EDITION 2020/2021

VAILLANT GROUP

Taking care …

Climate-neutral

An ambitious strategy for more climate protection

H_2 for the energy transition

Heating with hydrogen

The coronavirus challenge

Making a virtue out of necessity

Boosting innovation

The Johann Vaillant Technology Center

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Contents

Employer of choice

Do we recommend the Vaillant Group as an employer to our friends? The answer is: yes! And that is the highest praise. Because so many colleagues recommend the company to others, we are one of the most popular employers in Germany. This is the result of a ranking by the independent market research institute Statista and the magazine *Stern*.

Vaillant Wuxi holds its own in the pandemic

Occupational health and safety first and foremost. Immediately after the outbreak of the novel coronavirus, the Vaillant Group reacted with infection prevention in the company at the Chinese Wuxi site. The principle was early recognition, early detection, immediate isolation and rapid treatment. Local production at the plant in Wuxi could thus largely be maintained with normal staff and production output.

€2.7

BILLION

Despite the pandemic, the Vaillant Group had a successful financial year 2020 overall. Sales revenue exceeded the €2.7 billion mark for the first time. This corresponds to growth of over 4 per cent.

JOHANN VAILLANT TECHNOLOGY CENTER

Technological competence under one roof. Together with the two administration buildings, the new Test Center in Remscheid forms the innovative heart of the Vaillant Group. Short distances and open structures increase the speed of development. The innovative strength of the Vaillant Group has a long tradition that goes back to our company founder Johann Vaillant. That is why the new complex is named after him: the Johann Vaillant Technology Center.

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Carbon-neutral company

We are pursuing an ambitious and long-term climate strategy. By 2030, the Vaillant Group's CO_2 emissions are to be reduced by 50 per cent. From now on, we will completely offset the remaining emissions through existing, certified afforestation projects. In addition, we plan to carry out our own afforestation projects in emerging countries in the long term.

The climate strategy with its focus on CO_2 reduction and CO_2 compensation is part of our SEEDS sustainability programme, which was relaunched in 2020. In it, we set sustainability targets for the Vaillant Group in the four focus fields of Environment, Employees, Development & Solutions and Society up to the year 2030 – the climate neutrality of the company is one of them.

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Successfully certified

The certification agency Lloyd's Register Quality Assurance (LRQA) has again certified the Vaillant Group's compliance with international standards in quality (ISO 9001), environmental protection (ISO 14001) and occupational health and safety (ISO 45001). The LRQA auditors regularly inspect the sites in Belper, Bergheim, Bozüyük, Nantes, Remscheid, Skalica, Trenčín, Vitoria and Wuxi.

53 per cent increase in heat pump sales

Demand for efficient heat pumps remains strong despite coronavirus. The Vaillant Group benefited particularly from this trend. In this important product segment, sales growth last year reached a new record of 53 per cent. Two reasons for this are the consistent expansion of the product range and the strong demand for the new aroTHERM plus heat pump, which can also provide heating and hot-water comfort in existing buildings thanks to its environmentally friendly refrigerant.

See also **page 38**

There has never been a better time, but also never a more urgent time, to make a contribution against global warming. That is the core message of #whywait. The international campaign shows how important highly efficient heating technology is for protecting the environment and the climate.

With #whywait, Vaillant is visible in social media as well as on TV, radio and in print media. The campaign is running in over 20 countries.

Reinforcing human rights

In 2020, the Vaillant Group published a policy statement on respect for human rights. With this, the company expresses that it respects and strengthens human rights – an elementary component of the Vaillant Group's corporate self-image. The Declaration of Principles on Respect for Human Rights is part of the SEEDS sustainability programme and applies to all employees.

SEEDS

THE YEAR OF THE PANDEMIC
AT THE VAILLANT GROUP

Making a virtue out of necessity

Shortly after the turn of the year 2020, the world learned of a new lung disease afflicting the Chinese city of Wuhan. Only a few weeks later, the world came to a halt.

nstoppable and within a few weeks, the coronavirus spread first through China and then across all continents. Travel was suspended, borders sealed, businesses closed, production shut down – public life suddenly came to a standstill.

