A little green for each product:  
ebm-papst Brazil is helping to revitalise the rain forest***

For more information please go to: [www.ebmpapst.com/product-news](http://www.ebmpapst.com/product-news)



**FLATTER AND STRONGER** The new axial fan series is ideal for the tight space in fan trays, such as those used in telecommunications. Their installation depth has been reduced by nearly one-third – at maximum air flow. Thus the S-Force fans of the 2200 FTD series have 65 per cent higher cooling density with a significantly lower noise level and consume eight per cent less energy compared to predecessor models.

## Professional solution

As a drive for large tangential blowers and for pumps in medical technology and heating engineering, the high-efficiency motor BG 43 is the ideal professional solution. The three-core EC internal rotor motor with precision operating electronics combines high efficiency with high torque, enables nearly silent running and offers accurate control options.



## Keep cool

For use in refrigeration technology, the energy-saving GreenTech EC HyBlade® series has been expanded by adding smaller sizes. In addition to the large HyBlade® fans for evaporators, a high-performance series for fans is also available in sizes 300, 350, 400 and 450. The outstanding feature of these fans is the high efficiency of the new generation of EC motors and acoustics that are drastically improved by using the HyBlade® technology.



## GreenTech



Eco-friendliness and sustainability have always been at the core of our thoughts and actions. Now we have coined the ultimate expression: GreenTech. More information about GreenTech is available on [www.greentech.info](http://www.greentech.info).

**RADICAL COMPACT** The outstanding feature of compact centrifugal modules has always been easy installation. Now, the new RadiCal centrifugal fans are also turning in these plug-and-play modules. This combines the advantages of the modular design with those of the new RadiCal impellers. An ideal system solution that sets new standards in terms of efficiency and acoustics.



# Demanded and subsidised

In new construction and renovation alike, building owners are placing increasingly stringent demands on energy efficiency. Grant programmes provide important financial support. However, those who want to take advantage of these programmes should hurry: The German government plans to impose cuts as early as 2011

*Building owners have to attain specific energy standards to take advantage of grant programmes. Therefore components of modern efficiency houses aim at saving energy*

## 1 Ventilation system with heat recovery

Fresh air is taken in via a weatherproof grille, filtered and then preheated in a heat exchanger. Energy-saving GreenTech EC centrifugal fans from ebm-papst transport the heated air into the living space at an air flow rate of up to 400 m<sup>3</sup>/h, then feed it back to the outdoors.

## 2 Compact fans in the inverse rectifier

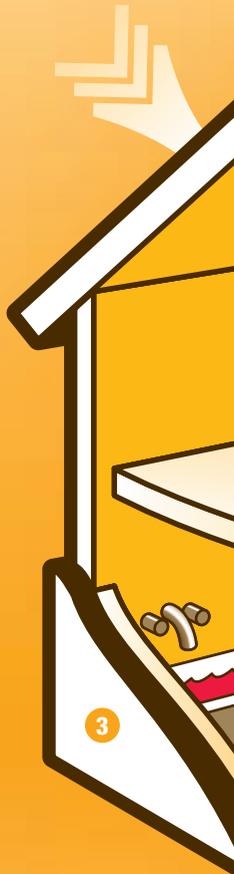
Inverse rectifiers convert the direct current generated by photovoltaic modules into usable alternating current. Energy-saving fans such as the S-Force models from ebm-papst enable efficient inverse rectifier operation.

