

Taking care ...



Growing forests

for climate
protection

Heat pumps

for
modernisation

Start-up support

Vaillant
Founders' WORKSHOP

...
of a better
climate.

Inside each home and
the world around it.



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OVER

€3

BILLION IN REVENUE

The 2021 financial year was very successful for the Vaillant Group despite the pandemic. The company continued on its course of growth. Sales revenue increased by about 20 per cent and exceeded the €3 billion mark for the first time.



Coping with Brexit

The trade and cooperation agreement between the EU and the UK has been in force since 2021. For the Vaillant Group, with a plant and sales companies in the important heating technology market of the UK, this has far-reaching consequences: new customs regulations, adjustments in the supply chains and in operational processes. Changes also affected the functions Finance, IT, Tax and Human Resources. Thanks to a great team effort and months of preparation, the Brexit transition turned out to be successful.

Klaus König takes over Industrial Division

The Vaillant GmbH Supervisory Board has appointed Klaus König as a managing director of the company with effect from 1 February 2022. He will take over the Industrial Division from Dr.-Ing. Norbert Schiedeck, who has been heading this division since 1 January 2021 on a transitional basis in addition to his function as Chairman of the Management Board of the Vaillant Group.



WORTH KNOWING

"Can't do it? Yes, you can!"

Vaillant Germany has launched a heat pump modernisation competition. The most challenging refurbishment properties in Germany are being searched for: detached and multi-family houses in which the installation of a heat pump is a great challenge even for the best HVAC professionals. Vaillant

offers the heat pumps free of charge and pays a large part of the installation costs. The installation of the heat pumps is documented on film and on social media channels.

The purpose of the heat pump modernisation competition is to prove: "Can't do it? Yes, you can!"



2 million Vaillant heaters in China

The Vaillant China National Dealer Conference was held in Chengdu, China, in September 2021. Due to low infection rates, around 700 sales partners and dealers from all parts of the country were able to attend the meeting – by far the largest event within the Vaillant Group last year. The management of Vaillant China had good news: the mark of two million wall-hung gas heating appliances sold was exceeded. This means that sales in China have doubled in just four years.



First COVID-19 vaccinations at the Vaillant Group

On 10 June 2021, the Vaillant Group vaccination campaign kicked off. First, colleagues from the plants received the offer of a coronavirus vaccination, as they did not have the opportunity to work from home. Over the course of the year, all employees received vaccination offers for initial, second or booster vaccinations in cooperation with the occupational health physicians.

Demand for heat pumps remains strong. This trend benefited the Vaillant Group more than others. Sales revenue growth last year reached 56 per cent. The reasons for this are the expansion of the product range and the strong interest in the new Vaillant aroTHERM plus heat pump, which is also suitable for the renovation of existing buildings.

WORTH KNOWING

Heat pumps from the UK for the UK

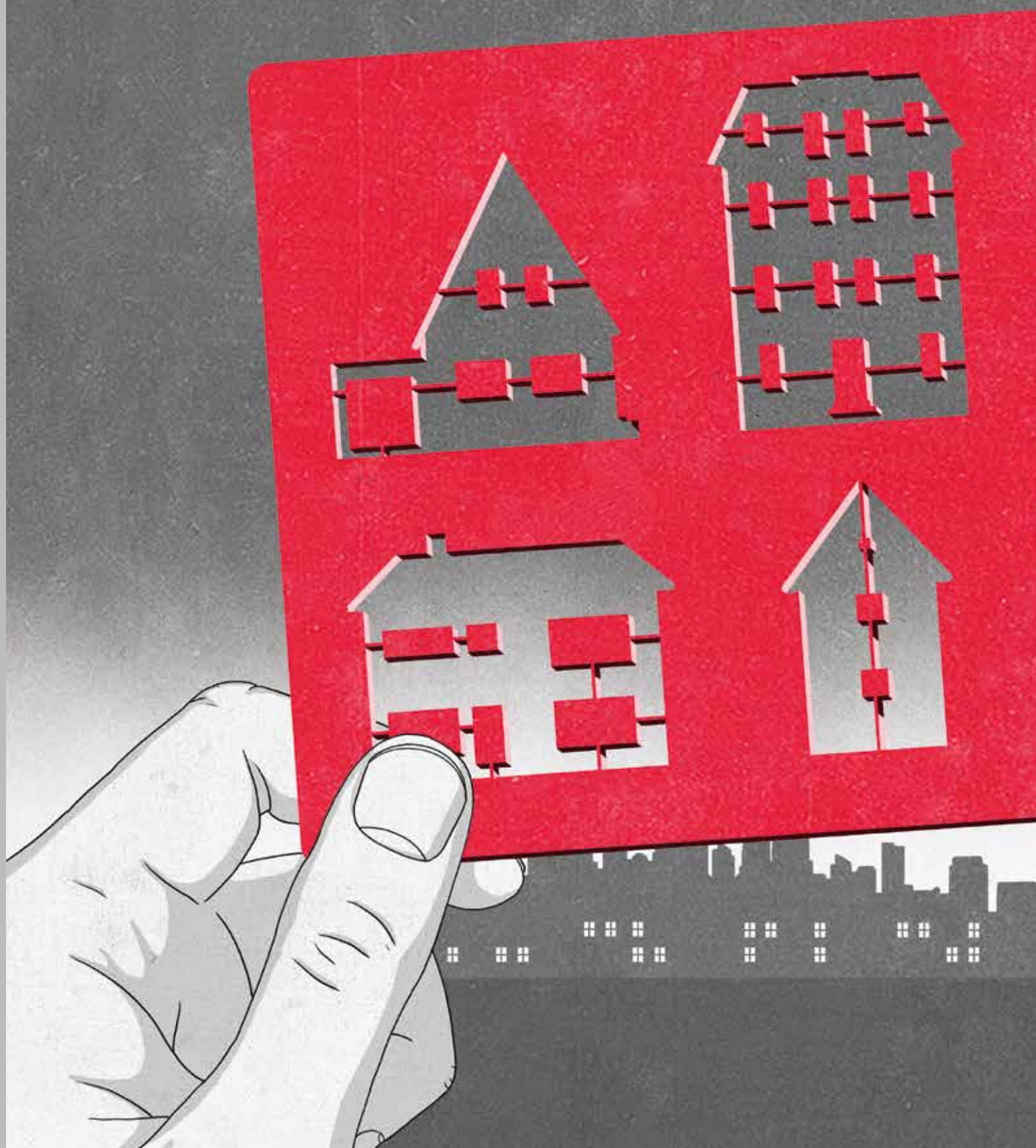
In 2022, production of heat pumps will start at the Belper plant in England. Around half a million natural gas and liquid gas appliances are manufactured annually for the British market at the site. Now production is being expanded to include the aroTHERM plus air/water heat pump.

Vaillant Group UK is one of the few heating appliance manufacturers in England that produce both high-efficiency gas heating appliances and heat pumps. The British government has set a target of having 600,000 heat pumps installed in the UK annually by 2028.



Vaillant supports SOS Children's Villages

The Vaillant Group has been supporting "SOS Children's Villages worldwide" since 2013. So far, 74 villages of the charitable organisation in 23 countries benefitted from the partnership, either in the form of environmentally friendly heating technology or social projects. In 2021, the French sales company successfully added another five projects – in Marange, Carros, Calais, Marseilles and Plaisir.



FACTS AND FIGURES

Modernising with heat pumps

Technically feasible
and ecologically smart



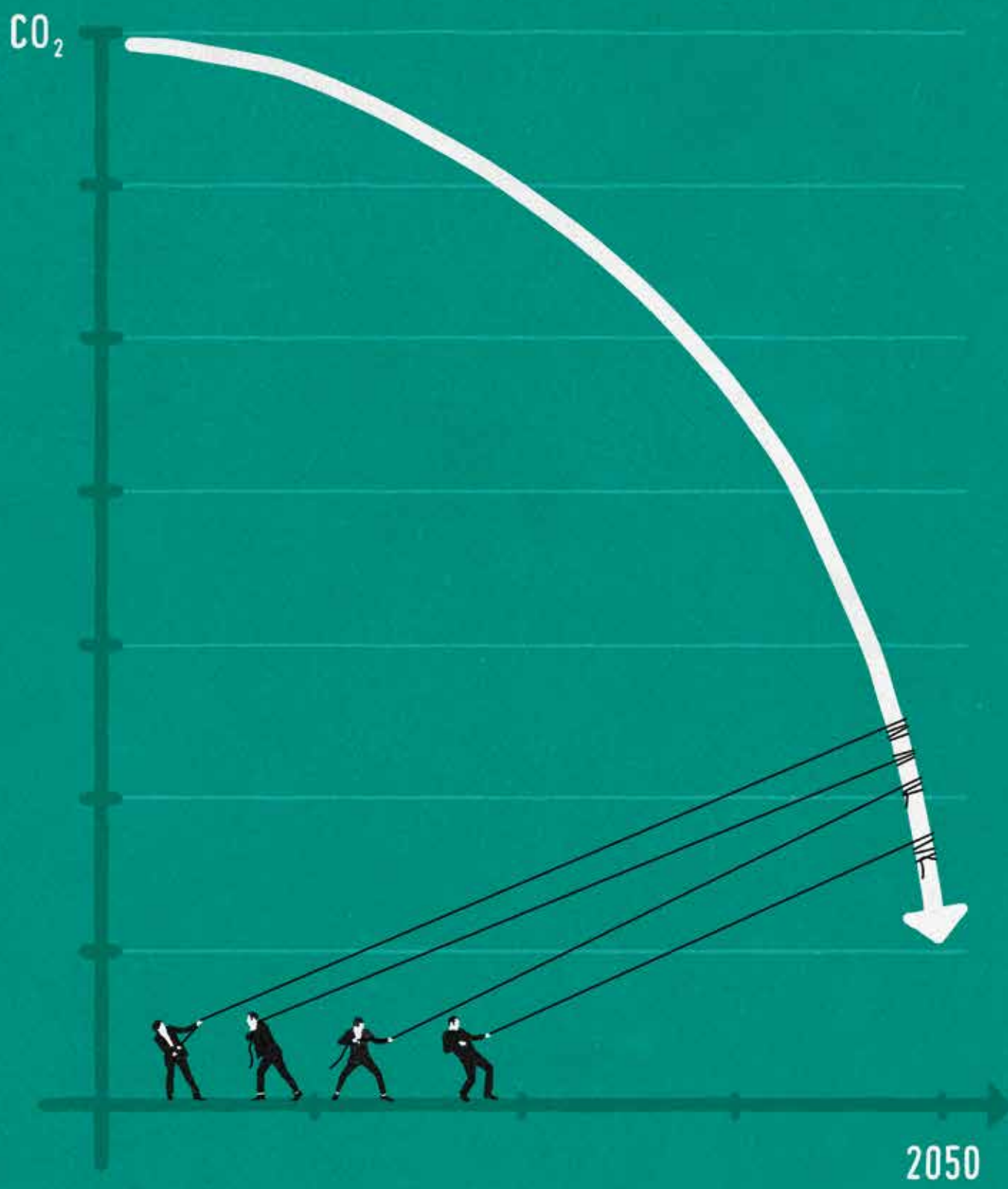
Heat pumps have long been the first choice for new buildings. But not yet for refurbishment. It is becoming ever clearer though that heat pumps are also reliable, environmentally friendly and energy-efficient in older buildings.

