



## Turning cold into heat!

How high-efficiency heat pumps create heat even from frost

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“We are **part of the change** in China”

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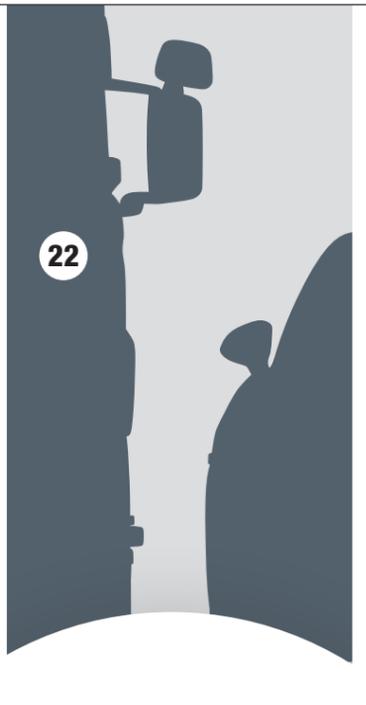
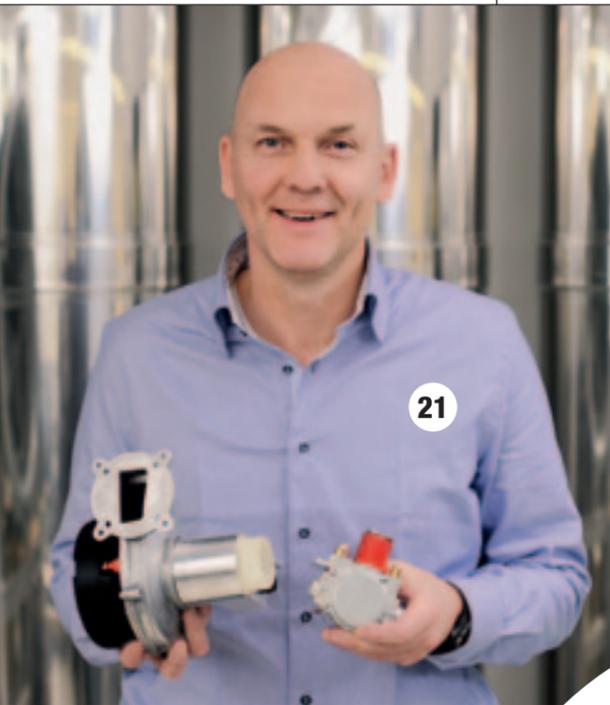
## Taking advantage of the upturn!

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

**Dear Readers,** the economic valley was deep—but it is now behind us. Before us are new heights: empty warehouses and full pipelines provide exceptional dynamics. Many markets and application areas are now making up for the investment slowdown during the crisis. There is no question that the upturn is real. But will it last? The signals from important markets and industries point to a long-term and sustained positive trend. Around the world, new technologies for an energy-efficient future are in demand. Powered by the success of sites such as Facebook, Google, and Twitter, the IT and mobile phone industry is reaching new heights, and with it the demand for precision air conditioning. Video on Demand sites, YouTube and IPTV providers are shifting the movie experience online, causing worldwide data traffic to multiply in ever

shorter cycles and heating up the demand for intelligent and powerful climate control solutions.

In Asia, the number one growth region, there is a steadily increasing demand for innovative refrigeration and ventilation systems. India is currently building a state-of-the-art refrigeration chain, and in China, energy efficiency is being given top priority. Not to mention that the efficiency requirements set forth in the ErP Directives will also cause the European market to move towards green power. As you can see, we are excited by the opportunities that exist around the world. We want to seize these opportunities along with you, our customers. In addition to optimism and zest for action, as the inventor of GreenTech EC technology, we also have the necessary innovative strength to help shape the future. Let's get started!



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## How do we secure our growth, Mr Fuchs?

Managing Director Finances and Controlling ebm-papst Group Hans Peter Fuchs explains how ebm-papst is dealing with the debt crisis and currency fluctuations

### What growth targets has ebm-papst set for itself?

The target for the ebm-papst group is to grow to a world-wide turn-over of two billion EUR within this decade. In addition to excellent products, this requires financing power that will allow us to invest in expanding our capacity. Of course, requirements also increase due to our business, as customers are granted payment terms. The increase of this working capital is not to be underestimated and usually ties up a substantial amount of money. This has to be provided using either our own or outside capital. Both require a certain minimum profitability, which ensures that we remain liquid independently and that banks grant us favourable credit terms.

### What are the risk factors that could jeopardise this growth?

Presently, it is hard to predict future trends. One reason is that we are confronted with payment flows in some 25 currencies around the world. Added to this is the insecurity in capital markets: since the beginning of the financial crisis, the fluctuation range of exchange rates—referred to as volatility—

has grown to extreme proportions. No longer are there sustained trends on which we can base our long-term plans. The most recent example of this is the weakness of the euro and the US dollar. To keep the currency risk to a minimum despite these factors, well-planned risk management is essential.

### What precautions is ebm-papst taking in this regard?

Securing capital is a complex topic that requires a great deal of expertise. For this reason, the ebm-papst group has established its own treasury management that has central responsibility for the group according to a finance guideline. It identifies risks at an early stage and then responds in a timely manner with the adequate countermeasures. This is of enormous significance, as after all, it takes a lot of additional turnover to compensate for a corresponding unplanned currency exchange loss. Intelligent safeguards against currency exchange fluctuations give us a certain degree of assurance in planning and thus a clear competitive advantage.

## Testing is proof of better service

### ebm-papst Farmington installs acoustic test chamber

To lower energy consumption and the noise level during operation in customer devices, the US subsidiary in Farmington, Connecticut has now launched a new service: since October 2010, the units are also tested in an acoustic test chamber in addition to the already established air flow test.

Customers supply their devices for testing—including everything from climate control systems to heat pumps to cooling units. The engineers check each device individually for sound pressure and

output. "Our objective is to test the devices at the earliest stage of development possible. In many cases, we can prove that our products can make them even better," says Robert Sobolewski, Managing Director of the US subsidiary.

Recently, the engineers tested a climate control system—once with the fan that came with the unit, then with the comparable model from ebm-papst. The comparison was a success: the results of the second test showed significant improvement. There-



Devices now undergo noise level testing in Farmington

fore, this customer presented its air conditioner at the International Air Conditioning, Heating and Refrigeration Expo in Las Vegas with the fan from Farmington.