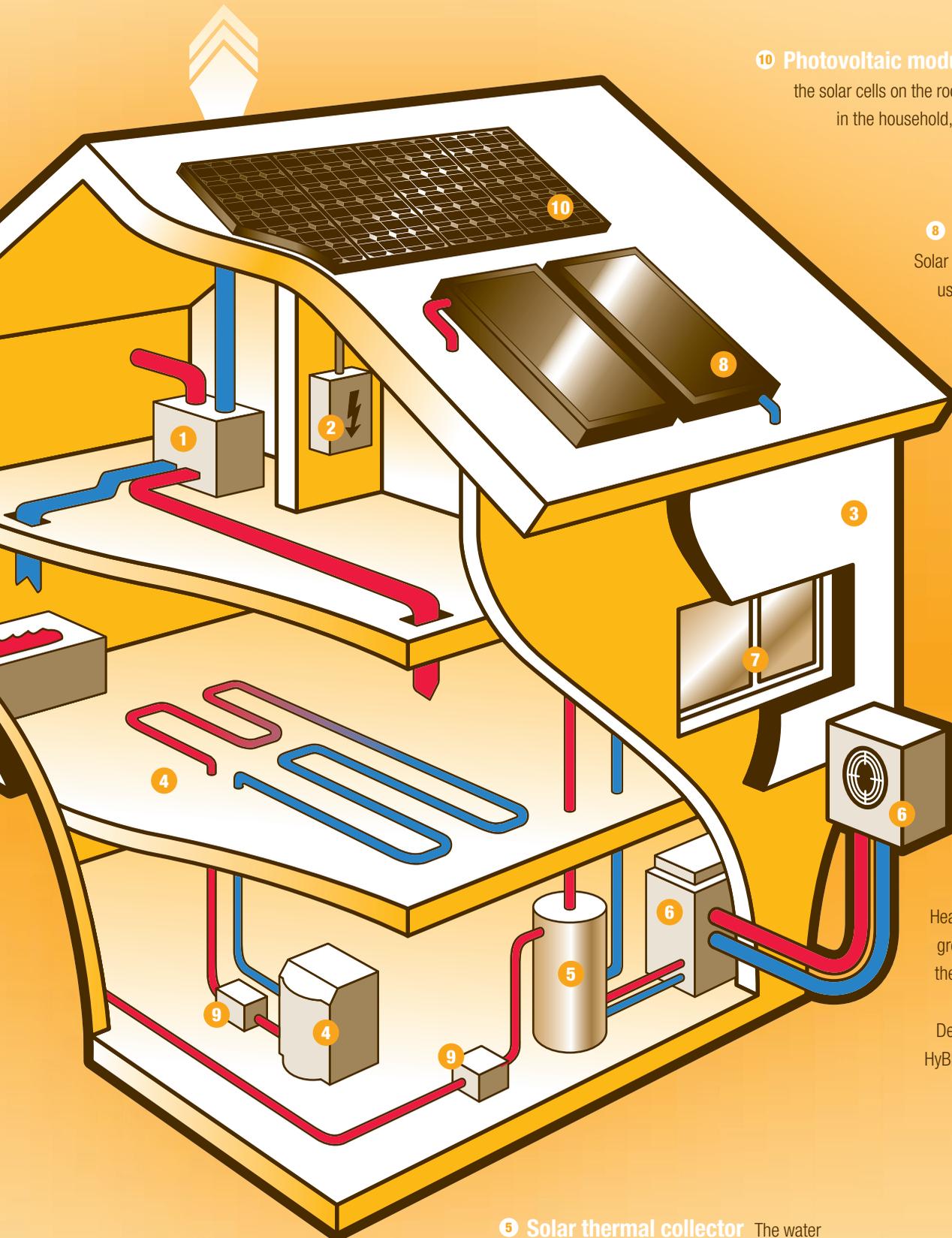
## 3 Insulation of the house

The most important measure for protecting against energy loss is optimal thermal insulation of the roof, walls and basement.

## 4 Surface heating

A heating system in the floor, wall or ceiling distributes heat over the entire surface. Thus the energy consumption during heating is reduced by about half compared to regular radiators. Using the LambdaConstant control system for gas condensing boilers, this already high efficiency can be increased even further.





**10 Photovoltaic module** Electricity is generated in the solar cells on the roof and either used immediately in the household, stored in accumulators or fed into the general power supply.

**8 Solar thermal system** Solar collectors mounted on the roof use the sun's energy to generate hot water. Modern recirculating pumps (9) with EC motor and closed-loop speed control adapt their output to consumption automatically and thus are particularly energy-saving.

**7 Thermal windows** Thermal windows are an important part of exterior insulation.

**6 Heat pumps** Heat pumps remove heat from the ground, the water or, as shown in the example, the air. Fans provide the necessary air exchange. Depending on the pump type, the HyBlade® or RadiCal GreenTech EC fans are ideal for this purpose.

**5 Solar thermal collector** The water heated by the solar thermal system is stored here for later use.

For many years, energy efficiency was not a particularly important aspect in building construction. As a result of the specific construction methods and aesthetic preferences of past decades, older buildings are real energy hogs by today's standards. Priorities have shifted, and today, increasing energy costs make household budgets tighter every year. The ever more clearly noticeable effects of climate change are prompting people to treat the environment more carefully. Those who are not motivated by these factors are constrained by the law in Germany and other countries to build in an energy-efficient manner. Just in 2009, the German federal government amended its Energy Savings Ordinance (EnEv), thus reducing the permitted annual energy consumption of a new building by 30 per cent compared to EnEv 2007. This means that only seven litres of heating oil may be used annually per square metre in a new building. The 30 per cent target also applies to renovations. By comparison, a typical single-family home from the 1970s requires some 20 litres of oil per square metre. Here, too, the initial impression confirms the conventional wisdom: The more environmentally friendly, the more expensive, which means substantially higher costs during construction. In a long-term view, however, this impression becomes more nuanced. Depending on future energy prices, the construction costs are amortised over the years and then lead to effective savings. To provide additional motivation for

building owners to choose energy-efficient construction, the German government offers a wide variety of grant programmes. Chief among these is the KfW Bankengruppe (banking group), which is owned by the government.

**The right grant programme for your new building** The grant programmes of the KfW serve as the general guideline for the energy performance level of all planned housing starts. According to this guideline, only houses that meet the criteria of a passive house or high-efficiency house qualify for grants. The latter type of house exists in three variants: 70, 55 and 40. In this case, less really is more, as a lower number corresponds to a higher subsidy level (see information box below). The background for these numbers is the fact that the high-efficiency house uses 55 per cent of the energy required by what is called a standard house. This is made possible by modern heat insulation and heating systems with renewable energies. Depending on the type of heat pump (see graphic on page 11), axial or centrifugal fans from ebm-papst can ensure optimal flow of air through the heat exchangers. The passive house embodies a slightly different concept. Even more effective insulation makes it largely independent of the outside temperature. In a ventilation unit, a plate or rotating heat exchanger takes a large portion of the heat from the exhaust air flow and feeds it back into the air inflow. GreenTech EC centrifugal fans

## Subsidy levels of the Kreditanstalt für Wiederaufbau (KfW)

In Germany, the KfW supports energy-conscious property owners with interest rate credits, both during new construction and renovation. Those who attain the energy standard of a KfW efficiency house obtain an additional repayment subsidy. The number behind the high-efficiency house specifies how high the annual primary energy requirement is compared to the legal regulations. The KfW high-efficiency house 70 thus corresponds to 70 per cent.