EUROPE: THE FIRST
CLIMATE-NEUTRAL CONTINENT

Zero emissions by 2050

The EU wants a gradual decarbonisation. Net greenhouse gas emissions are to come down by at least 55 per cent by 2030, measured against the reference year 1990. That is quite ambitious. To achieve the reduction target, savings must be doubled in the next eight years. Emissions are then to fall to zero by 2050.

In the building sector, the existing housing stock must become more energy-efficient, less CO₂-intensive and more sustainable. After all, in order to achieve the emissions target for 2030 alone, it is necessary to reduce greenhouse gases from buildings by 60 per cent, bring down their energy consumption by 14 per cent and reduce energy consumption for heating and cooling by 18 per cent. The aim is to achieve this by installing as many heat pumps as possible, which are operated on the basis of renewable energy from the environment and green electricity. The heat pump market is already growing throughout Europe. By 2030, 40 per cent of all residential buildings and about 65 per cent of all commercial buildings will be heated with electricity. Most of these buildings will then use heat pump systems.

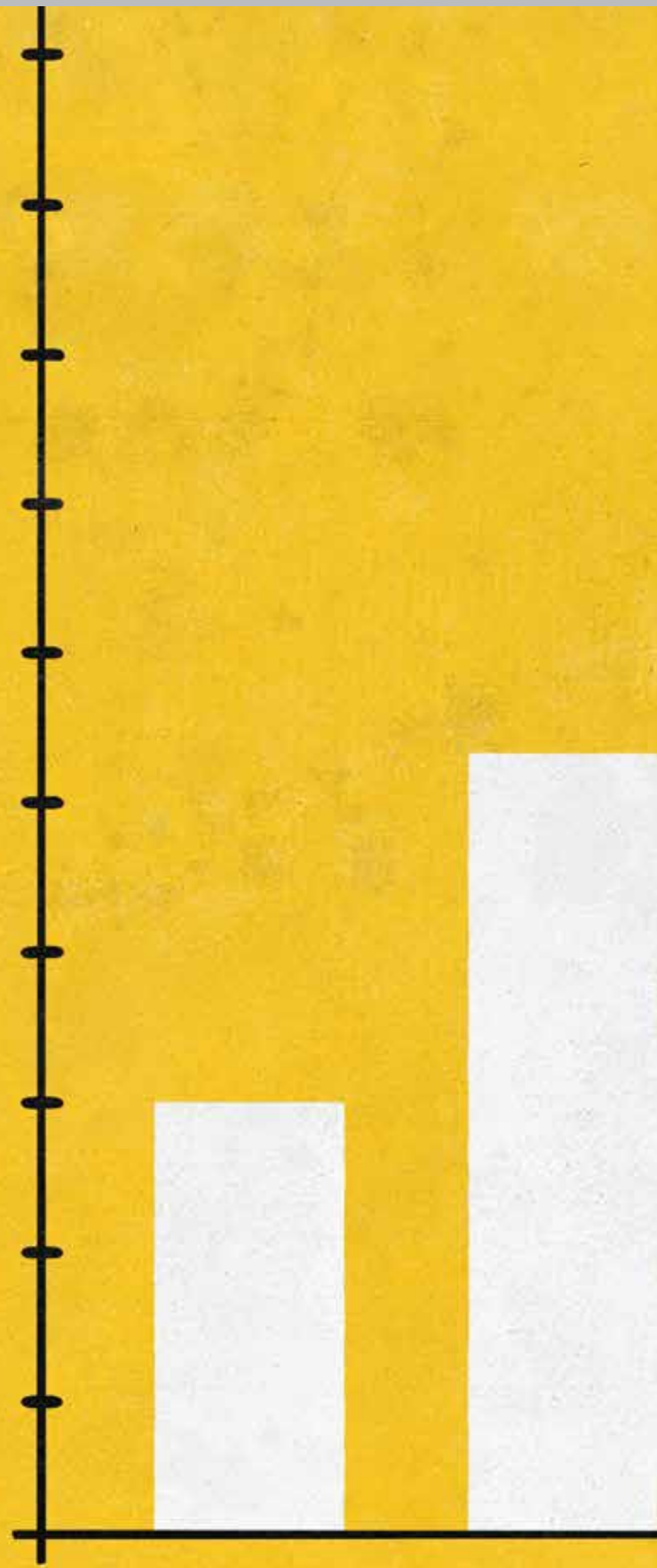


HEAT PUMPS HAVE A TAILWIND

Dynamic growth for years

It took ten years for the number of heat pumps installed in Europe to double from an initial 800,000 units to 1.6 million units. Then, in recent years, sales volume has accelerated sharply. No other technology is growing faster than heat pump technology.

In Europe, the heat pump market is mainly driven by the Scandinavian countries and the large markets in Central Europe. The European Heat Pump Association (EHPA) forecasts a prospective annual sales volume of around 6.8 million heat pump units in Europe. This does not seem unrealistic with an actual 1.62 million heat pumps sold in 2020, a new sales record – despite the many challenges in material procurement and throughout the supply chains during the COVID-19 pandemic. The number of heat pumps installed throughout Europe today is around 15 million units.





Europe trailing behind Asia and the US

China, Japan and the US account for the largest share of global heat pump sales. According to figures from the International Energy Agency (IEA), around 80 per cent of new heat pumps were installed in these three countries. The remaining 20 per cent of demand comes from Europe. However, the analysis includes both water- and air-led distribution systems. In Asia, air-led systems dominate. In Central Europe and Scandinavia, water-led systems, which can transport more thermal energy, are used more often for space heating.



HEAT PUMPS IN FRANCE, GERMANY AND THE UNITED KINGDOM

A look at the countries

The heat pump is gaining in importance across national borders. In France, heat pumps now account for a quarter of the total heating market. In Germany, the number reaches 15 per cent. Its share of the British heating market is currently still below ten per cent. One common feature, however, is the great market potential for heat pumps in the renovation of existing buildings.

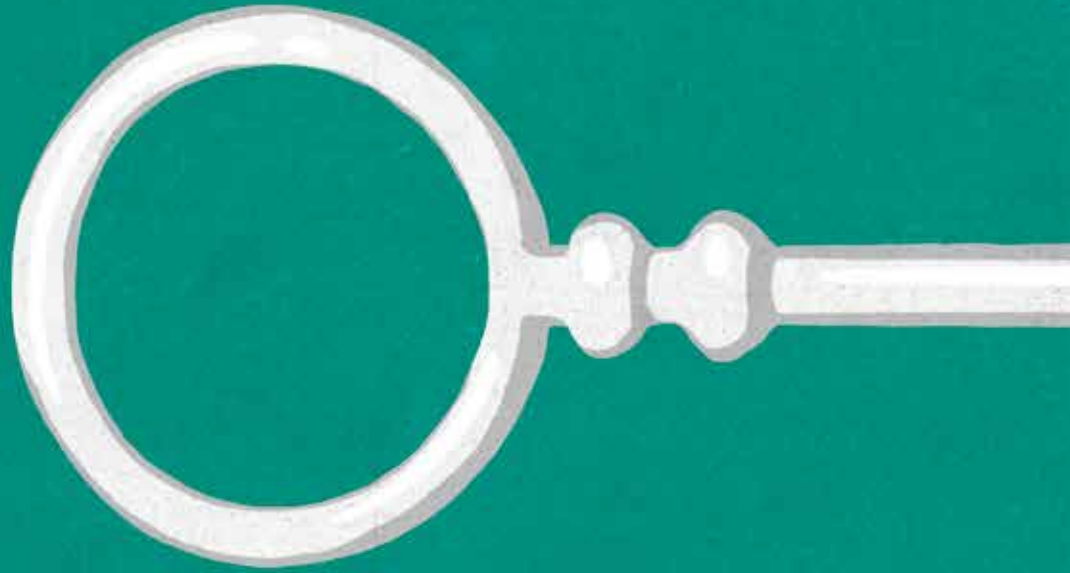
France has cheap electricity. The country relies on nuclear power for 70 per cent of its supply. This makes the electric heat pump an economically very attractive solution for French consumers. In Germany and in the UK, on the other hand, the price of electricity is much higher. Electricity is partly imported from abroad. And there are dark periods – times when no green electricity can be produced because of a lack of wind and sunshine. A look at the heat pump-strong Scandinavian countries also shows that cheaper electricity makes heat pumps attractive. Today, almost one million houses in Sweden alone are equipped with heat pumps. Electricity is not only less expensive than in many other European countries, but it is also largely generated from wind and hydro-electric power.

Subsidies as a booster

Statutory regulations and subsidies are accelerating growth in the heat pump market. Heat pumps are also gaining in importance in the United Kingdom, which has a strong gas market even in the new construction sector. The British government has launched market incentive programmes and subsidises the replacement of old heating appliances if they are exchanged for heat pumps.

Germany is also focusing on promoting heating technology based on renewable energies – including heat pumps. By the end of 2021, funds of over €11 billion were available in Germany for energy-efficient building renovation – a record figure. €9.5 billion are earmarked for the 2022 financial year.





HEAT PUMP WITH R290

The refrigerant is key

Older buildings usually have a higher energy demand. A house that was constructed several decades ago has a weaker insulation of the roof, cellar ceilings, doors and windows, often way below today's standards. And when it came to heating technology, the only question at the time of the house's construction was: would you rather heat with gas or with oil? Today, this usually means that the heat pump must replace a gas or oil heating system and the heat is delivered to the rooms via conventional radiators. The required flow temperatures are therefore higher.



Without additional knowledge of installation and maintenance

Natural refrigerant enables higher temperatures

Refrigerants are liquids that can store, transport and release thermal energy. In order to use a heat pump in modernisation, the highest possible flow temperatures are desirable. That is why the Vaillant Group employs the refrigerant R290 for the heat pumps Vaillant aroTHERM plus and Saunier Duval GeniaAir. This is because R290 has special thermodynamic properties that enable higher flow temperatures and therefore make it possible to use the air/water heat pumps with radiators without any problems. There is also a second advantage: R290 is a natural refrigerant and environmentally friendly. This is measured in terms of global warming potential (GWP). The value of R290 is 3. With other refrigerants, this figure can be over 2,000.

The Vaillant Group makes sure that the installation of heat pumps is as uncomplicated as can be for partners in the trade. Handling the refrigerant R290 does not require any special training. The refrigeration circuit is a closed system. No refrigeration certificate is required for installation and maintenance of the heat pump.