## News in brief

ebm-papst UK Ltd. Won several prizes at the **Cooling Awards 2010**. Geoff Lockwood was honoured as "Pioneer of the Year"—just like Gert Häussermann back in 2005. The iQ-motor is the "Refrigeration Product of the Year" and in the category "Marketing" the subsidiary received the title "Highly Commended".

From May 18 to May 20 the **4th Innovationsforum** will take place at ebm-papst in Mulfingen. Focal topics this time will be the latest product developments in industrial engineering, heating, air-conditioning and cooling technology. The forum addresses clients of these markets from the German speaking area.

At the **1st Congress of Global Market Leaders** in Schwäbisch Hall, Germany, Hans-Jochen Beilke, Chairman of the Board of Directors ebm-papst Group, reported on how to profit from the megatrend in energy efficiency. ebm-papst was invited as one of twelve global market leaders.

After the last heat is before the next heat: You can already register for the **16th ebm-papst marathon** on September 11. You can also register online at [www.ebmpapst-marathon.de](http://www.ebmpapst-marathon.de).

Represented at the **9th ebm-papst „Hallenmasters“** soccer tournament were two 19 and under teams from the region as well as ten junior teams from the national soccer league. The junior team of Borussia Mönchengladbach won the tournament.

After the fatal earthquake in Haiti 15 companies from the Hohenlohe region including ebm-papst decided to **collect for reconstruction**. In December 2010 they handed over a donation of 75,870 EUR.

You can become a „friend“ of ebm-papst, too: At the new "ebm-papst" **facebook group**.

**Distinguished as a corporate leader in climate protection: Markus Mettler (centre) holds the certificate awarded to ebm-papst**



## Award-winning

### ebm-papst recognised as a corporate leader in climate protection

The German federal government and Chamber of Commerce and Industry (DIHK) have distinguished ebm-papst and ten other companies for their dedication to protecting the environment. The firms have been accepted as members of the Climate Protection and Energy-efficiency Group of the German Economy. All of them have lowered their energy consumption considerably with state-of-the-art technology. ebm-papst persuaded the jury with the numerous energy efficiency measures carried out in all areas of the company. Markus Mettler, ebm-papst Environmental Officer, expressed his pleasure at the award and confirmed that the company will continue its work on behalf of the environment, stating: "We have achieved a great deal with our green company philosophy and we remain committed to continuous further improvements."



Portuguese soccer kids wearing their new team-shirts

## Football beats boredom

### ebm-papst Portugal supports neighbourhood children

Two ex-pro footballers in Lisbon devoted their free time to teach kids, under age twelve, how to kick and make friends. The practise sessions are held twice a week after school and had previously been made possible by the parents, who provided the equipment. Since summer of last year, ebm-papst Portugal has been sponsoring the project. At an international youth tournament held in Algarve in August 2010, the young athletes played in ebm-papst jerseys. "I come from this neighbourhood myself and was part of such a football team", Managing Director Nuno Duarte Pires relates. "What really mattered was having fun, learning to respect ourselves and others and create team spirit. When I heard about the initiative, I knew immediately that we had to support it."



*As a driver of EC Technology for 14 years, Gert Häussermann was "EC-Pioneer" for ebm-papst. In September 2010, he passed away at age 65 after a lengthy illness*

## Pioneer of EC technology

In memory of Gert Häussermann

Gert Häussermann was a valued partner for most of our customers worldwide since coming on board as Product Manager for EC technology at ebm-papst in 1996. In his 14 years at ebm-papst he accompanied the development of this energy-efficient technology with conviction. Whether in front of or behind the scenes, he was one of the driving forces of this sector in his time. He was personally active in developing and improving the products. Without his perseverance and endurance, the great success of GreenTech EC technology would not have been possible. With his conviction, he was able to generate excitement for using energy-saving and intelligent alternatives not only among

ebm-papst employees, but also among customers. His vast expertise as well as his inimitable, often unorthodox way of approaching and solving problems enabled him to do this. Customers and employees also noticed this when they were in need of help. Whatever the time or place, when a subsidiary sent out a cry for help, Häussermann never hesitated to hit the road and provide on-site advice and support.

We will miss him as a valued colleague, a valued partner and above all a valued person, but carry on his commitment to customers, employees and the advancement of energy-efficient solutions.

## Making buildings greener

ebm-papst Sweden implements energy savings

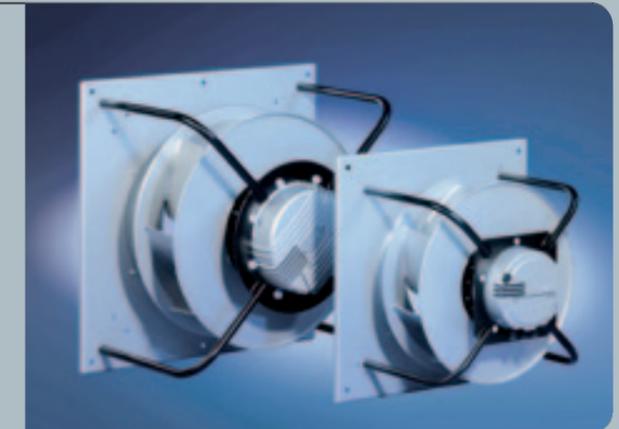
At ebm-papst, working in an environmentally responsible manner is a matter of course. For the Swedish location, this means making the company's own buildings more sustainable and working in a more environmentally conscious manner. To this end, the subsidiary in Järfälla has implemented three measures: It has equipped the office buildings with three new air handling units with EC fans and the warehouse with three big air heat pumps which also use ebm-papst fans. It has also taken the opportunity to provide additional roof insulation on the warehouse. "We save some 100,000 kilowatt-hours per year with the air heat pumps alone," relates Managing Director Bengt Knutsson, expressing his enthusiasm for the new energy-efficient measures.



*One of the new heat pumps on top of the warehouse*

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

**AIR POWER** The outstanding features of plug fans are their energy-efficient use and the new sizes, which cover even higher air performance ranges up to 20,000 m<sup>3</sup>/h. The aerodynamic styling of the centrifugal impellers and GreenTech EC technology makes them especially quiet and efficient. Plug fans are also very compact and controllable because the EC motor is integrated directly in the impeller.



**iQ for two** The iQ<sup>2</sup> series

complements clever additional functions into the already existing iQ motors, e.g. "reverse on start": after starting, a brief reverse operation blows potential pollutant off the condenser.



**HEATING STANDARD** For heat output up to 35 kW, the NRG 77 gas blower now supplements the efficient product line for condensing boiler technology. It is smaller, quieter, and has significantly increased aerodynamic efficiency of 56 percent—yet uses measurably less energy. Thus the successor of the NRG 118 is setting out to become the new standard in the market.