### Energy-efficient renovation

(Credit up to **75,000 EUR** per residential unit, effective interest rate\* **2.32 %**)

#### Repayment subsidy

Passive house	<b>12.5 %</b>	(max. 9,375 EUR)
KfW high-efficiency house 55	<b>12.5 %</b>	(max. 9,375 EUR)
KfW high-efficiency house 70	<b>10 %</b>	(max. 7,500 EUR)
KfW high-efficiency house 100	<b>5 %</b>	(max. 3,750 EUR)
KfW high-efficiency house 115	<b>2.5 %</b>	(max. 1,875 EUR)

### Energy-efficient construction

(Credit up to **50,000 EUR** per residential unit, effective interest rate\* **2.88 %**)

#### Repayment subsidy

KfW high-efficiency house 40	<b>10 %</b>	(max. 5,000 EUR)
Passive house	<b>5 %</b>	(max. 2,500 EUR)
KfW high-efficiency house 55	<b>5 %</b>	(max. 2,500 EUR)
KfW high-efficiency house 70		No repayment subsidy

\* For 10-year fixed interest rate and a 10-year mortgage  
Source: KfW (Status: August 2010)

## “Building owners always have to balance financial must and ecological want.” *Andreas Garscha, German developers' association (VPB)*

from ebm-papst enable operation that is not only energy-saving but also low-noise. This preheated fresh air, the body heat of the inhabitants and the heat energy of the household appliances allow the additional heat requirement to be extremely low, so that it can even be covered by natural energy sources such as solar radiation or geothermal heat. For both high-efficiency and passive houses, building owners benefit from a credit of up to 50,000 EUR with the KfW grant programmes. The interest and any loan repayment subsidies depend on the efficiency level attained.

**High savings potential for those renovating buildings** Those who renovate an existing building can select from several subsidy standards, as is the case for new construction (see information box on page 12). In most cases, this indeed pays off: “Builders are responding to the fact that their energy costs are hurting them,” relates Andreas Garscha of the VPB, a German developers' association. “For example, when we renovate a poorly insulated roof, we lower the ongoing costs by a considerable amount for decades. In many cases, the renovation would pay for itself over the long term even without the additional subsidy.” In addition to the significantly lower energy costs, other benefits include decreased mould growth and improved noise control. This not only makes the building a comfortable place to live, the increase in its value should not be overlooked as an incentive to renovate for greater energy efficiency. The basic prerequisite for the subsidies is a complete renovation carried out by a professional contractor.

**A question of attitude** Especially when planning a housing start, the homeowner should consider how important energy efficiency is for him or her. “No one should decide in favour of a higher efficiency level based on financial incentives alone,” recommends Garscha. “The savings do not increase in a linear fashion, but rather diminish compared to the greater one-time cost.” In any case, it is advisable to work with an independent consultant; indeed, for higher subsidy levels, this is mandatory. In any case, in Germany, the deliberations should take into account the fact that in addition to the grant programmes from the German federal government and states, some municipalities also provide support for energy efficiency-related construction and renovation projects. Research carried out in a timely manner is always recommended. After all, the programmes all have one thing in common: they are constantly changing. New programmes are added, while others are discontinued. This is another reason why building owners and renovators should not wait too long. Moreover, the German federal government has announced that it will cut its grants in half in 2011 as part of budget cuts. ○

## Energy efficiency worldwide

Energy-efficient homebuilding is becoming increasingly important on an international level as well. However, different countries have very different approaches to the topic.

**USA:** The government's “Energy Star” initiative supports homebuilders and renovators in their projects by providing support in planning and, above all, credit incentives.

[www.energystar.gov](http://www.energystar.gov)

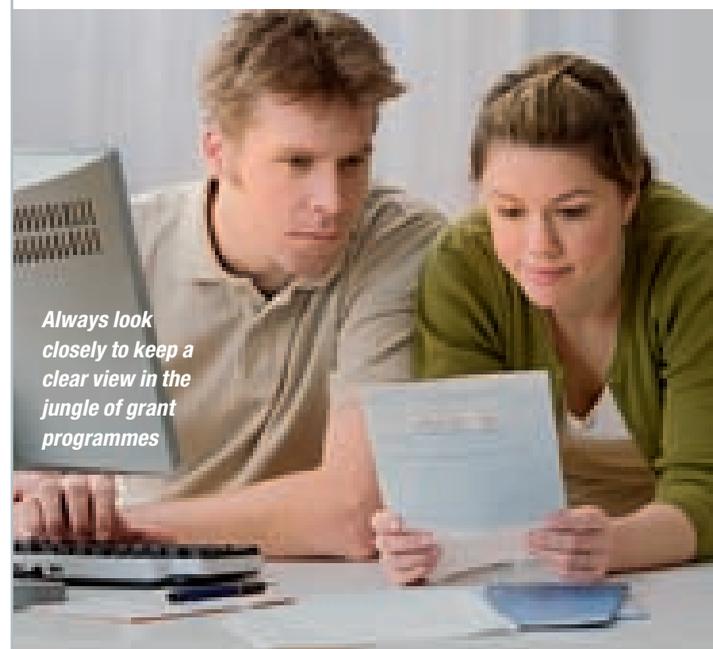
**Great Britain:** The independent “Energy Saving Trust” organisation provides advice and information free of charge. An extensive database provides information about the grant programmes, which differ widely from region to region.

[www.energysavingtrust.org.uk](http://www.energysavingtrust.org.uk)

**Japan:** The Ministry of Economy, Trade and Industry rewards Japanese residential builders for energy-efficient measures with “eco-points”, which they can redeem for goods and services. [www.meti.go.jp](http://www.meti.go.jp)

**China:** Though government subsidies for energy-efficient housing construction are not provided, government regulations to this effect are in place. The provisions vary greatly between regions. A good overview of some of the regulations is provided by the national energy savings association, CNGBN.

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



*Always look closely to keep a clear view in the jungle of grant programmes*

In 2013, the implementation of the Energy-related Products Directive of the European Union will bring with it minimum efficiency requirements for fans that affect many companies. In this regard, there is still a considerable need for information. Here, mag answers the most frequently asked questions

# ErP

## Frequently Asked Questions



### Questions

Steffen Wagner, Air-conditioning Product Marketing Manager at Rittal, poses the basic questions that concern his industry and others with respect to the ErP coming into force.