HOW MANY HOUSES ARE FIT FOR HEAT PUMPS – THE EXAMPLE OF GERMANY

Suitable more often than expected

Up to now, there has been little information about how great the modernisation potential is in Germany for older detached and terraced houses with regard to the use of heat pumps. To better assess this, Vaillant has carried out a market evaluation based on statistical data and published studies.

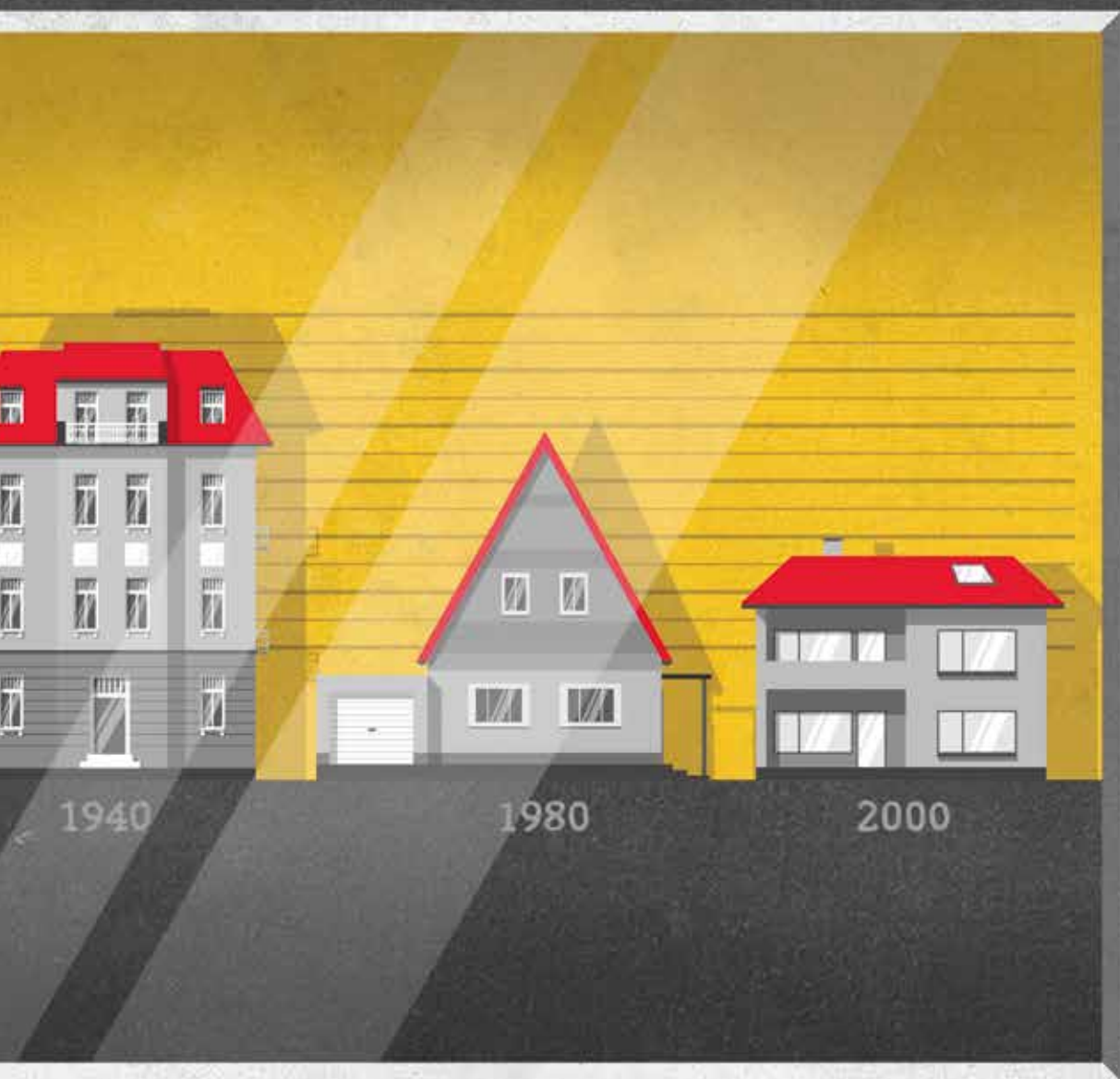
The classification of buildings by age and type is based on energy consumption and building technology aspects. A grouping is made into so-called "Hausonas". A distinction is drawn between non-core-renovated detached houses built up to the end of the 1970s, from 1980 onwards and from 1990 onwards. A further category consists of core-renovated detached houses and those built from 2002 onwards. The last group consists of non-core-renovated terraced houses of any vintage.

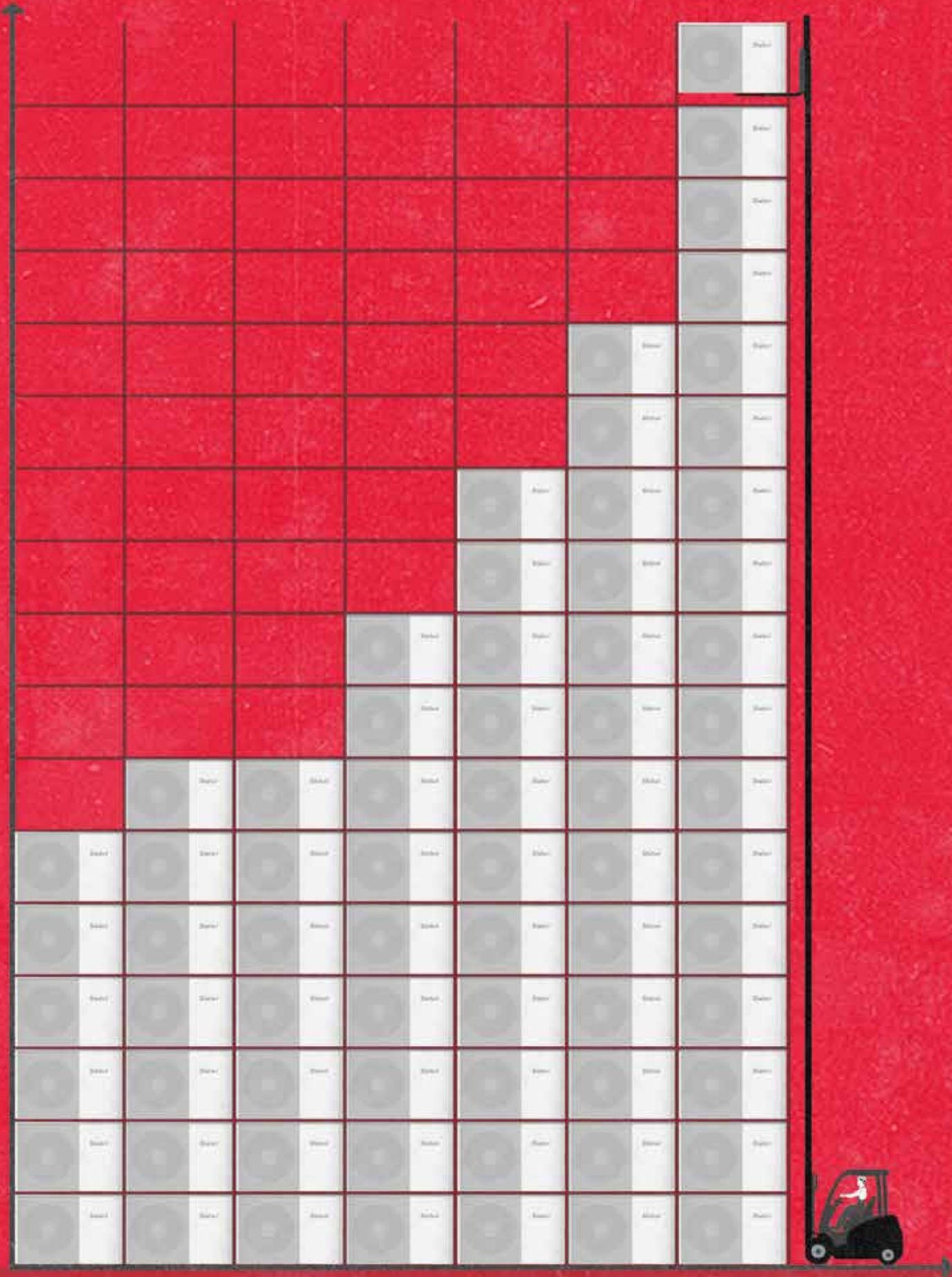
In buildings that were constructed after 1990, a heat pump can usually be installed without replacing radiators or taking measures to insulate the building. In many older buildings, it is advisable to replace the radiators and insulate the building's outer shell when adding a heat pump.

Support for HVAC partners

The know-how of installers and their communication with manufacturers play an important role in assessing whether a heat pump is suitable for modernising a house. Vaillant therefore provides trade partners and customers with information in the form of guidelines and calculation tools. The Hausonas are meant to provide an overview for the initial classification of the property.







EXPANSION OF VAILLANT GROUP HEAT PUMP PRODUCTION

Meeting the demand

The heat pump business is a strategic priority for the Vaillant Group. Annual sales increases amount to more than 50 per cent. To gain further market share, investments are flowing into the expansion of production in several countries at once.

In the company's international manufacturing network, the production volume of heat pumps increased many times over between 2010 and 2020. And within the next five years, capacities will continue to grow massively.

Gradual expansion

Heat pump lines have already existed at the German plant in Remscheid since 2018. Here, the proximity to the research and development centre, the Johann Vaillant Technology Center, is advantageous: synergies are created through the interaction between development and production. Several new production lines have also been commissioned at the French site in Nantes. At the British Belper plant, additional production capacities are currently being created for the market in Britain. Plans for further expansion are already under way.

Heat pump specialists

The Vaillant Group is not only expanding its technical capacities in heat pump production – but also the skill sets of production employees. After all, they need to be highly trained for the manufacture of the exceptionally efficient technology. Work on the refrigeration circuit requires specialist knowledge and specific qualifications. The production team therefore attends training courses lasting several weeks and regular workshops.

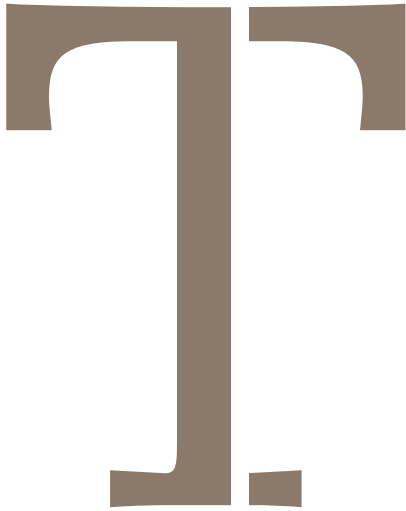


"WINE FLOWS IN OUR VEINS"



A woman with brown hair tied back, wearing a dark blue t-shirt and white gloves, is shown in profile, focused on harvesting green grapes from a vine. She is using a pair of pruning shears. The background is a lush vineyard with green and yellowing leaves, suggesting late summer or early autumn. The lighting is bright and natural, creating a warm atmosphere.