The Vaillant Group with its approximately 15,000 employees also had to react to the coronavirus challenge: the basic need for heat and hot water had to continue to be reliably met while protecting customers and employees from the virus at the same time. This was managed successfully. And not only that: the Vaillant Group has gained strength through the crisis. The people in the company – with all the necessary social distancing – stand together as one team.

The situation at the beginning of 2020 was marked by confusion. The rapidly growing numbers of infections with the novel coronavirus caused great anxiety everywhere. People had no experience with the disease; there was no known medication or treatment. With its international sales companies and development and production sites in Europe, Turkey and China, the Vaillant Group, like many other companies, was suddenly faced with the task of maintaining delivery and service capability worldwide while keeping its own employees healthy despite the pandemic. Official measures to control infections severely restricted public life at all company locations from spring onwards – beginning in China. "I was just at the German headquarters when the infection numbers in China became dramatic in mid January and the country went into lockdown," reports Dr Liangya Cheng, Director Industrial Asia and Head of Production at the Chinese Vaillant Group plant in Wuxi. His flight back home had become impossible. Due to the fast spread of the virus, China had sealed off the metropolitan region of Wuhan and other large cities and imposed a nationwide lockdown. Flights and public transport were suspended. The government extended the holidays after Chinese New Year so that people would stay at home longer. "Our production at the Wuxi plant also stopped for a few days longer than usual," says Dr Liangya Cheng. He managed to be on-site just in time, observing elaborate safety measures, when production was to resume on 10 February – under strict hygiene and safety regulations. At that time, the virus had already begun to spread across Europe.

First task: staying on top of events

The Vaillant Group reacted immediately: with the unfolding developments in China, a task force became active to secure the company's international ability to operate. This task force included representatives from the head office in Germany under the leadership of Mathias Stecher, Group Director Business Processes, and Dr Thomas Jasinski, Head of Process Management & Organisational Development. A pandemic, however, was something completely new for everyone involved. "We first had to address two important issues: on the one hand, we had to establish continuous lines of communication and set up an information channel through which we could exchange and consult with each other worldwide. And secondly, we had to define decision-making authorities at the

individual locations to enable quick action," says Thomas Jasinski.

At the beginning, the task force had its focus on China; shortly thereafter, Italy and Spain came on the agenda, and finally all European markets. The team was quickly expanded with the increasing drama of the rising infection figures worldwide and the highest decision-making level was involved. "From February onwards, the Vaillant Group Executive Board exchanged information several times per week virtually with all international managers about developments and the infection situation at local level," Mathias Stecher explains. At this point, the task force had already grown into forty people. "Every day started with the coronavirus meeting, where we exchanged information about local developments," reports Joe Dunn, Plant Director in Belper. In the UK, too, the infection rates had risen sharply since the end of February, and the country, like Spain and Italy, was expected to become a so-called hotspot in the coming weeks. The exchange between international colleagues from Procurement, Production, Human Resources, IT, Sales, Service and Health & Safety was one of the most important items on the agenda for weeks. "There had never been such a cross-functional coming together of this type before. We made sure that we didn't miss any important aspects," Thomas Jasinski emphasises.