#### Does the Directive affect fans only, or does it also include products such as compressors, pumps and the like?

→ The environmental design directive or Energy-using Products Directive (EuP) 2005/32/EC and its successor, the Energy-related Products Directive (ErP) 2009/125/EC, affect all products that use energy in any way. The objective is to impose minimum energy requirements on all of these products in order to attain the original goal, which is to reduce CO<sub>2</sub> emissions. This also means taking into account the products and devices you mentioned. Limits were imposed for pumps, for example, when directive No. 641/2009 was passed on 22nd July 2009. The directive for fans is expected to be passed in October of this year. The 27 countries of the EU agreed to the basic conditions on 11th June 2010. Accordingly, the first stage is to enter into force on 1st January 2013.

#### Which fans are affected by the new directive?

→ All fans with an electrical input power of at least 125 watts. The upper limit has been defined as 500 kilowatts. Like all rules, however, this one has exceptions: the directive does not pertain to fans for kitchen range hoods with electric power of less than 280 watts and fans used in clothes dryers.

The minimum efficiency level is defined depending on the fan type, the measuring system and the electrical power consumed. Concretely speaking, this means: The efficiency requirements for small fans are less than the requirements for fans with greater power.

#### What consequences does this have for the fans used in our products?

→ These fans are affected only if their electrical input power is greater than 125 watts at the best point. If these fans have at least 125 watts of power and do not meet the efficiency requirements, they have to be replaced by more efficient fans.

#### Do existing installations have to be converted?

→ Existing installations do not have to be converted. Only fans and devices with built-in fans placed on the market on or after 1st January 2013 in the European Union are affected. A transition period will apply, allowing units replaced during service to be grandfathered in. However, the "old" fans must then be labelled accordingly.

### What potential savings can be expected from the new fans?

#### How is their energy balance?

→ Usually, efficient fans have more efficient motors. These motors, together with aerodynamically optimised impellers and demand-oriented open loop speed control, can provide energy savings of up to 70 per cent – over a long service life.

#### Will the new fans be more expensive?

→ It is impossible to give an unqualified answer to that question. There are definitely cases in which the existing non-conforming fans can be modified in a cost-neutral manner such that they meet the requirements. However, there will also be cases in which increased efficiency means increased costs. But these extra costs are amortised in a very short time, depending on the duty cycle. Ultimately, this is a classic win-win situation: The operator benefits – as does the environment!

#### As a rule, the market does not accept price increases based on legal requirements. What measures are ebm-papst taking to avoid a price increase or even offer the new fans at a lower price?

→ It will not be possible to uphold this basic rule in the case of the ErP directive for fans. As described above, there will always be situations in which it is necessary to resort to other motor technologies. This is true particularly in applications that use slowly rotating fans – there, extra costs cannot be avoided. Ultimately, though, the higher purchase price pays off quickly due to the lower energy costs. Of course, ebm-papst will do everything in its power to offer efficient and cost-effective solutions, even in these power ranges.

#### What consequences does the directive have for global companies – what is the situation in terms of worldwide validity and availability?

→ All ErP directives are, for the time being, binding for all relevant components and products placed on the market in the European Union. This includes both products produced in the EU and those imported from non-EU countries. The directive does not include products for export. However, we anticipate that countries outside the EU will address these issues if they have not done so already.

### Are fans that meet the requirements for 2015 already available today?

→ Yes! ebm-papst GreenTech EC fans meet or exceed by far the limits prescribed for 2015. This means that ebm-papst can offer a future-proof solution for all fans used today. ○

**ErP2015**  
**EXCEEDS THE NORM**

*All GreenTech EC fans from ebm-papst meet the minimum efficiency requirements of the ErP Directive.*

## Answers

Uwe Sigloch, Head of Market Management Ventilation/ Air-conditioning at ebm-papst Muldingen, has been following the drafting of the Eco-design Directive and answering the remaining questions his customers have.





# Motor replacement in the Denmark

With the iQ energy-saving motor, ebm-papst is conquering the freezers in the supermarkets of Denmark

**T**orben Kirkholt, Managing Director of ebm-papst Denmark, smiles a relaxed smile. His many years of dedication are paying off at last. The two largest Danish supermarket chains are now using iQ motors in their freezers and are planning new markets with EC technology. With one of the two Danish freezer manufacturers, turnover has increased by 50 per cent. The other recently became a new customer and is now generating a six-figure turnover – per month.

Yet the relationship between these manufacturers and the motor did not get off to a very good start. “The OEMs didn’t have the history to market such energy-efficient devices to their customers. At a glance, a motor that costs three times as much was a loser for them,” explains Kirkholt, describing the difficulty of selling the economic motor to the customers. The installers who look after technical service with the end customers also had initial reservations. No wonder, for the iQ motor does not need to be replaced until it has been in service for ten to 15 years, in contrast to the Q-motor with two years. And finally, the supermarkets themselves reacted with great reserve. “They have often been disappointed in the past. Every supplier has a green dot on its products, but most of them are unable to keep the promise this implies. ebm-papst can,” stresses Kirkholt.

**Great savings in small places** But words alone were not enough to prove that. That is why Kirkholt decided to create facts. The iQ and Q motors were demonstrated as a direct comparison to an interested installer who often called in at the office in Brøndby to collect spare parts. The enormous savings potential convinced the installer. Kirkholt then asked him to find a supermarket that would be interested in making an exchange. He found one in the small town on Skælskør. “I have been looking for ways to save energy in my supermarket for years,” explains Poul Holm, Managing Director of SuperBrugsen. “For example, my shop was one of the first to fit sliding doors on its freezers.” A measure which saves some 23,000 EUR annually. For some time he had also had his sights set on the 100 small, high-consumption motors that drove the fans in his supermarket. The decision to replace the twelve old units in a test freezer with iQ motors of an identical size proved to be spot-on. “We had the power consumption of the test freezer measured 14 days before and 14 days after the change. Consumption was almost halved,” explains Holm enthusiastically.

He then had the remaining 88 motors replaced even before their next regular replacement. The energy savings mean that the fans will have paid for themselves in two to three years.