Southern Styria is the highest wine-growing region in Austria and one of the most charming landscapes of Europe. On more than 2,700 hectares of vineyards, mainly white wines are cultivated in the region. The best way to experience them is in local restaurants.



he market town of Gamlitz, near the Slovenian border, is one of the largest wine-growing areas in Styria and has made a name for itself with its award-winning wineries. The place name is said to go back to the word “gomilnitz” – derived from the Slavic “gom” (hill). Here, in the middle of the Gamlitz wine landscape, lies the *Weinschmiede* 18 of Bettina and Gustav Strauss. A cosy *Buschenschank*, with a sense for the essential.

But first things first: the *Weinschmiede* (lit. wine forge) is located on the premises of the Tscherne winery, which was founded in 1772. The estate looks back on a history that is just as old as that of the two vintners, whose families have been involved in wine-growing for many generations. “The origin of our work lies in the family business ‘Weingut Strauss’, the parent house on the Gamlitzberg, which is run

by Gustav and his brother and stands for a high-quality wine assortment. It has been in the family since 1810 and is one of the largest connected vineyards in southern Styria,” reveals Bettina Strauss, who with her husband Gustav acquired eight hectares of land in the immediate vicinity of the original winery for their *Weinschmiede* project in 2018. There, on the so-called “Ried Hundsberg”, they planted new vineyards, renovated the historic buildings of the Tscherne winery and brought the place back to life.

A combination of old and new

Nothing was left to chance in the structural renovation of the winery – consisting of the manor and former stables. In every area, the aim was to create a harmonious combination of old and new. One might say a well thought-out mix of originality, comfort and new staging. “There is a lot of love for detail in the design of our rooms. For example, we have integrated the old roof truss into the new building and used original tiles in the wine vault. In this way, we were able to reuse old stock in a meaningful fashion. However, the overall appearance only became coherent for us through the combination with timelessly modern elements. For example, the use of generous glass surfaces. They allow our guests to immerse themselves in the magnificent natural panorama – even from their beds,” says Bettina Strauss.

The view from the *Weinschmiede* over the extensive vineyards is impressive. From a technical point of view, however, it is also worth taking a look below ground. For the unique feel-good ambience, not only were the historic buildings lovingly revitalised, but the entire refuge was made fit for the future with environmentally friendly heat pump technology from Vaillant.

“We didn’t have to do any convincing for our system in this project,” reveals Vaillant project manager Martin Moder. From the very beginning, it was clear that there should be a sustainable

solution for the *Weinschmiede*. “Gustav Strauss was already able to gain experience with our heat pump technology in his parents’ house and has valued us as a reliable partner and competent advisor for many years.”

Ground collectors in the vineyard

The requirements in the hilly terrain were special, even for the experienced Vaillant team. In the search for the optimal solution for heat generation, the possibilities were examined in detail. Deep drilling in an area where coarse-grained gravel, clayey silts, sands and marls characterise the soil



“The origin of our work lies in the family business.” Bettina Strauss

The vineyards of the Tscherne winery are located on the so-called "Ried Hundsberg".



Weinschmiede 18 already existed in 1772 as the Tscherne winery. A complete revitalisation turned the old farm into a modern place of comfort.



Winemakers Bettina (left) and Gustav Strauss are passionate hosts. Together with Martin Moder from Vaillant (right), they realised the heat pump project. The ground collectors are laid between the vines.



Among other things, the heat pump and the buffer storage tank were installed in the utility room. A modern control system enables all rooms in the buildings to be controlled individually.

In the *Weinschmiede 18*, tradition meets modernity. The old building stock has been preserved and combined with new elements.



In the guest rooms, the mix of old components and state-of-the-art technology creates a stylish ambience. Hot water, heating and cooling are provided by the Vaillant heat pump.



“It is very convenient for us that the heat pump works maintenance-free.” Gustav Strauss

might have worked, but would have been associated with high costs. “Easier” seemed the use of the sunny vineyards themselves. Therefore, an efficient, albeit unusual, approach was chosen: over a total length of 2.4 kilometres, ground collectors were laid between the vines at a depth of around 1.2 metres in order to use the grass strips in the vineyard to generate geothermal energy. The installation of the technology was quite a delicate undertaking, because care had to be taken during the installation work not to damage the sensitive roots of the valuable vines.

The winery owners are satisfied with the “invisible” but extremely powerful result. Martin Moder, who is responsible for the planning and after-sales service of the Vaillant system, emphasises the advantages of the chosen solution and points to the generous dimensioning: “There is no lack of land in a vineyard, so we were able to use ground collectors on a large area. In this case, the usable space is relatively large, but this ensures that the supply to the *Weinschmiede* works all round the clock and in all weathers – from the guest room to the pool to the cold storage.”

Sophisticated master concept

The ambient heat is collected by the ground collectors, transferred to the heat pump and used together with a buffer tank for the hot-water supply, heating and cooling of the two winery buildings. In addition, a photovoltaic system covers the guest house’s own needs – a separate e-bike station on the premises is also fed with the solar energy generated. A particularly practical feature is that each heating and cooling circuit at the winery can be operated individually and thus precisely adjusted to the respective

demand in the different parts of the building – and this can be done from any location using a tablet or smartphone.

Those who are as close to nature as Bettina and Gustav Strauss not only demand genuine quality from their own produce, but also want to indulge guests with sustainable comfort. “It feels right to create a space for well-being in harmony with nature – not only because of the reduced heating costs, but because we want to preserve what makes our region so special. This is also becoming more and more important to

guests,” Bettina and Gustav Strauss confirm and point to another practical component of their energy production: “We are busy enough with the vineyard and the tavern, so it is very convenient for us that the heat pump works maintenance-free.”

A place for the soul

With the *Weinschmiede 18*, Gamlitz has gained a feel-good place that invites you to enjoy and let your soul relax in historical surroundings. Anyone who has once experienced the impressive wine terraces with their narrow, winding roads will come back time and again. And this is necessary, as a single visit to the *Weinschmiede* is not enough to hike the many hillsides in the area, to explore the countless wine tours by bike, to visit the excellent inns and to taste your way through the best wines of the region. By the way, the season does not matter for a stay: the wine roads of southern Styria always boast breathtaking vistas, seasonal delicacies, delicious wines and warm hospitality.

And Martin Moder also likes to drop in from time to time at the Ried Hundsberg. While enjoying a Styrian snack and a glass of wine, he sometimes goes into raptures: “The Strauss family has impressively succeeded in creating a modern work of art from old stock that has lost none of its authenticity. They say there is truth in wine. Here, the wine also contains the full power of modern heat pump technology. An extraordinary project that may find imitators in the future.”



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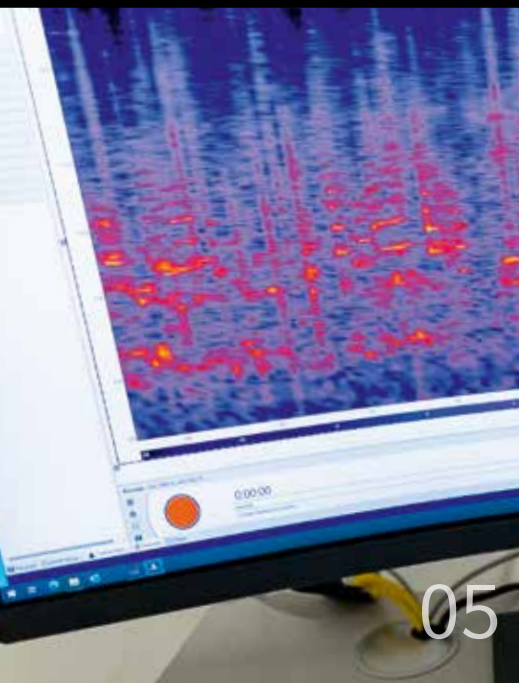


03

A LOOK BEHIND
THE SCENES



04



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CONTROL ROOM

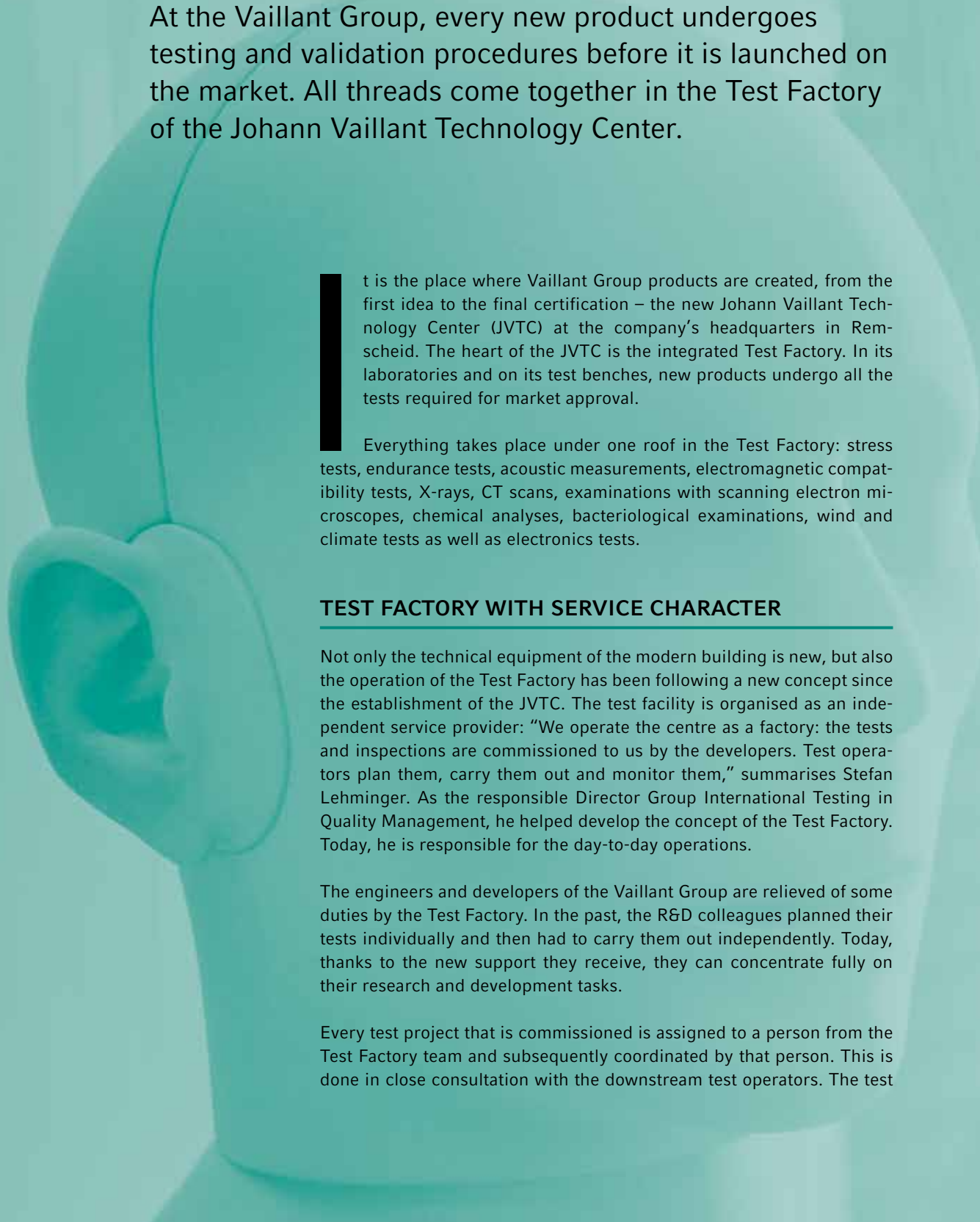
THE TEST FACTORY

FOR

OF THE JOHANN VAILLANT

INNOVATION

TECHNOLOGY CENTER



At the Vaillant Group, every new product undergoes testing and validation procedures before it is launched on the market. All threads come together in the Test Factory of the Johann Vaillant Technology Center.