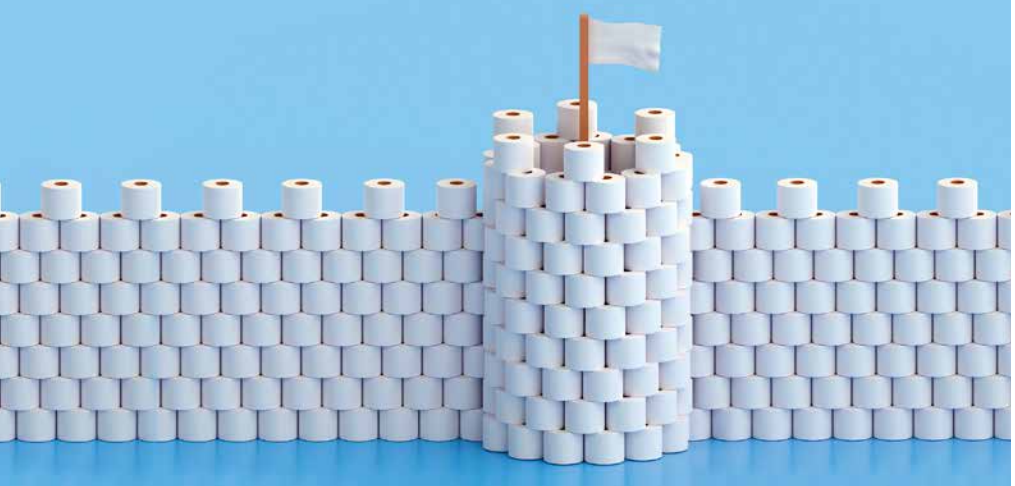
New reality

The Vaillant Group had to adjust to living with the new virus. At the beginning of March 2020, all administrative and commercial employees of the Vaillant Group

"Establishing lines of communication and defining decision-making authorities were our first actions, even before hygiene rules and remote working policies."

Dr Thomas Jasinski,
Process Management & Organisational Development

Different countries, different stockpiling



What do people hoard in the pandemic? It varies. In Germany, there was such a high demand for toilet paper that supermarkets sold only one packet per customer. There were also empty shelves for pasta and flour. In Turkey, eau de cologne was in high demand. In France and Spain, gaps opened up on the wine shelves. In Scandinavian countries, people stocked up on non-prescription drugs. In the Netherlands, there were queues outside coffee shops. And in the USA, gun purchases skyrocketed.

"We had to find recommendations and solutions for a vast range of situations, from the smallest sniffle of an individual to disruptive business issues like border closures."