**Saving by numbers** “The advantage over the competition is partly our technological lead, but above all it is how we use it,” explains Torben Kirkholt. The possibility of giving the end customer not just promising messages but also and above all convincing figures from everyday usage brought the breakthrough. The doors to the major supermarkets opened. “Prior to this project, we had absolutely no access to the technical staff at the end customers, the ones who decide which motors are employed in the freezers. Within the space of just three months we built up an enormous degree of credibility.”

The Coop chain alone is able to save up to 14.5 million kilowatt-hours a year. Projected onto the other two major chains, Coop and Danish Supermarket, the savings potential in all of Denmark amounts to three to four times this amount – equating to about 21,000 tonnes of carbon dioxide. Add to this for every kilowatt saved by the motors another 0.33 kilowatts of other savings. The lower heat development of the iQ motor means there is less need for the building to be air conditioned. And for Kirkholt the interest of the supermarkets opens up another strategic advantage. They are now demanding equipment with energy-efficient ebm-papst technology from the OEMs. ○

**Poul Holm had been looking for new ways to save energy in his supermarket**

## iQ Motors

To date, supermarkets have used Q motors to drive the fans in their cooling equipment. These are inexpensive in their procurement, but are more expensive in their power consumption. The iQ motor has exactly the same dimensions and features on the outside. But on the inside, the electronically commutated “intelligent” drive demonstrates its huge advantages:



- Up to 70 per cent in savings
- high running smoothness
- Longer service life



# Clean standard

## Pump drive from St. Georgen helps reduce nitrogen oxides in diesel emissions

The EURO 6 standard reduces harmful emissions from diesel engines significantly – those of carbon particulate matter and those of nitrogen oxide ( $NO_x$ ). The stringent limits that take effect 1st September 2014 cannot be met just by improving combustion in the engine. Therefore, many manufacturers of commercial vehicles and passenger cars use what is known as a Selective Catalytic Reduction System (SCR). In this form of exhaust gas treatment, nitrogen oxide emissions are reduced by adding an ultrapure urea solution. A high-performance, reliable pump with an ebm-papst drive injects the urea additive. “This will become standard in commercial vehicles,” states Peter Metzger, Head of Sales Automotive at ebm-papst in St. Georgen, confidently. For diesel engines of lorries weighing over 3.5 tonnes, the legislation dictates that the exhaust gases must be treated such that they are largely

free of nitrogen oxides. Compared to the EURO 5 standard, the  $NO_x$  limits are being decreased by 80 per cent, to 500 mg/kWh. “For passenger cars, this is largely dependent on the type of engine and future legislation. The system is not absolutely necessary for diesel engines with small volumes, as the emissions are already below the currently valid limits,” Metzger explains. “However, we expect the limits to be made even more stringent.”

**To render nitrogen oxide harmless**, power plants have long added ammonia to the flue gas. However, ammonia is a highly irritating, poisonous gas. It is a hazardous material that can be transported only in pressurised liquid form. Therefore, ammonia is unsuitable for mobile use in vehicles. It takes a chemical trick to enable the cleaning process in lorries and passenger cars: The

*SCR exhaust gas treatment minimises the nitrogen oxide emission — what remains is chiefly water and nitrogen*

vehicle-compatible SCR uses a solution of urea in water as an additive, which breaks down into its initial components only when strongly affected by heat. This solution is now tried and tested.

The exhaust gas, which is practically free of carbon particulate matter, exits the engine into the exhaust gas system. Here, the additive — urea dissolved in distilled water — is metered. The high temperatures break down the urea immediately into carbon dioxide and ammonia. At the downstream catalytic converter, this reacts with the nitrogen oxides to create water and nitrogen — thus cleaning the exhaust gas.

**“We expect the limits to be made even more stringent.”**

*Peter Metzger, Head of Sales Automotive at ebm-papst in St. Georgen*

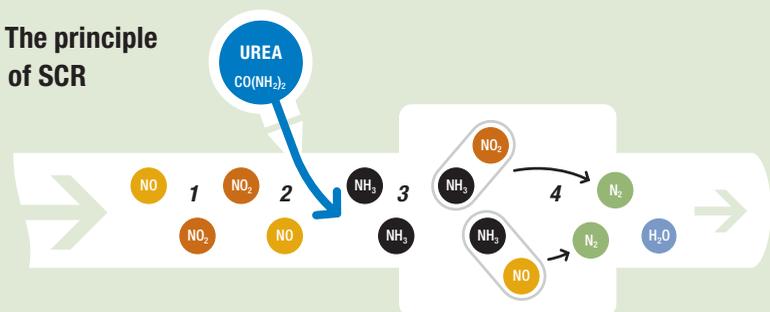
On average, this process consumes an amount of saturated urea solution equal to about six per cent that of the fuel. Thus a 60-litre tank of additive lasts about 4,000 kilometres if the diesel fuel consumption of a lorry is 25 litres per 100 kilometres. However, the fuel consumption also becomes lower at the same time, as the diesel engine runs more efficiently.

## The dilemma of consumption and carbon particulate matter vs. nitrogen oxide

In the cylinder of a modern diesel engine, clean air is compressed and reaches a temperature of 800–900 degrees Celsius from the heat of compression alone. Finely distributed fuel droplets are injected via the nozzle, evaporate and burn by spontaneous combustion in the hot environment. With the highest compression and ideal selection for starting the injection, carbon particles that form can be burned at the highest possible temperature. This kind of combustion, however, which aims at low consumption and low development of carbon particulate matter, favours the production of nitrogen oxides.

To keep fuel consumption, development of carbon particulate matter and nitrogen oxide emissions low at the same time despite this, the automotive field is also relying on downstream exhaust gas treatment: The catalytic exhaust gas treatment or SCR technology.