It is the place where Vaillant Group products are created, from the first idea to the final certification – the new Johann Vaillant Technology Center (JVTC) at the company's headquarters in Remscheid. The heart of the JVTC is the integrated Test Factory. In its laboratories and on its test benches, new products undergo all the tests required for market approval.

Everything takes place under one roof in the Test Factory: stress tests, endurance tests, acoustic measurements, electromagnetic compatibility tests, X-rays, CT scans, examinations with scanning electron microscopes, chemical analyses, bacteriological examinations, wind and climate tests as well as electronics tests.

TEST FACTORY WITH SERVICE CHARACTER

Not only the technical equipment of the modern building is new, but also the operation of the Test Factory has been following a new concept since the establishment of the JVTC. The test facility is organised as an independent service provider: "We operate the centre as a factory: the tests and inspections are commissioned to us by the developers. Test operators plan them, carry them out and monitor them," summarises Stefan Lehming. As the responsible Director Group International Testing in Quality Management, he helped develop the concept of the Test Factory. Today, he is responsible for the day-to-day operations.

The engineers and developers of the Vaillant Group are relieved of some duties by the Test Factory. In the past, the R&D colleagues planned their tests individually and then had to carry them out independently. Today, thanks to the new support they receive, they can concentrate fully on their research and development tasks.

Every test project that is commissioned is assigned to a person from the Test Factory team and subsequently coordinated by that person. This is done in close consultation with the downstream test operators. The test



01

operators are each specialised in certain procedures. They also provide advice and support in test design: "The Test Factory is about much more than providing the equipment or planning and carrying out individual tests. It is about the tests being essential components in the product development process. Our experts in the Test Factory therefore get actively involved to find solutions for specific requirements for products, components or systems," says Stefan Lehming.

UNDER CENTRAL CONTROL

The Test Factory is operated from the central control room: colleagues from the Group Quality department coordinate and oversee all activities from this location. Around 350 different inspections and tests are possible. The control room is responsible for planning and equipping the test benches and test facilities, and it supervises the execution of the tests, taking into account occupational safety and quality management.

06



05





Specialist teams handle test rig development, calibration and the precise coordination of measuring equipment, as well as supplying the test stands with gas, water, electricity and, most recently, also with hydrogen. "We monitor every single test object from the control room and can locate it individually at any time. Via large monitors, we have an overview of all data from the laboratories, test chambers and test benches in real time," says Christoph Ritter, team leader in the Quality department and responsible for the control room. The tests in international laboratories – for example in Skalica, Bozüyük or Wuxi – are also connected to the system and tracked in the control room. In this way, the colleagues monitor the progress of all tests and inspections, company-wide.

ACCURATE DOWN TO THE LAST DETAIL

"Accurate scheduling is a major advantage," says Stefan Lehming. Many tests are long-term, some run for weeks and months, others are planned on an hourly basis. The control room ensures maximum utilisation of the test rigs, avoids idle time and enables standardisation and automation. This increases capacities: "Automated tests can run unattended and outside normal business hours, even during weekends or when the developer is on holiday," emphasises Christoph Ritter.

The greatest flexibility for the Vaillant Group results from its independence from external institutes and certification bodies. Even for official approvals, outsourcing is often no longer necessary: "We can carry out many certifications ourselves in-house. Our procedures and test benches are recognised, checked and officially approved according to all legal standards," says Stefan Lehming. "With the new Test Factory, the Vaillant Group has completely repositioned itself."





03

01

CONTROL ROOM

02

HEAT PUMP
DEVELOPMENT

03

ACOUSTICS CHAMBER

04

EMC EXAMINATION
AND TEST LABORATORY

05

CLIMATE TEST STANDS

06

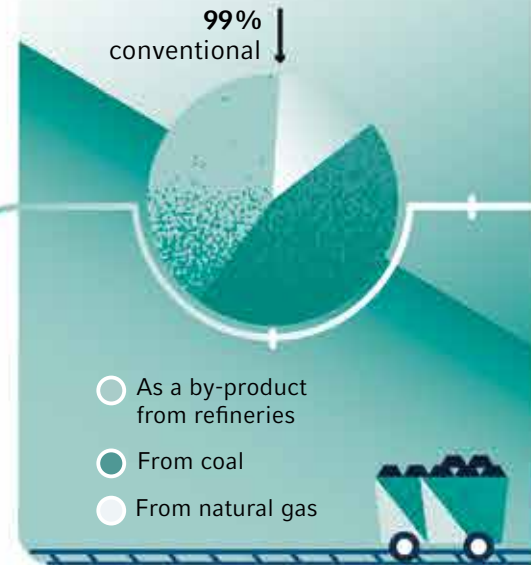
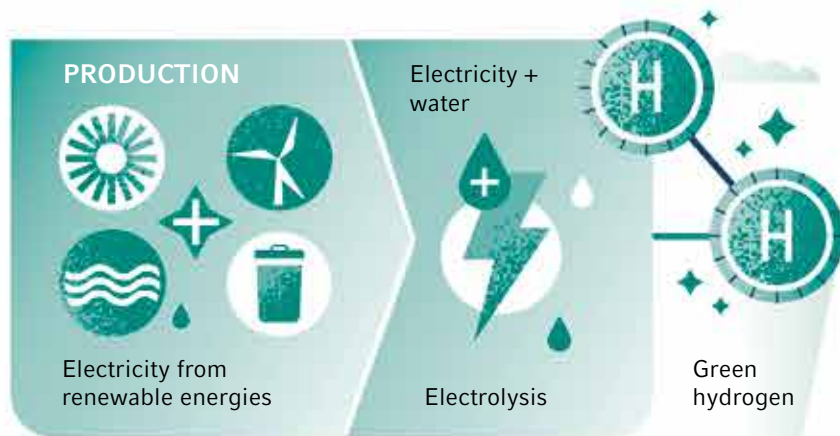
ELECTRONICS
DEVELOPMENTJOHANN VAILLANT
TECHNOLOGY
CENTER

AT A GLANCE

Hydrogen (H₂) – today and tomorrow

The establishment of a hydrogen economy is in its infancy. Europe is driving the pace of development.

Worldwide, H₂ is produced almost entirely on the basis of fossil fuels



Estimated hydrogen demand
Germany as an example, by sector, in terawatt hours/year

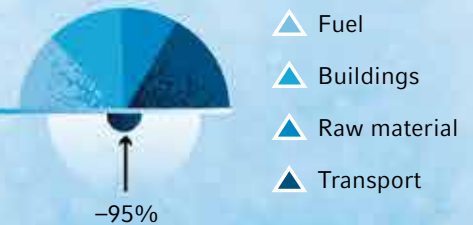
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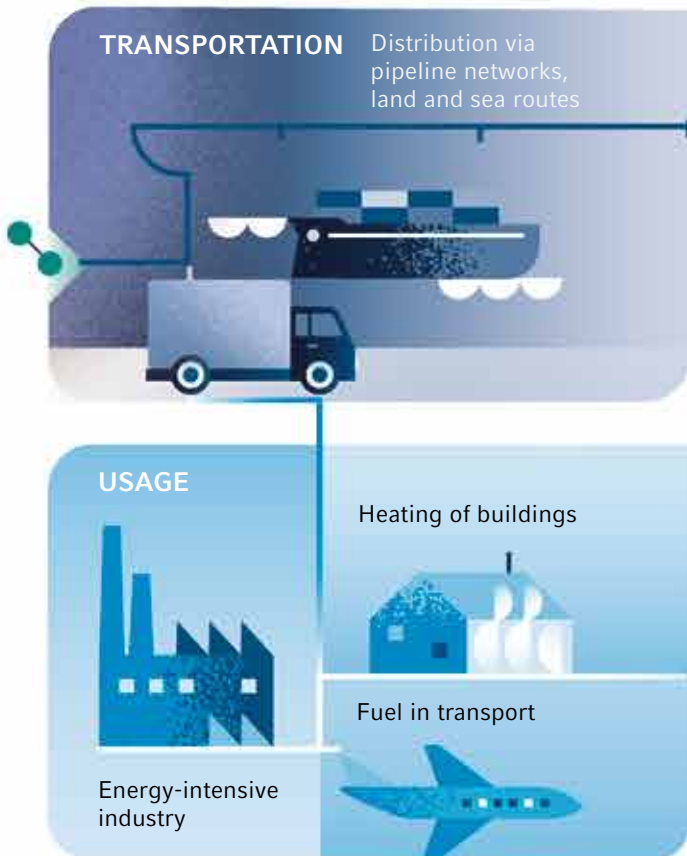
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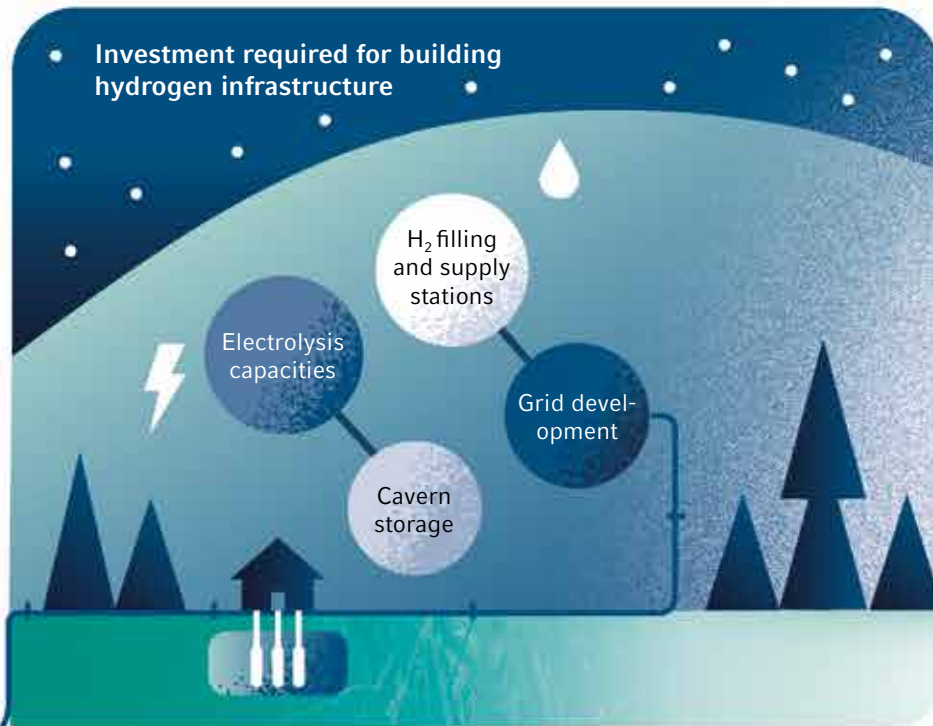
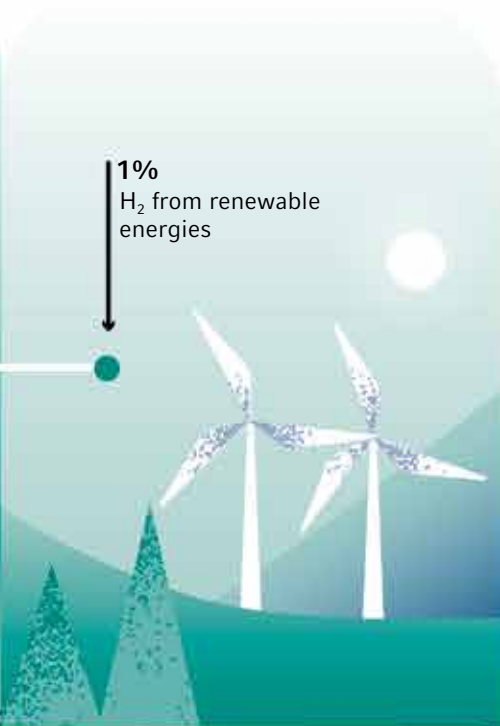