Mathias Stecher,
Group Director
Business Processes

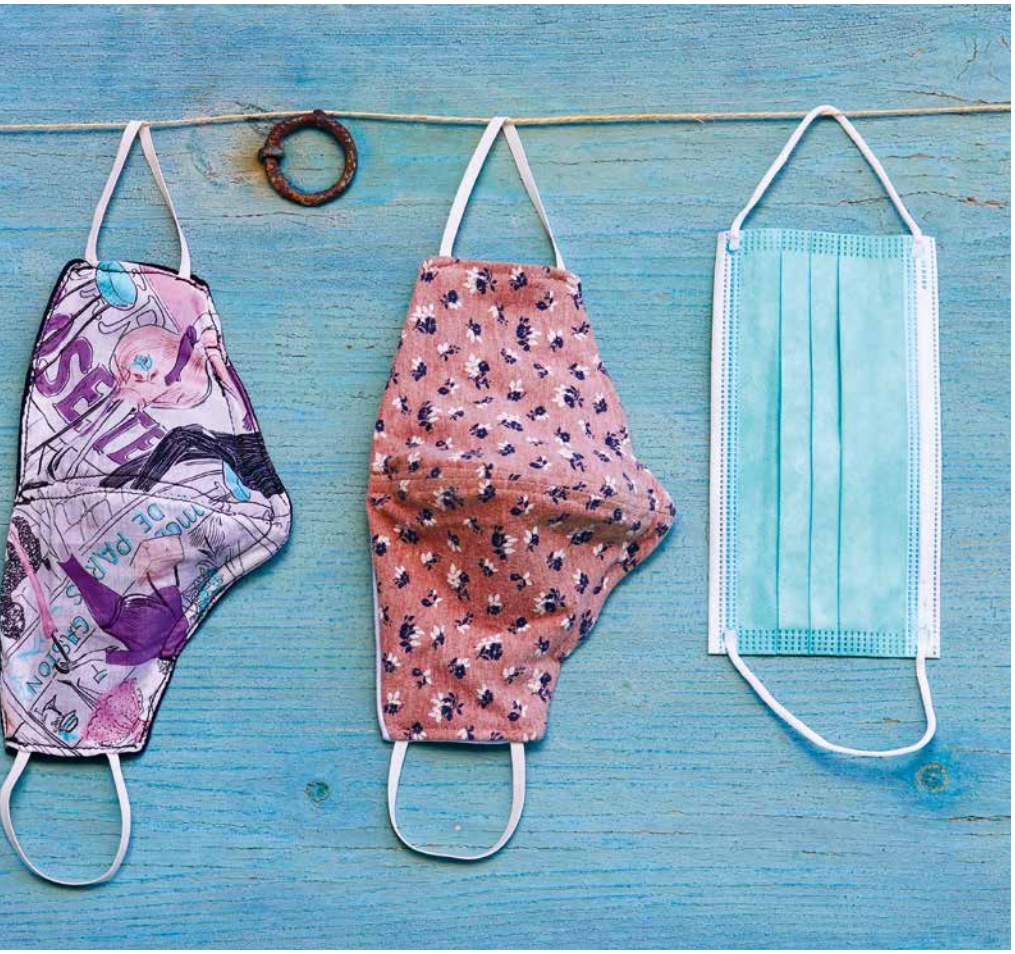
Face masks – symbol of the pandemic

It makes the pandemic visible: the mask to protect oneself and the people around us. In 2020, the global trade volume of disposable masks shot up from 0.8 to an estimated 165 billion dollars.

were sent home to work remotely from there. Strict hygiene and safety measures were introduced at the plants and production floors. "We were faced with a jigsaw puzzle of individual measures, and some of them varied quite a lot from location to location. We followed the recommendations of the WHO and the relevant government health authorities and communicated this advice to the managers in the countries. They in turn had to adapt that to local regulations," says Thomas Jasinski. That is why extended decision-making powers were so important. "We had to act quickly," says Plant Director Joe Dunn. "When we realised what was heading our way, we adapted our preventative and reaction policies, plans and risk assessments immediately. We wanted to make sure that we were ready before the cases started to rise in the UK. We briefed the full plant team to ensure that everyone was fully clear with the steps that we needed to take together." The measures were then fine-tuned again and again at all locations.

Standards for times of crisis

In the production plants, a central Business Continuity Management (BCM) team ensured internationally uniform processes. Local BCM teams oversaw their implementation on-site. The overarching goal: to uphold production despite all obstacles and to maintain the highest possible level of safety at the same time. "All of a sudden, we were not dealing with technical requirements any more, but with a virus. Together with Industrial Manufacturing, we first had to find out which measures we had to implement and how we would get them coordinated," says Thomas Jaster, who in his function as Director Group Manufacturing, Organisation & Standardisation has an eye on the entire pro-



duction network of the Vaillant Group. The situation in the plants was assessed several times a day in status meetings to guarantee the continuation of production operations. Accesses and routes in the plants, occupancy plans for social rooms, partitioning off of parts of the premises, the installation of partition walls, the introduction of mandatory mask use, hygiene rules, social distancing and much more had to be considered. "We worked out a 100-point programme for our plants, with which we made production safe step by step," reports Lutz Forßmann, Plant Director in Remscheid, Germany. The fact that the measures were implemented so quickly and so consistently everywhere was one reason for the successful crisis management of the Vaillant Group, he believes. "That has welded us together. And the fact that the supply of production material was guaranteed everywhere was impressive," he adds.

Demonstrating adaptability

The supply of production materials is a key issue because manufacturing relies on it. "Our processes in material procurement and production have been disrupted by the pandemic," says Oliver Albig, Director Group Supply Chain Operations. Together with a team, he is responsible for making sure that the Vaillant Group production sites in all countries are supplied reliably and on time with materials and components and that the logistics for this run smoothly. He was in close contact with the Group Purchasing department and the international plant directors. Many suppliers had simultaneously stopped their production or were unable to deliver. Bottlenecks were imminent. "Together with our colleagues in Purchasing, we reacted to this by building up additional safety stocks – where still possible – switching to alternative suppliers at short notice

"Everyone came together as 'one' to make sure that our people and the business were protected through the pandemic. There was a real sense of camaraderie."