**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).

## Maximum efficiency

Reliability, service life, energy consumption—the new i-maxx generation of fans meets the highest demands in all these areas. In the i-maxx ACi 4400 both the drive and the fan as well as converter electronics are integrated directly into the motor hub for the first time.



**COMMUNICATIVE** The VDC-3-49.15 series of electronically commutated external rotor motors with operating electronics now has a new addition. The version with integrated CANopen communication interface ("K5") takes the step into the world of bus communication—ideal for use in automation systems.



# Pumping for the climate

Renewable energies instead of fossil fuels — this is the future for home heating as in other areas. Heat pumps play an every greater role here. However, they vary greatly in output, installation effort and costs

Warm and cozy: the heat pump can use the heat from the outside air even at icy temperatures



The heat pump takes heat out of its surroundings and transfers it to a heating medium. In doing so, the pump uses a refrigerant with a very low boiling point. The refrigerant evaporates as soon as it flows past a heat source. A compressor condenses the refrigerant, which is now in the form of a gas, thus increasing its temperature. The high-temperature gas finally transfers the heat to the heating or domestic water

Of the 18 million heating plants installed in Germany, not even 20 percent conform to the current state of technology. This means great potential for state-of-the-art systems that use renewable energies. The heat pump is one solution for energy-efficient heating and hot water. However, it is not suitable for every home-builder or renovator. Though they all share the same principle, the type of heat source, output and installation effort differ greatly.

In principle, a heat pump works like a refrigerator: While the kitchen appliance draws heat from foodstuffs and discharges it without being used, the heat pump takes heat out of its surroundings and transfers it to a heating medium. In doing so, the pump uses a refrigerant with a very low boiling point. The refrigerant evaporates as soon as it flows past a heat source, drawing energy from it. A compressor condenses the refrigerant, which is now in the form of a gas, thus increasing its temperature. The high-temperature gas finally transfers the heat to the heating or domestic water. Thus it takes approximately three-quarters of the energy it needs for heating and water heating in the home. The compressor uses the other quarter, mostly in the form of electricity.

**The three elements** Heat pumps are "solar collectors" with a twist: They use the solar energy stored in groundwater, underground and in ambient air. The different types of heat sources can also be used to distinguish between types of heat pumps (the medium to which the pump gives off heat is always water): water/water heat pump, brine/water heat pump and air/water

heat pump. Which heat source is ideally suited for a specific heat pump project depends on factors such as whether the building is new or renovated and what kind of pipe is required. The local basic conditions, such as the composition of the ground, and the funds available for investment must also be taken into account. Some of the various sources can be used only by employing complex technology. Even in winter, groundwater has a relatively high temperature—in Germany, between seven and twelve degrees Celsius. Moreover, purely from

### Air/water heat pumps are flexible, the tapping effort is low and they make optimum use of the potential energy

an energy standpoint, water is the best heat source. Water/water heat pumps thus attain very high performance figures. However, tapping into the groundwater is expensive and requires a permit. A total of three holes must be drilled: First, a test bore has to be drilled to determine whether the required limit values for water quality are complied with. Then, what is called an injection well is drilled, followed by a pumping well. From an energy standpoint, beneath the ground is also a very good heat source. At a depth of up to one and a half me-

ters, the temperatures are likewise in the range from seven to twelve degrees. The brine/water heat pump can also use this heat via a ground collector. This is based on thin plastic pipe mats that are buried horizontally at a depth of 1.2 to 1.5 meters. However, this system requires a large open garden area that cannot be built on in the future, as doing so would impair the performance of the ground collector. A second method of using geothermal heat involves the geothermal heat probe. The effort for tapping the necessary deep bore hole is comparable to that for a well: 100 meters deep with a diameter of 20 centimeters. Moreover, it is difficult to obtain permission from the water authority. Air is available everywhere and can be used without a permit. Whether indoor or outdoor installation, air/water heat pumps are extremely flexible and the effort required for tapping this source is low. Moreover, high-efficiency devices make optimum use of the potential energy in the air.

**Extracting heat from air** In new construction and, particularly, in renovation of living space, which needs only smaller-scale modifications to the area surrounding the house, the air/water heat pump is ideal. State-of-the-art devices make it possible to use the heat present in the outside air, even at icy temperatures as low as 25 degrees Celsius, for heating and hot water. By using the latest technology, these devices extract heat from the air to provide flow temperatures for heating circuits of over 60 degrees Celsius. Where heat pumps are usually suited only for use with wall or floor surface heating systems, new high-efficiency models also enable renovations in old buildings that are heated using radiators. Therefore, these heat pumps attain annual performance factors, with high coefficient of performance (COP) values around 4, which also has a positive effect on the user's wallet. Today's devices attain this increased efficiency with innovative components and optimum interaction.

**Ideal rotational performance indoors and out** Two variants of air/water heat pumps are on the market: one for indoor and one for outdoor installation. Both place different requirements on the aerodynamics. In indoor installation, the device takes in the outside air via one duct and exhausts it through another one. Pressure drops take place through these ducts. Therefore, compact centrifugal fans are ideal for this purpose. These are suitable for a high pressure build-up and take up only little installation space. A great example is the RadiCal® series from ebm-papst: even today, the new centrifugal fans exceed the ErP efficiency directive that will soon be in effect, cut both energy consumption and noise behaviour in half and feature extremely compact dimensions.

Because in outdoor installation, the condenser is outdoors with only a refrigerant line leading indoors, space requirements and pressure drop are usually not an issue—though the noise level is, particularly at night. To avoid having to switch off the heat pump at night, axial fans that can be run at lower speed are well suited. Take, for example, the HyBlade® from ebm-papst. Thanks to its GreenTech EC motor, it can be adjusted flexibly, allowing it to run at lower speed at night. Moreover, it is significantly quieter over the entire speed range and needs some 30 to 50 percent less power than a fan operated with an AC motor.

Example for an outdoor installation high-efficient air/water heat pump



### Performance figures of heat pumps

The COP value (coefficient of performance) is the ratio of heat output to the electric output used at a certain operating point. The calculation also includes the output of auxiliary devices, the defrosting energy and the proportion of pump output. A COP of 4 means that four times the supplied power is converted into usable heat. The annual performance factor is the key figure for evaluating the energy performance of the overall system. Calculated over a period of one year, it designates the ratio between the quantity of heat given off and energy fed into the system.