### The principle of SCR



**Hot exhaust gas, free of carbon particulate matter, enters the exhaust gas system (1). Dissolved urea is injected in an exact dosage (2) and decomposes (3) into carbon dioxide (CO<sub>2</sub>) and ammonia (NH<sub>3</sub>). At the catalytic converter insert the ammonia reacts (4) with the nitrogen oxides (NO, NO<sub>2</sub>) to form water (H<sub>2</sub>O) and nitrogen (N<sub>2</sub>).**

For this method of decreasing nitrogen oxide emissions, Bosch developed a pumping module and a dosing unit. The reduction of nitrogen oxides must work reliably over a wide flow rate range. Because urea solution becomes a solid at below-zero temperatures, an internal heater in the dispensing device must thaw the lines quickly after the engine starts. The quantity of additive that the pump injects directly into the exhaust gas system must be adapted exactly to the amount of nitrogen oxide in the exhaust gas. During this process, a closed-loop control system with the actual value set by an NO<sub>x</sub> sensor regulates the timing of the metering of the additive for each nozzle at a cycle of 1 Hertz. At a system pressure of 9 bar, the dosing unit guarantees the required mass flow rate: from 36 grams per hour when idling up to 7.2 kilograms at full load. If the pressure drops, the denitrification is incomplete — a demanding task for the pump drive.

Therefore, Bosch incorporated the drive experts of ebm-papst St. Georgen into the development. “Bosch was looking for a partner with whom they could develop the motor and electronics,” Metzger adds.

**This resulted in a modular drive concept** with EC motor. The modular design makes it possible to keep following the current state of changing legal requirements. The pump, hydraulic components and electronics can be replaced individually.

The drive experts from Germany’s Black Forest region devised an elegant solution to this challenge: The external rotor motors they produce are known for very good synchronous running and high torque, even at start-up. The drives are also highly compact. The developers made use of these basic properties and further improved the drive for automotive applications. They optimised the electromagnetic compatibility for mobile use and designed the bearing system and all other components for a long service life in the required temperature range. The load profiles are typical for automotive and place a load on the engine not only when it is in operation, but also when it is not moving. In continuous operation at a

constant load, this is over four and a half years, as Metzger stresses: “In a lorry, this corresponds to a service life of over one million kilometres.”

The multi-pole motor sits together with the electronic commutation on a board and has variable lengths. This way the overall height of eight millimetres provides sufficient output for operating a car. The 13-millimetre version corresponds to the larger mass flow rate for industrial vehicles. Both are equipped with a wide voltage input and therefore enable use in a 12/24-volt vehicle electrical system. The high requirements demanded by the automotive industry for supplier components effortlessly fulfil the 100 per cent quality control of fully automated manufacturing.

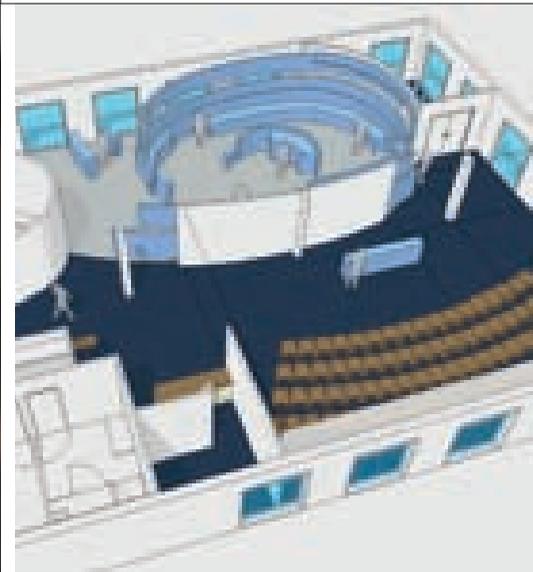
Peter Metzger underscores that exhaust gas treatment with SCR will become an important competitive factor for the automotive industry in the coming years. “The environmental requirements will also continue to rise substantially internationally. For that reason, markets in which exhaust gas treatment has hardly played a role to date will quickly incorporate it.” ◯

**The modular design of the exhaust gas treatment system can be adapted to the most current state of the legal requirements**



**ebm-papst pump drives for a cleaner environment**

A high-performance, reliable pump with an ebm-papst drive injects the urea additive. The compact motor with very low detent torque was developed simultaneously with the customer’s application. The fully automated manufacturing enables tolerance deviations to be minuscule in all relevant dimensions and values.



*In the new client centre the seminars about EC technology (with Dan Hopkins, left) are always well attended*

## Licence to teach

**ebm-papst has become the first fan manufacturer to offer officially recognised advanced training seminars in Great Britain**

An hour's drive north-east of London is where the new information heart of ebm-papst UK has been beating since June 2009. It is from here that the benefits of EC technology are broadcast. The newly established Client Centre in Chelmsford offers modern facilities for presentations, exhibitions and especially seminars. Here, for example, building planners and engineers learn how they can reduce carbon dioxide emissions. And participants here also make sure that they keep their licence. In the United Kingdom, many professional associations insist that their members undergo continuous professional training. Continuing Professional Development (CPD) means that they have to demonstrate a certain number of hours every year. ebm-papst UK uses this obligation specifically as a chance to teach end customers and their consultants more about ways of saving energy with EC technology. The British subsidiary is the only fan manufacturer with the official licence to offer CPD seminars.

**EC: One link in the savings chain** "We are trying to transmit a message that goes beyond our products," says Managing Directors David Jarvis, explaining the underlying idea. "What benefit can the end customer draw from EC technology? For example, that it can be used to keep food in supermarkets fresher for longer." The target group for the seminars are primarily energy managers, buildings managers, hotel managers. "Anybody who has anything to do with

paying bills," explains Jarvis. Well knowing that everybody who takes an overall view of energy efficiency will benefit from the seminars. Even architects and engineers can learn about the numerous benefits that GreenTech EC technology will bring their customers. Lower energy costs, lower maintenance costs, quieter climate control systems, resulting in hotel guests having a more relaxing night's sleep, for example. It is clear that EC is just one link in a greater chain of effects. "With efficient systems you can make the greatest savings. These are greater than those that can be achieved with EC motors alone. We have some compelling stories to tell, but to do so we have to look beyond our own horizon — that's the challenge," stresses Jarvis.