Joe Dunn,
Plant Director Belper, UK

"A big takeaway from the coronavirus crisis is the increased sense of community."

Lutz Forßmann,
Plant Director Remscheid, Germany

and making express deliveries. To some extent, we were also able to resort to safety stocks that we had built up for Brexit," explains Albig. There was mutual support. Production processes were adapted to market changes and material availability at individual plants. The international exchange worked very well.

Always able to deliver

"We did adapt our production for a short time because of the drop in demand across the country. But we went back to normal after a few months," says Joe Dunn from the UK. Only in the French plant in Nantes was there a critical phase: due to personnel absences on account of the strict quarantine measures in particularly hard-hit France, there was a threat of a staff shortage. Thanks to the good networking and coordination of the plants, a solution was quickly found for this too: several colleagues from the UK and Germany volunteered to help out in Nantes under strict safety precautions. Despite all the negative aspects of the coronavirus pandemic in spring 2020, the great sense of community among the colleagues of the Vaillant Group continued to grow during this time. Both in the national teams and in terms of international cooperation.

It was possible to maintain production in the Vaillant Group and to remain able to deliver. "We had the advantage that we had built up safety inventories early on, even before the situation worsened. And we were lucky that the transport of goods largely worked well," recalls supply chain manager Oliver Albig. When the situation calmed down somewhat in the middle of the year, the time was used to re-evaluate the adopted measures and develop them further with a view to another wave.

Learning new words

The coronavirus pandemic is also reflected in the use of language. Many terms that were reserved for experts last year are now familiar to most of us. Word creations have also emerged, some of which have made it into dictionaries.

COVID-19 app
mRNA
Intensive care capacities
Face covering
COVID-19
Social distancing
Lockdown
Anti-masker
Wuhan
Herd immunity
Spike protein
R-value
Hotspot
Hygiene concept
FFP2 mask
PCR test
Coronavirus
Superspreading event
SARS-CoV-2
High-risk area
Incidence value
Antibody test

"With the experience from the crisis, through the close exchange with the other departments and countries and thanks to the great team performance, we knew what to do by that time."

Different countries, different customs

"One challenge throughout the pandemic was to meet the frequently changing local rules and regulations and yet find common standards for all company procedures," reflects Thomas Jaster. For example, there was initially no legal requirement to wear masks everywhere, and the recommendations for wearing masks and distances to be kept varied from country to country, and sometimes from region to region. For production sites located close to national borders, such in as Roding in Germany and in Skalica in Slovakia, the border closure with the neighbouring Czech Republic was an issue. Permits for commuters had to be applied for. Elsewhere, individual cultural issues had to be taken into account, such as the deep-rooted tea culture in Turkey: there, tea service was stopped in March for hygiene reasons. "That was a big upset for our workforce. We then developed a safe solution and were able to introduce a hands-free pouring mechanism using a foot pedal," reports Mustafa Kuyucu from Turkish production in Bozüyük.

Then again, in many places the problems were of a similar nature – such as the procurement of masks and personal protective gear. Colleagues from China, France, Italy and Spain unanimously describe this as the biggest difficulty they faced in the first half of 2020. "Getting personal protective equipment for our service staff seemed almost impossible," says Alberto Basauri, Director Service Spain. Along with Italy, Spain was the European country where infections reached dramatic levels early on. "The prices for masks, gloves and shoe coverings skyrocketed," confirms Fabio Boselli, Director Service & Master Division Italy. But he also sees something positive in the company's joint management of the coronavirus crisis. There has never been a better feeling of solidarity than now, and that is not least due to the good organisation in the company and a sense of security that exists among the staff. While other companies and industries had to announce short-time work or shut down their operations completely, the Vaillant Group was able to reliably supply its customers with convenient heating and hot-water appliances as well as services throughout the crisis year of 2020.