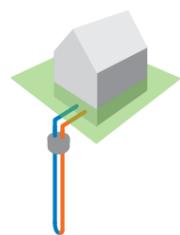
### Tapping the heat sources



#### Heat source: Groundwater

Ground water, which remains at a constant temperature over the seasons, is fed to the water/water heat pump via a suction well and returned to the ground water via an injection well.

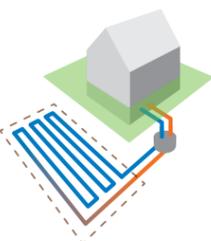
- Advantage:** Optimal heat source in terms of energy  
**Disadvantage:** Strict regulatory requirements, cost-intensive



#### Heat source: underground—geothermal probe

Through boreholes up to 100 meters deep, water is pumped underground, where it draws geothermal heat.

- Advantage:** Very good heat source in terms of energy  
**Disadvantage:** Strict regulatory requirements, extremely cost-intensive



#### Heat source: underground—collector

Thin plastic pipe mats use the solar energy stored just below the surface of the ground.

- Advantage:** Very good heat source in terms of energy, no drilling required  
**Disadvantage:** Takes up a large amount of space, cost-intensive



#### Heat source: outside air

Outside air is drawn in and stripped of the heat it contains.

- Advantage:** Versatile, cost-effective  
**Disadvantage:** Low performance values at low temperatures



*Neither double-digit  
sub-zero temperatures  
nor the vast territory can  
unnerve Denis Stepanov*

## Salesman braves the cold

Denis Stepanov sometimes travels 10,000 kilometres on a business trip. He is responsible for ebm-papst's sales in Siberia

Siberia—the word brings to mind huge distances, few people and, above all, bitter cold. And this description is entirely accurate. The snow cover around the Siberian ebm-papst office in Yekaterinburg is rather deep as early as late November. However, Stepanov does not let this get in the way of his business trips. As the only outside salesperson in Siberia, he has to cover an enormous sales territory—more specifically, ebm-papst's largest in the entire world—by himself. “Of course, my everyday work also includes regular office tasks,” Stepanov relates. “However, I spend about half of my working time on the road.” In Siberia, customer contact is key. From his sales office, Stepanov travels to customer events, product presentations and, above all, negotiations.

**To cover all of the customers**, good planning is everything. Most of all, this means keeping a close eye on the weather report. One has to be ready for anything: Siberia's climate ranges from a sweaty 35 degrees Celsius in summer to an unbelievable –70 degrees Celsius during the cold season. This extreme range is also encountered within any given season. Siberia includes multiple climate zones, which Stepanov can often feel right on his skin: “At the same time of year, I can wear just a T-shirt here at home, while I have to break out a heavy coat in other locations.”

**A different kind of frost protection** Given the often cold surroundings, it sounds almost paradoxical that Stepanov cites ground cooling as one of the most important projects. “That plays a great role here,” he says. “After all, oil production is one of the most important sectors of the Siberian economy.” We can



*Stepanov travels as far as Chabarowsk at the Chinese border—5,000 kilometers away from his office*

quickly understand what that means by looking at the conveyor systems on the northeastern peninsula of Taimyr: in winter, the frozen soil thaws quickly, as the crude oil heats up to temperatures as high as 50 degrees Celsius when pumped out of the ground. If the plant falls into the sump thus created, the results are catastrophic. Exactly that is prevented by cooling machines with centrifugal fans in GreenTech EC technology, which keep the ground at a constant temperature around the freezing point, regardless of the weather. Projects such as these require Stepanov to drive thousands of kilometres, as Siberia is one of the world's least densely populated regions, with an average of only three people per square kilometre. Accordingly, there are only a few



*On his business trips, Stepanov often has go by plane (left). In Novosibirsk degrees around minus 19 celsius are quite normal (right)*

major urban areas, with a lot of nothing in between. Novosibirsk, for example, is about 1,500 kilometres from Yekaterinburg, while Vladivostok is even 5,000 kilometres—it would take several days to make the drive by car. These distances do not bother Stepanov much: “I can fly to any region in just a few hours,” he explains. “To keep the business trips at least somewhat manageable, I purposely chose Yekaterinburg as the headquarters.”

Russia’s fourth largest city, which will be one of the venues for football’s World Cup in 2018, is located in southern Siberia, a major centre of Russian industry. Only the means of transport have not quite kept up with this status. Usually, Stepanov has to make short trips by bus or taxi, which often get caught in Russia’s infamous traffic jams. The only Siberian city with an underground system is Novosibirsk, where two Metro lines run. However, improvement is in sight, and Stepanov relates proudly how he took on a project for another city’s streetcar system.

**Keeping out draughts** “The streetcar company of the city of Irkutsk approached me back then with a problem,” reports Stepanov. The passengers had to cope with average outside temperatures as low as -45 degrees Celsius. At every stop, the open doors caused a draught to blast through the wagons, sending a chill through the whole compartment in seconds. Even at full power, the heating system was not powerful enough to heat the air by the next stop. The solution: The company took Stepanov’s advice and installed a warm air curtain at each door. This keeps the cold outside. The warm air curtains are activated only when the doors are actually open. This ensures energy ef-

ficiency. Since the installation, feedback from passengers has been entirely positive. Finally, they can take off their hat and gloves in the city train. This also impressed the streetcar manufacturers, who have since made the warm air curtains standard in Siberian cities.

When Stepanov talks about this project, it is easy to tell how much fun he has in his work: “Basically, I am doing the same thing as my many colleagues around the world. Customers come to me with a problem, and we then solve it together.” Despite the massive distances in Siberia, he has a job that allows him to deal with many interesting people. “That is a very nice fringe benefit,” he adds. ○

### 36 x Germany

Germany seems extremely small in contrast to Siberia. But this counts also for the USA, India or China. There’s no bigger territory in the world. Siberia takes up one third of the whole of Asia.



**Germany**  
357,112 km<sup>2</sup>



**Siberia**  
13,100,000 km<sup>2</sup>

# Green shopping oasis

With its new supermarket, Brazil’s Verdemar retail chain takes its name literally by going green

In Jardim Canadá, a community in the Brazilian state of Belo Horizonte, cool temperatures are occasionally encountered due to the great elevation. Therefore, customers appreciate the floor heating of the Verdemar chain’s supermarket, which opened in April of last year. Though this may sound like wasteful luxury, it is actually precisely the opposite. All of the store’s many amenities, of which the floor heating is just one, have one thing in common: they are 100 percent environmentally friendly. In the store’s 1.500 square metres of space, Verdemar—Portuguese for “green sea”—has created an environmentally aware shopping oasis that remains one of a kind in Brazil.