2050
643



↑ Reduction of greenhouse gas emissions





Decreasing costs through indus- trialisation

In cents/kilowatt hour

2019



2030



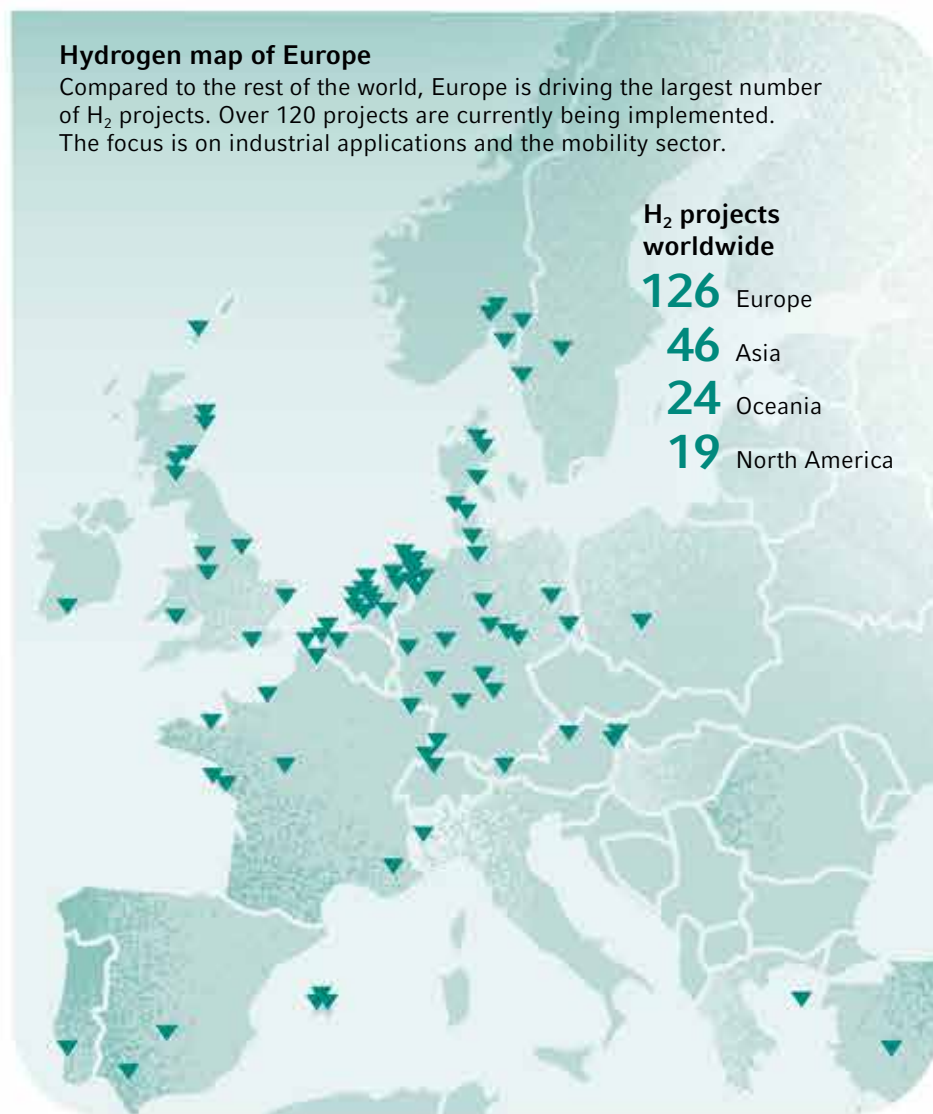
2050



- **Grey H₂**
Fossil generation and
CO₂ release
- **Blue H₂**
Conventional H₂ in
which CO₂ is captured
- **Green H₂**
CO₂-free, produced
with electricity from
renewable energies

Hydrogen map of Europe

Compared to the rest of the world, Europe is driving the largest number of H₂ projects. Over 120 projects are currently being implemented. The focus is on industrial applications and the mobility sector.



Ready for hydrogen



Several of the latest Vaillant gas appliances are suitable for 20 per cent hydrogen use. This has been verified in extensive tests and trials.

automatically adjust to fluctuating gas qualities. After more than a year, one conclusion is evident: anyone who installs one of these Vaillant heating appliances today is prepared for the future use of hydrogen.

Hydrogen can contribute to climate neutrality. As a natural gas admixture, CO₂ savings could be achieved in the short term through its use. It is therefore being investigated whether the existing infrastructure of the gas grids can be used for this purpose and whether existing condensing boilers are compatible. Grid operators from 13 European countries are currently examining how they can contribute to the hydrogen value chain as a link between hydrogen producers and consumers. In Germany, gas grid operators have already developed a concrete strategy in the “H2vorOrt” initiative. Heating appliance manufacturers such as the Vaillant Group provide the necessary heating appliances. Both these initiatives are aimed at using climate-neutral gases in buildings as well.

Running condensing boilers on hydrogen

The Vaillant Group is working on verification that several current Vaillant condensing boilers can be operated permanently with 20 per cent hydrogen. Among others, the testing company TÜV was also involved in the testing. The primary focus was on a total of three appliance models. Devices of the ecoTEC pro series with a pneumatic combustion system, ecoTEC plus devices with an electronic combustion system and the ecoTEC plus and ecoTEC exclusive models of the latest generation with a gas-adaptive combustion system, the so-called IoniDetect. The latter can

Robustness, safety and lifetime within norm

The successfully completed test programmes confirm that the units will operate flawlessly with hydrogen in the long term. The necessary work began in mid 2020. The first technical trials started at the end of 2020, initially at external testing companies. At the start of 2021, endurance tests began in the internal research and development centre, the Johann Vaillant Technology Center.



The short- and long-term tests included examinations of the robustness, the safety and the service life when operating the appliances with hydrogen. The safety assessment also included the testing of all parts and components for hydrogen suitability, including corresponding supplier confirmation. In addition to the internal tests, the Vaillant Group took part in field trials to evaluate the hydrogen suitability of existing appliances. For this purpose, the Vaillant Group used, among other projects, the HyDeploy field test in the UK. Customers had the hydrogen-fuelled Vaillant heating appliances in operation in their homes. The performance of the appliances was checked with regard to heating comfort. Conclusion: the households did not notice any difference. Heat output, target temperatures, noise level, warm-up time and efficiency were all within the standard range.

During the long-term tests of the heaters, an entire service life was simulated. Here, too, the results were positive: the appliances did not show any irregularities in terms of performance, usage wear and tear or material stress when run with a hydrogen admixture.

Currently, the Vaillant Group is assessing the suitability for hydrogen admixture in further product lines, including gas water heaters and appliances with large output classes up to 150 kilowatts. Investigations on installed appliances are also the subject of tests that are being carried out together with external partners. One example is the Avacon project in Germany. The aim is to clarify whether these appliances can be operated with natural gas mixed with hydrogen.

Eight European countries

have included hydrogen-based heat generation in their national hydrogen strategies – even if the primary focus of these strategies is on the industrial and transport sectors. Leading the way in H₂ heaters is the UK, with its large market of around 23 million installed gas appliances. 85 per cent of all households in the country use gas for heating. A major market opening for H₂ heaters is expected in the UK as early as 2026. Other large heating technology markets where hydrogen use is being considered are Germany, the Netherlands and Italy. France is also showing increased interest in the use of hydrogen in the building sector.



INTERVIEW

“The decarbonisation of the heating market is a massive task that must be shaped in a way that is open to all technologies and oriented towards the needs of the people.”

Professor Gerald Linke,

Chairman of the Board of the German Technical and Scientific Association for Gas and Water, on the potential of hydrogen in buildings.

→ In light of the generation capacities, is the idea of large-scale hydrogen use a realistic scenario for climate and energy policy?

← Unlike a few years ago, there is a consensus that hydrogen is needed. I don't think there is an energy supplier who doesn't see hydrogen as a technology of the future. And governments do too. 20 countries have developed a hydrogen strategy. That means there is interest on the industrial and the political side. A rational

assessment of hydrogen is also different today. Let's take the German example. We have decided to phase out coal, and before that nuclear energy. Renewable energies have their limitations, for example availability of land. The sun does not always shine and the wind does not always blow. If we continue at the current rate, we will not manage to become climate-neutral by 2050. We must also focus on other technologies and energy sources. Gas, of course, is a bridging technology, as is hydrogen.

→ And should hydrogen always be green hydrogen – i.e. hydrogen from renewable energies?