**Faster on the market** The effort is worthwhile. ebm-papst also gains enormously from the seminars. If you know what a customer's customer needs, you can tailor your products precisely to these needs. "We are currently learning a great deal. This knowledge will enable us to put the right products onto the market much faster." In addition, the energy-efficient brand is also expanding onto the markets of the end customers — and they are demanding equipment with GreenTech, the future-oriented EC technology from their suppliers. That is something else that David Jarvis knows. "We are changing from pushing to pulling our products." ○



## Triad for Miele

### The ebm-papst group is deploying its concentrated know-how in an especially efficient heat pump drier from Miele

Clothes dryers are highly practical. However, many machines still consume too much energy. Conventional condensation dryers are unable to improve on Efficiency Class B, which is hardly in line with the times. But with the development of heat pump technology, this issue is now home and dry. Modern machines employing heat pumps are able to make energy savings of up to 50 per cent. All three of ebm-papst's German factories – St. Georgen, Mulfingen and Landshut – were able to input their respective core competence in the market success of the latest heat pump drier from Miele.

**Miele is a synonym for quality.** Machines made by the family-run company are tested for a service life of 20 years to ensure that they remain as reliable as the customer expects throughout this time. To satisfy this requirement, the company follows a universal approach covering the entire product life cycle when it develops new machines and technologies. Continuous optimization for the benefit of the customer and for the protection of the environment. The development phase is decisive. This is where the foundations are laid for quality: avoidance of critical materials during production, conservation of resources while in use and the capacity to recycle the materials used. Even during the development of a new drier, the German technology

and quality leader defined strict requirements. Minimal energy consumption should be achieved to reduce operating costs and minimise environmental impact. Moreover, the user must be able to find Miele's trademark quality in the specific product characteristics: gentle washing of laundry, short program times, quiet operation and long service life. The expectations placed on suppliers are equally high. ebm-papst was able to convince with its competencies and supported the legendary Miele quality with its close links between its factories.

The evaporator fan for cooling the compressor and heat pump circuit comes from St. Georgen. The process blower for recirculating the air in the drier circuit was developed in Mulfingen. And the condensate pump for pumping off the condensation is supplied from Landshut. ◯



### CONDENSATE PUMP

- **Task:** To pump the condensation in the water tank straight into the drain
- **Technical requirements:** Additional sealing between the pump section and the condensate tank // Shaft seal with long service life and low friction loss // Customer-specific float system with low water absorption and thus low float weight increase // Low moisture loss (under 10 per cent)



### EVAPORATOR FAN

- **Task:** Cooling the compressor and heat pump circuit
- **Technical requirements:** High protection rating due to exposure to moisture when cleaning // High ambient temperature due to position between heat exchanger and compressor // Integrated terminal connector // Very long service life // High sensitivity to noise



### PROCESS BLOWER

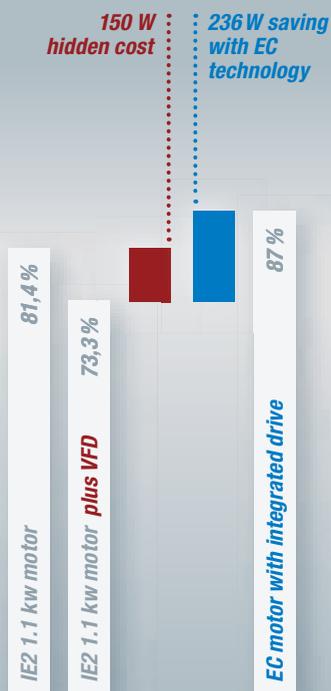
- **Task:** Air recirculation in the drier circuit, cloths drying
- **Technical requirements:** High air flow in critical assembly space // High pressure loss caused by application // High protection rating required due to moisture in the process air // High sensitivity to noise // Development of a customer-specific scroll housing



**Geoff Lockwood,**  
Technical Director  
at ebm-papst UK Ltd.,  
United Kingdom

## Efficiency

The difference between EC and induction motor with VFD and the hidden cost (loss) of the VFD unit.



# EC technology or VFD?

## The hidden cost of variable frequency drives

In an effort to reduce our Carbon emissions many Governments around the world encourage the use of variable frequency drives (VFD) with induction motors. This decision is made on the understanding that significant energy savings are achieved through the fan and pump 'power law'. The flaw in this decision is the oversight of alternative technologies such as EC motors and that there are hidden costs with variable frequency drives.

**The power law theory** states that the power consumed by the impeller is proportional to the cube power of the change in speed; reducing the impeller speed by 50 per cent reduces the power input to 12.5 per cent. If the fan speed can be modulated to meet a demand then significant energy savings can be achieved. This law should be used with care as theory does not occur in practice.

It assumes turbulent air flow throughout the control range, and this is unlikely, and it does not consider fixed losses within the motor and drive. Significant savings can still be achieved, but not quite as much as the law would indicate.

There are some hidden costs with VFD's, for example they increase motor losses. IEC60034-31, selection of energy-efficient motors including variable speed applications, advises that the addition of a VFD increase motor losses by 2 to 5 per cent; in adverse circumstances it can increase motor losses up to 15 to 20 per cent.

The VFD also has its own losses with small drives being less efficient than large drives. The losses are also dependant on the drive switching frequency. The loss is less with low frequency switching, but this produces

mechanical noise from the motor. The drive is therefore normally set at a high switching frequency but this increases its losses, for example a 1.1 kW drive is typically 95 per cent efficient at low and 92 per cent at high switching frequency. Another loss overlooked is that of power factor correction.