**Naturally cold** The heart of the green systems—and the supplier of the hot water for the floor heating—is the cooling system. “We are the first supermarket in Latin America to use CO<sub>2</sub> as a refrigerant. It replaces the chlorofluorocarbons used earlier,” explains Brognaro Poni, Business Director of the supermarket chain. In the Skyrack Breeze cooling system from Brazil-based manufacturer Plotter & Racks, CO<sub>2</sub> serves as the refrigerant for the upright freezers and freezer cases. This allows foodstuffs to be cooled faster, letting them retain more moisture and thus maintain a higher level of quality. “Compared to conventional refrigeration plants, CO<sub>2</sub>-based systems have emissions that are about six times lower,” explains Marcelo Merolli, Managing Director of Plotter & Racks. Moreover, due to the higher refrigeration capacity of the carbon dioxide and the resulting lower temperatures, higher throughput rates can be attained, which saves costs. The energy balance is likewise respectable:

savings of some 40 percent are possible due to smaller compressors and pumps, smaller pipeline diameters and ESM fans.

**Small, quiet, effective** The fans with GreenTech EC technology supplied by ebm-papst can be run at normal or double speed. An electronic sensor measures the ambient temperature and adapts the speed of the fans to the respective conditions. At reduced speed, the maintenance-free ESM fans provide energy savings of up to 60 percent—which saves costs. Moreover, the fans generate very little heat and work quietly. An additional plus: They are very small and thus are an ideal addition to CO<sub>2</sub>-

based refrigeration plants, which require less space in general because of their smaller subassemblies.

**At the vanguard** Brognaro Poni needs space for other innovations that are outstanding features of his supermarket: for example, for recycling facilities for oil, paper, glass, metal and Tetra Packs, which his customers can bring to the store for processing. “We want to set an example with our new store. The investment in Jardim Canadá was about 15 percent higher than for our traditional stores, but we offer our customers state-of-the-art comfort and convenience while also doing good for the environment.” ○



**Green inside: Verdemar’s eco-friendly supermarket**



# Favourite of dentists

Separation systems from Dürr Dental feature high-performance VARIODRIVE motors — which are also extremely quiet



Many people still have amalgam fillings in their teeth. However, this filling material contains mercury and is not allowed to enter the wastewater stream. Therefore, the CAS 1 Combi-Separator from Dürr Dental AG has become the absolute

favourite of dentists. The double-stage system combines separation and amalgam separation. Through two hoses, the fluids from the mouth suction and the spittoon bowl reach the combi-separator, which separates the secretions from the air using a centrifuge and removes the mercury-containing amalgam.

This is integrated directly into the treatment chair. Unlike “wet” suction, only air is removed in this “dry” suction. Therefore, long hoses through which the highly infectious medium flows to a central separation unit are a thing of the past.

**Inner quiet** Most importantly, the patient hardly notices. In addition to the drive, this is ensured by a special sound dampening system in the housing. This is based on an EC external rotor motor of the VARIODRIVE Compact family with integrated electronics from ebm-papst. “An important criterion in selecting the drive is high running smoothness. Noise and heat should be kept to a minimum so as not to cause additional irritation to patients in dental practices,” Nonnenmacher emphasises. He was the Dürr project manager in charge of developing the combi-separator. Two of the unit’s features ensure the quiet performance that is needed: the centrifuges, which are injection-moulded with minimal tolerances, and the drive that is designed for running smoothness. However, the drive must also be highly compact, as only a small amount of room is available for the combi-separator in the treatment chair. The ebm-papst drive meets this requirement ideally — one of the reasons being that the design engineers have equipped it with a longer shaft. “Only this way was it possible to implement the combined separation,” explains Nonnenmacher.

**Fully adapted** The motor incorporates even more customer-specific changes. Instead of ferrite magnets, the drive for the combi-separator uses plastic-enclosed magnets. “This provides the advantage that the plastic-enclosed magnets were quieter,” Nonnenmacher elaborates. The drives communicate with the electronics of the treatment unit via an individually adapted interface: “This allows us to display levels or various operating states,” he emphasises. Because the medium extracted by suction is extremely aggressive and can react with untreated aluminium, the engineers from St. Georgen, in collaboration with the customer, have protected the motor flange with a resistant coating.

**Streamlined high-performance** The design is not the only feature that makes the combi-separator from Dürr Dental a streamlined solution. Its high efficiency is equally valuable. “Only a limited amount of energy is available at the treatment chair. Therefore, the energy demand is an important consideration in selecting the suitable drive,” project manager Nonnenmacher emphasises. Here, the numbers add up: “Compared to the previous motor, we were able to attain savings of over 20 percent.” This does not mean any sacrifice of performance. The Combi-Separator CAS1 attains a separation rate of some 98 percent, setting the clear reference in this market and providing reliable protection for our environment. ○

## The VARIODRIVE family

The VARIODRIVE and the VARIODRIVE Compact variant originate from basic elements of DC fans. Because EC drives meet even the stringent requirements of medical technology, they are used in the Dürr Dental CAS 1 Combi-Separator with amalgam separation and the CA 1 Amalgam Separator units.

### The outstanding features of these drives:

- 1 and 3-phase external rotor motors in 5 sizes
- High torque stability
- Low vibration
- Low-noise operation
- High efficiency
- Compact design
- Highly functional with integrated operating electronics
- Higher torque in conjunction with gearmotors of different shapes and sizes



*Efficient concepts for ventilation make the permanent data-transfer of smartphones work*



## FANS FOR THE MOBILE

Fans play an important role in mobile phone communications

Though they work behind the scenes, the task of the fans is all the more important: they ensure that the systems in the network operators' nodes do not overheat. Around the world, countless control cabinets lay the groundwork for data traffic: They relay phone calls between the mobile and land line networks or transport data, even across long distances.

For years, telecommunications providers have used DC fans in these cabinet-sized units. "Compared to AC technology, these fans are very powerful and energy-efficient," says Stefan Schneider of Fan Product Marketing at ebm-papst. "Therefore, the benefits of a switch to EC fans would not justify the effort and expense." Despite this, increased efficiency is always at the very top of customers' wish lists. "With innovative aerodynamics and motors and electronics technologies in our S-Force generation of fans, we were able to obtain a double-digit increase in efficiency." Moreover, it is important that the fans have high electromagnetic compatibility so that they do not interfere with telephone signals.