← By building up 10 gigawatts of electrolysis capacity from renewable electricity, one would come to about 30 terawatt hours of green hydrogen in Germany. That corresponds to about one per cent of today's energy demand. But blue and turquoise hydrogen can also be produced in such a way that it has a similar carbon footprint to green hydrogen and contributes to climate protection. In this way, the required larger quantities could be produced within a very short time.

→ What steps do you think are needed now to build a functioning hydrogen economy in the medium term?

← Very important are transformation plans to prepare the distribution grids for hydrogen admixture or pure hydrogen transport. This begins with the determination of local customer needs, the quantities demanded by the market, and ends with concrete technical measures to adapt the grids. The distribution grid operators united in the “H2vorOrt” initiative have already begun to do this. Studies show that the natural gas grid could be converted to hydrogen with relatively low investment costs. In addition, hydrogen transport through the major transversals over a length of 40,000 kilometres within Europe is being tested in European projects.

→ The use of hydrogen in the building sector plays a rather subordinate role in most policy plans. Does the building sector need to be given more consideration?

← Heating energy is primarily provided from natural gas. Today, we transport twice as much energy in the



Prof. Dr. Gerald Linke holds a doctorate in physics and is Chairman of the Board of the German Technical and Scientific Association for Gas and Water (DVGW). DVGW codes of practice lay the foundation for technical self-regulation of the gas and water industry in Germany. The association provides an inspection and certification unit for products, individuals and companies. It also initiates and promotes research projects. The DVGW is a non-profit association, economically independent and politically impartial. The DVGW is the nominated institution for hydrogen infrastructures in the German Energy Legislation.

natural gas grid as in the electricity grid. In my opinion, a complete electrification of the building sector is unrealistic. But you can replace the molecules that are still fossil today with carbon-free molecules – that is, hydrogen.

→ What technical preparations must the heating technology industry make to enable the use of hydrogen?

← As an ideal solution, we need self-adapting heating appliances that, if installed today, will also run on hydrogen tomorrow. Current condensing boilers can already be operated with 20 per cent hydrogen in admixed form. We expect that new appliances that come onto the market now will have the corresponding certifications and approvals. It would also be desirable for appliances to be convertible to pure hydrogen use at a later date. In order to provide incentives, the efficiency of hydrogen-capable appliances could be given a higher rating within the framework of the EU Ecodesign

Directive. This would certainly have a guiding effect on consumer behaviour.

→ The DVGW is involved in numerous initiatives for the development of a hydrogen infrastructure and in building up the necessary know-how. What topics are currently on your agenda?

← A key project is the publication of a hydrogen database planned for the summer, which will contain all the knowledge on materials, components and parts, including those from the manufacturing industry. Grid operators will then be able to determine where the weak points in their distribution grid are and what costs they can expect if they convert the grid to hydrogen. The second focus is participation in further hydrogen production projects, especially blue and turquoise hydrogen.



A close-up photograph of a person's hand holding a small, young plant seedling. The seedling has a thin, reddish-brown stem and several small, bright green leaves. The root ball is dark and has a coarse, fibrous texture, likely from a biodegradable nursery medium. The background is softly blurred, showing more green foliage.

GROWING FORESTS FOR CLIMATE PROTECTION

Afforestation is an effective measure against global warming. Forests absorb the climate-burdening greenhouse gas CO₂ and capture it. This is why afforestation projects are an integral part of the Vaillant Group's climate strategy.

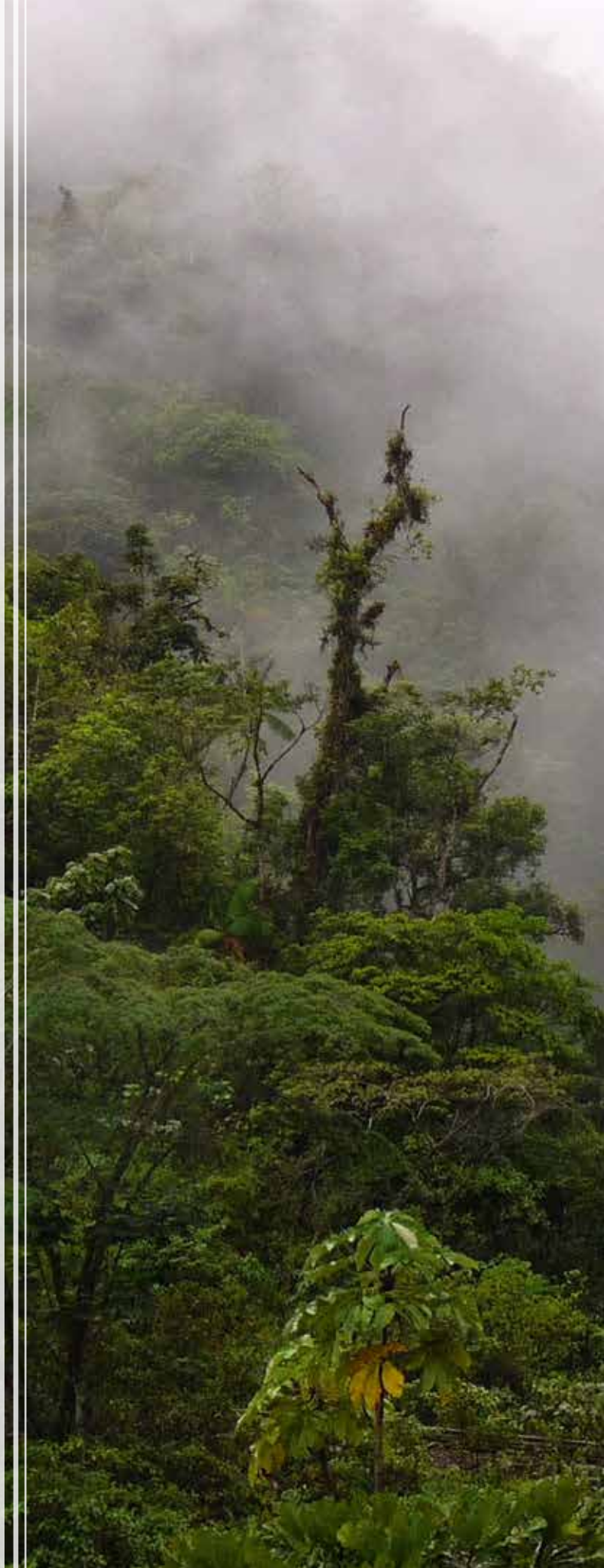
With the SEEDS sustainability programme, the Vaillant Group has set itself concrete environmental targets. The top priority is to avoid greenhouse gas emissions that lie within the company's direct area of responsibility – so-called Scopes 1 and 2. By 2030, CO₂ emissions will be halved compared to the base year 2018 through the use of electricity from renewable energy sources, efficiency measures in production and within buildings, and the switch to a "green" vehicle fleet.

The remaining emissions are offset by afforestation projects, which are also an important component of the climate strategy. Together with partners, the Vaillant Group is developing new forest and landscape conservation areas for this purpose. A first large project in Peru is currently being planned, and a second project – in Central America – is also in preparation. But trees do not grow from one day to the next. Until the newly planted forests reach their full potential, the Vaillant Group is acquiring CO₂ certificates from an existing project in Panama.

THE PROJECT BEHIND THE CO₂ CERTIFICATES

CO₂OL Tropical Mix in Panama is one of the first afforestation projects to be certified with the reputable Gold Standard. It is considered a successful model, not only for environmental protection, but also for the creation of sustainable regional structures.

As is the case in many other countries in Latin America, the tropical rainforest in Panama is primarily cleared for timber and agricultural use. For the majority of the rural population, agriculture is the only source of income. The preservation of the rainforest, on the other hand, holds no economic value. 70 per cent of the forested area has been cleared for this very reason.

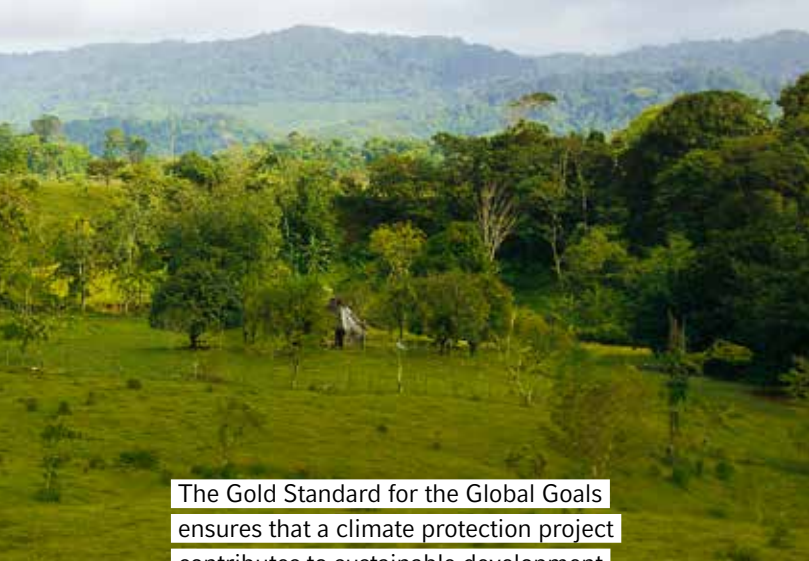


PANAMA PROJECT CO₂OL TROPICAL MIX

- Currently absorbs 250,000 tonnes of climate-damaging gases per year
- Afforestation of more than 13,000 hectares with 20 predominantly native species of trees and protection of more than 30 other types of trees
- Increases biodiversity and creates a habitat for many endangered animals
- Creates sustainable income opportunities for 150 direct employees under fair working conditions
- Produces 34 tonnes of sustainable cocoa (UTZ certified) and 8.3 square metres of tropical timber (FSC certified) per hectare per year
- Supports local schools through financial programmes and teaching materials
- Fulfils six Sustainable Development Goals of the United Nations
- Certified with the Gold Standard for the Global Goals







The Gold Standard for the Global Goals ensures that a climate protection project contributes to sustainable development in the region.

One goal of certified projects like CO₂OL Tropical Mix is to resolve the conflict between ecological and economic interests. The replanted areas are sustainably managed by the local population. The aim is to ensure that even after the end of the project period of 30 years, the forest will continue to exist in the long term.

CREATING SUSTAINABLE STRUCTURES

The first trees in the course of CO₂OL Tropical Mix were planted in western Panama as early as 1998. Over the decades, new mixed forests were created by reforesting wastelands and former cattle pastures with largely native species of trees. These now store around 250,000 tonnes of CO₂ per year. Today, the total area under cultivation is more than 13,000 hectares and extends over various regions throughout Panama. "The project combines ecosystem restoration with timber extraction and cocoa cultivation," explains Julian Ekelhof, Senior Director Climate Solutions of the lead project partner FORLIANCE. He accompanies the team and the partners in Panama through the certification process. As an organisation, FORLIANCE does not own any land itself, but works together with local landowners who, in turn, take over the planting and cultivation of the land themselves with the help of their employees.