**When these losses** are added together and compared to alternative technology the true cost is revealed. Whereas EC motors include variable speed technology and power factor correction the associated losses are not hidden, but shown within the overall figure. For example a 1.1 kW 4 pole motor a high efficient (IE2) induction motor is 81.4 per cent efficient. When the VFD, filter and increased motor losses are added this leads to an overall efficiency of 73.3 per cent, a hidden cost of 150 W. A comparable EC motor is 87 per cent and saves 236 W, see figure 1.

With a theoretical energy reduction of 78.5 per cent when the fan is reduced to 50 per cent then it is understandable why variation of fan speed is encouraged through legislation. However this should not be restricted to variable frequency drives as there are hidden costs that are not concealed with alternative technology, such as EC technology. Which saves even more energy while being more efficient and infinitely adjustable. ○



**No hidden surprises with EC technology**

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**Chillventa**, Nuremberg, 13–15 October 2010  
**eCarTec**, Munich, 19–21 October 2010  
**MATELEC**, Madrid, 26–29 October 2010  
**electronica**, Munich, 9–12 November 2010  
**Compamed**, Dusseldorf, 17–19 November 2010  
**SPS/IPC/DRIVES**, Nuremberg, 23–25 November 2010  
**AHR**, Las Vegas, 31 January – 2 February 2011  
**EuroShop**, Dusseldorf, 26 February – 2 March 2011  
**ISH China**, Beijing, 1–3 March 2011  
**Climatizacion**, Madrid, 1–4 March 2011  
**Mir Klimata**, Moscow, 1–4 March 2011  
**Energiesparmesse**, Wels, 4–6 March 2011

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### Events

**Indoor football championship for A Juniors**, Mulfingen, 8–9 January 2011  
“**Youth research**”, Künzelsau, 24–26 February 2011

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**mag**

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**Intelligent tangential blowers for ventilation technology**

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**Keeping an eye on the environment during product development**

tech.mag 2/2010 is available from the middle of October 2010.

Contact our sales team or e-mail

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# Embodying regional responsibility

ebm-papst Landshut shows great commitment.

The company's involvement has anchored it into the region

"As one of the major employers in the area, regional responsibility is very important to us," stresses Stefan Brandl, Managing Director of ebm-papst Landshut. That wasn't always the case. Even though the regional roots have been cherished at its home base in Mulfingen ever since the company was founded, a series of changes prevented a similar development in Landshut. In 1997, "Elektrobau Mulfingen" (ebm) acquired the Alcatel factory and renamed it "Motoren Ventilatoren Landshut" (mvl). Six years later, the group was reformed and mvl became ebm-papst Landshut. Bernd Truntschka, an ice hockey legend who was born in Landshut, says aloud what many people at the time thought: "After these changes, nobody really knew what ebm-papst really stood for in Landshut." Not least because the predecessor companies showed less interest in the surrounding area. A lot has changed since then.

**More than money** Since 2003, the company has stopped giving customers gifts at Christmas. Instead it makes a donation to the Friends of St. Marien Paediatric Hospital. The local ice hockey team has been sponsored since 2005. Ice hockey – in part thanks to Truntschka – is something of a tradition in Landshut. The "Cannibals", the professional team of the EV Landshut ice hockey club, play in the German second division. The

company's commitment is expressed not only in paid shirt and perimeter advertising. Over the years, a valuable cooperation has developed, a cooperation that also benefits employees. When ebm-papst in Landshut was forced to introduce short-time working during the economic crisis, the workforce supported the decision. As thanks, the company invited every member of staff to a Cannibals match. The team was delighted with the interest. "ebm-papst is now a permanent fixture in Landshut," says Bernd Truntschka, who is now manager of EV Landshut.

**For sustainable training** Parallels between the company and the club can be seen when it comes to promoting youth talent. Both are committed to sustainable training. One perfect example is Tobias Rieder. The 17-year-old shooting star of the Cannibals pressed ahead with his training as an industrial clerk at ebm-papst at the same time as he pursued his ice hockey career. He has now moved on and plays for one of the top teams in Canada. The fact that he sometimes needed time off for ice hockey training? "That was worth it for us," says Brandl.

The people of Landshut have now learnt to appreciate the company. That could be seen from the esteem that Brandl enjoyed at the ebm-papst-initiated Junior Cup, which was held in September together with the football section of the Landshut-Berg sports club. The crowd applauded both the junior kickers and him: as stadium announcer. ○

*Stefan Brandl is also active for the region personally – as stadium announcer at the Junior Cup*





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“ Working where others go on holiday: for most people, the region around Lake Como brings to mind images of sun, ice cream and spaghetti. However, this beautiful Italian landscape is the setting for a strong and, above all, innovative economic location. Being close to suppliers and customers is particularly important to us, as our products complement those from the immediate industrial environment – a win for everyone involved. We are always closest to market and can absorb product ideas and suggestions for improvement from customers immediately. Moreover, we are also researching and developing — to put pressure on the competition. After all, we’re not here on holiday! ”



# Cause.

# Effect.



# -67%

When using ebm-papst W1G200 axial fans in refrigerated counters, energy costs can be reduced by 67% using GreenTech EC technology.

GreenTech stands for climate protection that pays off for more than just the environment. As a result, consistent use of ebm-papst fans with GreenTech EC technology can radically reduce the power consumption compared to AC fans – and that pays off. In a small supermarket with 40 fans in refrigerated counters for example, in addition to 5.6 t of CO<sub>2</sub>, the cost of more than 9.4 MWh of electricity can also be saved annually. After all, it's not for nothing that our basic philosophy is: Each newly developed product must exceed the economic and ecological performance of its predecessor. [www.greentech.info](http://www.greentech.info)



W1G200

The engineer's choice

# ebmpapst