This is becoming more important all the time, as the volume of data has been growing exponentially for years. In 2009 alone, worldwide data traffic was some 40 million gigabytes—an increase of 247 percent over the previous year. Thanks to smartphones, people use their mobile phones not only to make calls, but also to send e-mails and stream videos online. This growth trend has long been visible around the world and is by no means limited to the leading industrial nations.

**Withstanding wind and rain** In the frozen tundra of Russia and the Sahara desert, developers have to focus on another aspect: weather-resistance. Mobile phone transmission towers, known as base stations, have to deliver the same level of constant output, even under drastically harsh conditions. These fans are adapted specifically to these operating conditions. "For outdoor installations, we use DC fans that we have tested thoroughly," Schneider says. Therefore, devices from ebm-papst can cope with extreme temperatures equally well as with precipitation or salty air in coastal regions. ebm-papst regularly outperforms the applicable industry standards in these areas. ○

*Enno Vrolijk shows how the new safety valve adds to gas blower*



## Giving gas

ebm-papst is taking over a product group from heating unit manufacturer Dungs and expanding its position as a system supplier

By acquiring a small but important component, ebm-papst can now offer its gas blowers as complete systems. The component is a safety valve for regulating the gas supply. In this process, it directs the gas from the distribution system into the heating unit. The acquisition of the gas safety valve product group from Karl Dungs GmbH & Co. KG at the start of Fiscal 2011 completes an entire series of strategic acquisitions in the heating engineering sector. The acquired line of business includes not only existing product groups, but also technical expertise from Dungs, providing a foundation on which developers can build for future parts. For ebm-papst, this is an important step towards growing into the role of a system supplier in the heating and condensing boiler sector. "This acquisition is a response to the needs of our customers," explains Enno Vrolijk, the Product Line Manager responsible for heating systems at ebm-papst. "Market trends are clearly heading in the direction of solutions from a single source."

This strategic repositioning offers a number of benefits to customers. The most important of these is obvious: A complete system can be put into operation immediately after it is delivered, with all necessary components built right in. This also means less administrative effort. The customer now has

only one supplier for a device, who is familiar with each individual part. This is particularly practical for later maintenance or upgrades to the machine. The benefits are also noticeable in the efficiency calculation: If the components of a complete system are optimally matched to each other, they make better use of fuel, thus increasing efficiency. "A welcome side effect of this is that the complete system generates lower noise and pollutant emissions," adds Vrolijk. "The more compact design also improves the power density and electrical input capacity." Ultimately, all of these factors result in significant cost savings.

A complete system means higher performance, but also places higher demands on the developer. Vrolijk was conscious of this responsibility. "We proceeded with the greatest caution during the acquisition, making sure the products were a perfect fit for us." The critical factor for deciding in favour of Dungs valves was their high degree of reliability and their versatility for various applications. They are particularly suited for applications of small appliances in the private household. Thus the components fit seamlessly into the ebm-papst concept and were able to be combined quickly with the existing gas blowers. Production of the complete systems is already scheduled to start in April of this year. ○

# Big car, smaller emissions

The Controlled Piston from FTE helps vehicles save energy — using ECI motors from ebm-papst

Usually, when we think of V8 lorries and SUVs, the first thing that comes to mind is their size—and high fuel consumption. However, models are also available that use little fuel relative to their weight and horsepower—and thus also have lower carbon dioxide emissions. A Controlled Piston (CP) from FTE automotive plays a critical role in helping these vehicles save fuel. Wherever automation of hydraulic clutch operations is required, the electrohydraulic actuator unit provides high efficiency over a wide pressure and volume range. The prerequisite for this is a highly accurate drive—such as the ECI motor from St. Georgen. We might say that it puts the “Controlled” in “Controlled Piston.” The ECI provides an ideal starting point for this application, as it is highly dynamic and thus can move to the necessary positions with great accuracy.

**High-precision switching in lorries** The lorry’s gear shift mechanism uses a ECI 76.45. The fully automated clutch switches gears much more

quickly, accurately and smoothly than previous models. This is not only more pleasant for the driver, it also saves fuel. For example, the gear shift mechanism allows downshifting at an early stage when driving uphill, making it possible to maintain speed without using more petrol. Basically, the engine actuates the piston of the CP only if the driver is actually switching gears. In the old pneumatic system, a constant supply of pressure had to be provided. This would not be possible without the fast and accurate activation by the ECI motor. However, the motor also has to withstand some tough conditions: vibration, heat and cold over endless kilometres. “Over its service life, the lorry goes through millions of gear shifts,” says Peter Metzger, Automotive Sales Manager at ebm-papst St. Georgen, illustrating the challenge. “During this entire time, the motor has to withstand extreme mechanical and thermal loads.” The brushless ECI motor is ideally suited to this task.

The highly complex control system also has to withstand these loads. The integrated electron-

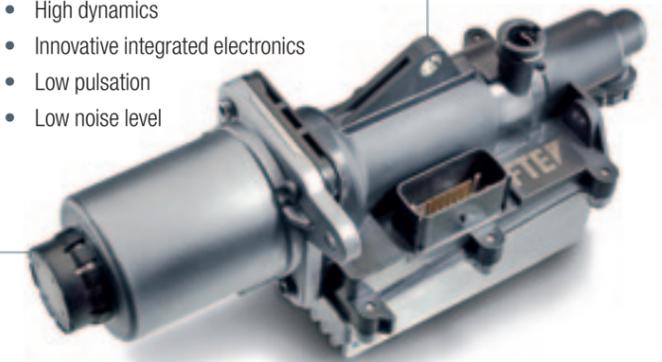
## Controlled Piston (CP)

The CP electrohydraulic actuator from FTE automotive is an actuator unit for use in clutches and hybrid applications. It enables highly dynamic hydraulic applications to be implemented in the area of mobile drives.

The central element of the CP is the ECI brushless DC motor from St. Georgen. It drives a recirculating ball screw spindle that moves a hydraulic piston for pressure generation and volume displacement.

**Therefore, the CP provides the following advantages:**

- High overall efficiency
- High dynamics
- Innovative integrated electronics
- Low pulsation
- Low noise level



ics are a joint development of ebm-papst and FTE. The centrepiece is called “flex technology”: in a certain area, the printed circuit board can be bent by up to 180 degrees and folded together. This enabled FTE automotive to integrate the electronics into the CP module in a space-saving manner.

**Smooth transitions in the hybrid** The intelligent control system for operating the CP in large sportscars also presented a great challenge. The result of the co-operation of FTE and the developers in St. Georgen: “Fully integrated, four-wheel drive compatible control of the entire powertrain, which comes together in our control system—and is one-of-a-kind on the European market.”