FOSTERING BIODIVERSITY

For the production of cocoa, the cultivation of cocoa trees coupled with other species of trees and plants – so-called agroforestry systems – is used instead of monocultures. The cocoa plants grow in the shade of almond, banana and cedar trees and are thus protected from excessive exposure to the sun. The combination of cultivated and natural vegetation also protects the soil from drying out and from erosion. "In addition, the agroforestry is a habitat for many animals," explains Ekelhof. Over the years, 15 endangered animal species have settled in the CO₂OL Tropical Mix area. Ecological corridors connect the different project sites. "Through so-called stepping-stone biotopes, the animals living there pass from one forest area to another. This creates large habitats for more biodiversity."

From time to time, a small proportion of the trees is selectively harvested. For every tree that is felled, a new forest is already replanted.





HIGHEST STANDARDS

In tropical regions, five to ten years pass after the seedlings are planted before the trees can absorb a larger amount of carbon. For this reason, emission certificates are only issued when climate-damaging greenhouse gases have already been sustainably captured in the biomass. The calculation for CO₂ capture takes into account the number, diameter and size of the trees, including their underground biomass. Future thinning is also taken into account. Only what is sustainable is certified. How much CO₂ is stored in a newly planted forest area is determined according to a predefined and recognised method. Depending on the project, the calculation is checked every two to five years by

independent auditors and additionally by the Gold Standard organisation's own auditors. One CO₂ certificate is issued per tonne of carbon captured. The Vaillant Group acquires such certificates within the framework of voluntary offsetting. The proceeds are paid out to investors who have taken over the pre-financing of the project, and they are used to cover the operating expenses of the project.

Certification with a quality standard such as the Gold Standard for the Global Goals guarantees that a climate protection project makes a measurable and lasting contribution to reducing CO₂ in the atmosphere and promotes sustainable development in the region. In addition, the project measures must not have any negative side effects and must



More than 1,000 people in five communities benefit from forestry, cocoa production and CO₂ certificates.

further at least three of the 17 Sustainable Development Goals of the United Nations. CO₂OL Tropical Mix demonstrably fulfils no less than six of these, including climate protection, fighting poverty and rural depopulation, sustainable production, support for local educational institutions and fair working conditions.

LONG-TERM PERSPECTIVE

Sustainable forestry, cocoa production and the sale of CO₂ certificates have created long-term income opportunities for the local population. Around 150 people are employed in the project's own seed nurseries, tree nurseries, wood

and cocoa processing facilities, carpentry workshops and a small chocolate factory. Through downstream services and value chains, more than 1,000 people in five communities benefit directly or indirectly from the climate protection project. "Even when the project period officially ends and no more certificates are issued after that, the local population will still be able to make a living from cultivating the afforested areas," says Julian Ekelhof, looking to the future. This will ensure CO₂ storage in this ecosystem in the long term.

LOCALLY ACTIVE ...

TINY FOREST MORE THAN JUST TREES

Vaillant UK has launched the “Tiny Forest” initiative. The first micro forest in Glasgow city centre has already been planted. More urban green spaces are to follow soon.



The pouring rain did nothing to dampen the cheerful mood. To mark the start of the UN Climate Change Conference in October 2021, a team of Vaillant UK employees in Glasgow, Scotland, planted 570 trees and bushes on the edge of Glasgow Green, a large park in the city centre. The event, in which the environmental organisation Earthwatch Europe and local residents took part, represented the first “Tiny Forest” initiative. In the coming years, more and more micro forests will be created on uncultivated land and fields of grass in densely developed residential areas in large British cities – made possible and supported by Vaillant UK.

The planting of fast-growing Tiny Forests in urban environments is intended to counteract the summer heat of the cities, with which climate change has already made its presence felt. Buildings and streets absorb heat during the day and release it at night. Temperatures hardly drop. Especially in city districts with large residential complexes and few green spaces, people suffer from the heat in summer. The micro forests filter the city air and provide cooling through the evaporation of the stored water.

“Together with our partners, we select areas that are close to social housing and suitable for renaturation. We create spaces where residents can feel comfortable and have access to a bit of nature,” explains Sonia Glover, who, in addition to her role as Marketing Manager at Vaillant UK, is the Sustainability Ambassador for her national sales company. She can count on many volunteers among her colleagues.

TRIED AND TESTED: THE MIYAWAKI METHOD

The idea of the Tiny Forest originated with the Japanese biologist Akira Miyawaki and it has found imitators all over the world over the decades. Thanks to special preparation of the soil and the selection of suitable plants, dense small biotopes with a high level of biodiversity develop quickly



without the use of fertilisers and pesticides. Although a Tiny Forest is only the size of a tennis court, it can absorb up to 30,000 litres of rainwater and capture up to 600 kilograms of carbon per year. Within three years, a former wasteland is transformed into an oasis for plants, birds, insects, small mammals – and city dwellers. The small habitats support the preservation of biodiversity in urban centres, improve air quality, capture CO₂ and increase soil quality. They serve local recreation and strengthen local awareness for climate protection.

CREATING AWARENESS

The Tiny Forest programme is designed for the long term. In cooperation with local authorities, housing associations and Earthwatch, two, maybe even three more micro forests are to be created in British cities every year. The mini forests are maintained by a team of volunteers who are trained by Earthwatch employees to cultivate the plants.

The new initiative adds another facet to Vaillant UK's sustainability activities: “We want to make a contribution against climate change and create a space in densely developed areas where the whole community can come together and get involved,” adds Sonia Glover. “Our goal is to get our customers involved in climate protection as well.” Because a Tiny Forest is much more than just a means to store carbon.

... FOR CLIMATE PROTECTION

SHOVEL-READY IN REMSCHEID

In addition to afforestation activities in Central and South America, the Vaillant Group also plants close to home – right at the headquarters in Remscheid.

The consequences of climate change are being felt everywhere – including in Germany. In many places, violent storms, persistent drought and insect infestations have taken their toll on the native forests. Whole areas of woodland are disappearing. The restoration of these ecosystems with their function as CO₂ and water reservoirs is a way to counteract climate change.

That's why the Vaillant Group launched a regional project last year together with the Remscheid Forest Cooperative. The Vaillant Future Forest is being created on a 13-hectare area at the Neyetalsperre, a drinking water reservoir in the

Oberbergisch district. A spruce forest used to cover the area. The drought of the past summers and the bark beetle damaged the trees so severely that the land had to be cleared. Now, through reforestation and natural forest development, a new ecologically valuable mixed forest will be created.

NATURAL REFORESTATION

In the Vaillant Future Forest, up to seven native species of trees will grow that can cope well with drier and hotter climates, including beech, oak, maple, silver fir, Douglas fir and bird cherry. The Remscheid Forest Cooperative and

Vaillant Group CEO Norbert Schiedeck (centre), representatives of the city of Remscheid and members of the forest cooperative plant the first 50 trees at a joint planting event.



the team of the Remscheid Municipal Forestry Office rely on natural silvicultural methods: only 500 trees per hectare are planted on the area in question. The remaining trees are created through natural seeding. Wind and forest animals distribute the seeds on the forest floor, where they germinate and grow into new plants. In this way, many millions of young plants are created over the years.

Fast-growing pioneer trees such as birch and willow provide shade for slow-growing species such as beech and oak in the first few years. They also prevent proliferating plants from crowding out the young trees. Later, some of the birches are removed to make room for the other types of trees. In this way, a lush and ecologically valuable mixed

forest will develop over time, which will regulate itself. The task of the foresters will be to accompany this process. In later years, trees will also be selectively felled so that the forest rejuvenates itself. The resulting wood will be processed into paper or furniture.

The project is accompanied scientifically by agricultural and forestry specialists from the University of Applied Sciences and Art Göttingen. The aim is to gain new insights into the forest ecosystem.





Founders' WORKSHOP

*Vaillant
lends a
helping
hand*

There is a lack of young talent in the skilled trades sector. In times of ambitious climate targets, of all things, skilled HVAC professionals are in short supply. The Vaillant Founders' WORKSHOP wants to make it easier to start a business.

The whole of Europe is working on the energy transition – and with it comes extensive investment in sustainable energy concepts, the technical modernisation of existing buildings and the gradual switch to renewable energies.

The installing HVAC companies in the sector are facing busy times ahead. Positive prospects that, in view of dwindling numbers of available HVAC professionals in many countries, are becoming a major challenge. Vaillant Germany has therefore addressed the question of how to support future business and service partners in their work.

Together we are stronger

The search for solutions led to the Vaillant Founders' WORKSHOP – an initiative to support installers on their way to self-employment. The idea follows the principle of "together we are stronger": "As a manufacturer, we make it easier for our partners to start their business and help to get their company successfully on track. With the services related to our systems and products, the coopera-

tion with the founders then continues in a spirit of partnership. A win-win situation from which both sides benefit," explains project manager Marco Faccin. In order to affiliate the young entrepreneurs to the Vaillant Group at an early stage, the team of the Founders' WORKSHOP has put together comprehensive service packages for all start-up phases of a heating, ventilation and air-conditioning trade business – from planning and strategy to the design of logos and websites to the provision



Behind the Vaillant Founders' WORKSHOP are a team of nine people from the German sales company.



The Vaillant start-up advisers are committed to actively supporting young entrepreneurs in the industry. Demand in the heating technology market is booming and HVAC professionals are in increasingly short supply.

of experts for legal, tax and subsidy issues. The step-by-step approach makes it particularly easy for founders: in the initial meeting, the Vaillant start-up advisers determine the individual start-up needs, discuss suitable solutions and select service modules for the step into self-employment. The support provided by Vaillant experts guarantees that the up-and-coming business owners can concentrate primarily on their specialist skills.

Even after the business has been established, the young entrepreneurs find advice and assistance at the Vaillant Founders' WORKSHOP – whether in customer acquisition via HeatingOnline, the digital organisation of the business or materials procurement. In addition, the Founders' WORKSHOP offers a platform where young entrepreneurs can network and exchange ideas with like-minded peers.

Unique start-up campaign

The concept of the Vaillant Founders' WORKSHOP took about a year to develop – a structured process from the idea to successful marketing in coopera-

tion between colleagues from the central divisions and national sales companies of the Vaillant Group. The result: an exclusive manufacturer service offer that is unique in the industry – in this form. "The Founders' WORKSHOP project focuses on the increasingly strong target group of digitally minded young entrepreneurs. We want to inspire them with our offer and connect with them where it is important for them," affirms Simon Latus, Manager Vaillant Digital Strategy. In spring 2022, the Vaillant Founders' WORKSHOP started its pilot phase. Interest has already been aroused – several dozen founders have been on board since then. Whether Vaillant Germany's Founders' WORKSHOP will also be offered by other national companies will be decided after initial experiences in the pilot market, Germany.

The fact that the innovative idea has made it from planning on paper to practical implementation in the shortest possible time speaks for the innovative spirit of the Vaillant team.