In this car, the CP system actuates the cut-out clutch and switches the different operating modes. The parallel full hybrid provides the cars with petrol-sipping power, but thanks to the intelligent electronics, this does not mean any less performance or driving dynamics. For this purpose,

the control system uses either the combustion engine or the electric motor or a combination of the two. The electric drive keeps the car moving with zero emissions at speeds up to 50 kilometres per hour in city traffic, but also maintains the car’s speed while cruising on the motorway. If the driver spontaneously needs to use the full engine output, the combustion engine and electric motor provide a simultaneous boost. The individual operating states have to be closely matched to each other. This is carried out by the CP, an intelligent control system that shifts gears so smoothly that the car’s occupants do not even notice it.

At the heart of the hybrid CP, an ECI 56.45 actuates the piston. The “little brother” of the lorry motor, it is located in the wheel well along with the module, remaining quiet and inconspicuous. “During development, we tried out different lubricants to decrease the already low noise even more,” reports Metzger. Thus the small, smart drive not only helps the vehicles attain lower emissions, it also makes driving more fun! ○



Dipl.-Ing. (FH) Jens Krotsch  
Head of Advanced Development  
Drives at ebm-papst Mulfingen

## Low-noise fan drives

Only drive components that are perfectly matched to each other deliver optimum results

Noise behaviour is a critical feature of fan drives. Fans are used in a wide variety of different devices and installations that have individual structure-borne vibration characteristics. The usual procedure for avoiding resonance by matching the natural oscillation and excitation is often not effective for these variable-speed drives. Secondary measures such as mechanical decoupling are device-specific and incur extra costs. Therefore, this application calls for a solution with robust noise reduction and low vibration excitation, which provides good results in various specific applications.

Three-phase asynchronous motors work with a sinusoidal power supply with low vibration and noise. Problems can occur in speed setting due to current harmonics caused by the speed controller. Continuous and low-noise speed setting performance requires operation while connected to a well-adjusted frequency inverter. In this case, the EC motor is the preferable solution from an economic perspective. Though the motor's vibratory behaviour is not always optimal due to the design principle, ebm-papst considers this an opportunity to develop particularly low-noise EC drives.

**For EC motors,** we distinguish the causes of noise and vibration excitation between alternating forces caused by permanent magnets and those caused by electromagnetic effects. For example, the slots of the stator cause a variable magnetic air gap permeance which, in conjunction with the permanent magnet field excitation, generates torque fluctuations known as cogging torque. The commutation of the currents in the windings can also cause elec-

tromagnetically induced fluctuation. In addition to the torque fluctuation, the forces acting on the rotor in a radial direction are also of great importance.

The motor and commutation electronics likewise have an effect on the noise behaviour. ebm-papst develops and produces both drive components as one unit—an important requirement for an optimal drive system.

Thanks to a beneficial combination of the number of slots and poles and a special sheet steel and magnet geometry, the cogging torque of the ebm-papst motors is less than 0.5 percent of the rated torque. Conventional motors have cogging torque between 5 and 8 percent. In addition, a method of current commutation is used that is specially optimised for fans. This provides an ideal compromise between low vibration and high efficiency.

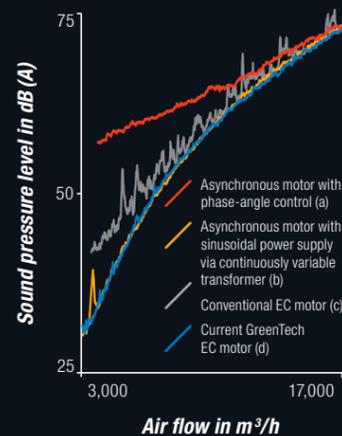
**Optimising the motor** and commutation electronics together makes it possible to improve the vibration and noise behaviour of our EC motors dramatically. Today's drives provide excellent results, even in sensitive applications. Normally, no additional specific measures are required, decreasing the application effort substantially. ○



The W3G800 profits from perfectly matched drive components

### Noise comparison

The noise comparison shows a three-phase asynchronous motor with speed that has been changed via phase-angle control (a) and using a continuously variable transformer with the ideal sinusoidal power supply (b). For comparison, the curves of a conventional EC motor (c) is shown. The current GreenTech EC motors (d) attain values comparable to the three-phase asynchronous motor in its most favourable operating case



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**HARFKO**, Seoul, 16–19 March 2011  
**Hanover Messe Industrie**, Hanover, 4–8 April 2011  
**China Refrigeration**, Shanghai, 7–9 April 2011  
**Auto Shanghai**, Shanghai, 21–28 April 2011  
**Green IT Expo Japan**, Tokyo, 11–13 May 2011  
**Aqua-Therm**, Kiev, 16–19 May 2011  
**IAA**, Frankfurt, 15–25 September 2011  
**FEBRAVA**, São Paulo, 20–23 September 2011  
**Elkom**, Helsinki, 4–6 October 2011

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#### Termine

**Fiscal year press conference ebm-papst**, Stuttgart, 10 May 2011  
**16. ebm-papst Marathon**, Niedernhall, 11 September 2011

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**A new generation of air/water heat pumps**

**Frequency inverter cooling calls for properly matched fans**

tech.mag 1/2011 is available from the middle of March 2011.

Contact our sales team or e-mail  
Corinna.Schittenhelm@de.ebmpapst.com.

# Small cells, big effect

Four donors in three years—this is the result of a type-matching campaign at ebm-papst in Mulfingen

In autumn 2007, three trainees found out that the son of a colleague was ill with leukaemia. They spontaneously organised a type-matching campaign for the Association of German Bone Marrow Donors (DKMS). 370 ebm-papst employees registered. Since then, the campaign has already identified four suitable bone marrow donors, who have helped sufferers with their donations. Thus, within three years the quota applying to all of Germany was achieved at ebm-papst in Mulfingen alone: Roughly one per cent of all those tested actually become donors. Three employees have already donated stem cells, the fourth is waiting to start.

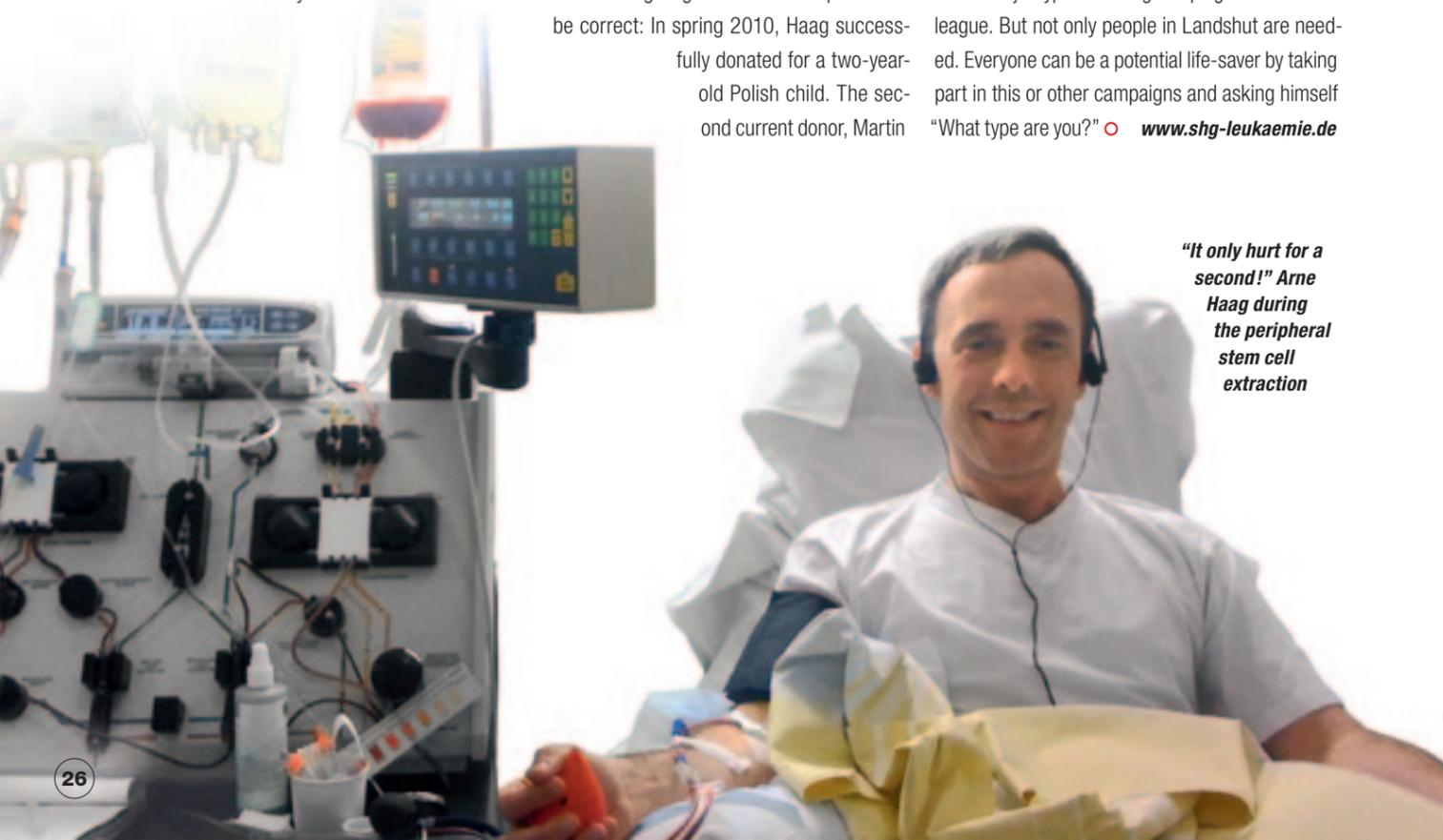
**For the two latest donors,** Arne Haag and Martin Münz, the stem cell donation was a real challenge—but also a very good experience. Just the decision itself as to whether to become a donor or not was initially very hard for Arne Haag. For the extraction of stem cells may also involve certain

health risks for the donor. “Until you realise that you really are about to be a donor, you don’t give it too much thought. Only then did I ask myself what it really means for me”, is how Haag describes his thoughts. “After all, the medical intervention is not totally without risk.” Nevertheless, he decided to become a donor. For extraction, Haag chose the so-called peripheral stem cell collection method. Here, a medicine flushes the stem cells out of the bone marrow and concentrates them in the blood, from which they are filtered by a special system. The intervention is on an outpatient basis, the donor can work on the following day. However, the medicine taken is not without risk, it was originally developed for leukaemia patients. “You are taking a medicine against an illness that you yourself don’t have. This makes you feel a little uneasy. Also with regard to the side-effects, such as chills and back pains.” However, the desire to help others overcame all misgivings. The decision proved to be correct: In spring 2010, Haag successfully donated for a two-year-old Polish child. The second current donor, Martin

Münz, never had any doubts: “The thought that I might save a life gave me no alternative.” But also his donation involved certain challenges. he had no choice regarding the extraction of his stem cells: For him, only direct extraction from the pelvic crest, where the concentration of stem cells is very high, came into consideration. “This method is only used when the situation is already very critical with regard to the leukaemia patient. I didn’t dare ask any more details.” The risk from the required general anaesthetic did not unduly worry Münz, as everything had all gone smoothly for his two previous operations under general anaesthetic. However, just before the appointment for the operation, he found out that his donation had to be delayed because the leukaemia patient was in a life-threatening condition. “I had really been hoping to be able to help the ill person, and now I was really worried.”

In January, ebm-papst in Landshut too is to start a major type-matching campaign for a sick colleague. But not only people in Landshut are needed. Everyone can be a potential life-saver by taking part in this or other campaigns and asking himself “What type are you?” [www.shg-leukaemie.de](http://www.shg-leukaemie.de)

*“It only hurt for a second!” Arne Haag during the peripheral stem cell extraction*



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“ China is a blend of the old with the new. You can witness the intersection of both in Shanghai. Looking across the river from Puxi you see the old Shanghai with the background of the new and growing area of Pudong. While China works to retain much of its history and culture in daily life there is no stopping the pace of development you can see all over the country. That pace in China is fast and with 1.3 billion people and over 650 cities with populations greater than one million, the opportunities are plentiful for ebm-papst. As I look into the future of China I see similar changes for ebm-papst with new markets for us to reach. We are a part of the change going on in China today. ”

# What is it?

# Significant.



# 100%

of our GreenTech EC fans already exceed the requirements of the ErP limits planned for 2015.

GreenTech represents our demonstrable commitment to protecting our climate. ebm-papst EC fans with the GreenTech label not only already exceed the requirements of the planned EU directive for fans, they also feature impressive environmental performance thanks to sustainable development and production. Numerous environmental awards confirm this. It is no accident that their enormous energy saving potential has benefits not only for the environment, but also for the user. After all, this is our firm conviction: every new product must exceed the economic and ecological performance of its predecessor. Want to find out how do we do it? [www.greentech.info](http://www.greentech.info)

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