In service for the customers

For the colleagues in Service, whose work takes place on-site at the homes of customers, ensuring occupational health and safety was of paramount importance. "The safeguards in the service business had to effectively protect both our service staff and our customers," Eric Ebner, Head of Service Excellence, points out. One of his tasks is to ensure that the operational processes in Service run smoothly on an international level.

Safety concepts were developed: for the service centre employees, the necessary social distancing of people had to be observed, or – as for the back office – work from home was made possible. The assignments of the service technicians were prioritised: "We postponed maintenance jobs. But if a boiler breaks down, you simply need to have someone to fix it," emphasises Marc Nathan, Director Service France. As in other markets, a decision was made in France to reduce the number of contacts to the bare minimum. Non-urgent or non-essential maintenance orders could be made up for in the summer months, when infection levels were at a low ebb in most countries. "We were really worried about our business at the beginning, but we have remained stable against the economic trend," says Łukasz Górnicki, Head of Service Poland. What the Polish service manager found challenging though was the spontaneous switch of training sessions to e-learning formats for training field staff and service technicians. "It was quite a task to put the

"We moved forward while the country stood still."

Fabio Boselli,
Director Service & Master Division, Italy

"Coronavirus has taken us a huge step forward on the path of digital transformation."

Benjamin Ottersbach,
Team Leader IT Infrastructure

practical content into a new virtual format. But we managed it and had good experiences with it," says Górnicki.

Boom for online training and e-learning

At all Vaillant sites over the course of the year, e-learning and online training courses replaced face-to-face events for customer service technicians, installers and other service staff at the Vaillant Group. "We had a significantly higher participation rate in online training, not only for technicians, installers and planners, but also for marketing and sales staff," reports Fabio Boselli from Italy. In China, there were almost 80,000 registered webcast participations in February and March alone. "A completely new world has opened up for us," reflects Jörg Sieland, Head of Training at Vaillant Germany. Digitalisation in training had already been on the agenda, but it had never been seen before in such abundance and with such regularity. "We have mapped all our topics digitally, incorporated product videos into the webinars and expanded our infrastructure and platforms with the support of Digital Marketing," adds Jörg Sieland. In his view, face-to-face training will still be necessary in the future. However, the boost that the coronavirus pandemic has given the company in terms of digitalisation has probably changed it permanently.

More effective than expected: remote working

Approximately 15,000 employees worldwide, around 9,000 of them relying on computers to do their jobs. More than 5,500 staff at various locations had to work from home at the shortest notice. The pandemic made it necessary. The new job reality may have come ever so suddenly, but fortunately it did not hit the Vaillant Group completely unprepared: "We had already started to build up a digital infrastructure for communication, virtual meetings and work tools a few years ago. So we had a good starting position," say Christian Spieß, IT Project Manager, and Benjamin Ottersbach, Team Leader IT Infrastructure. "Within four days, we went to working completely from home for two months – it couldn't have worked without the existing infrastructure."

However, the considerably increased volume of data traffic and ensuring the security of the IT systems posed a challenge: "The systems had to be converted to videoconferencing and expanded accordingly. Thanks to the flexibility of providers and in good cooperation with the Purchasing department, we were able to double the bandwidths company-wide within a few days in order to maintain the IT service under the new conditions," says Benjamin Ottersbach. Of course, not everything went smoothly. Many employees first had to familiarise themselves with the possibilities of digitalisation. The requests to internal IT support increased many times over at the beginning. The changeover to remote working was time-consuming: "But a clear advantage was that the technology required for this was already in use at that time. So we could concentrate entirely on data security and availability."

A matter of culture

The well-functioning remote working policies have shown how valuable flexibility is on the job. And this is not just a question of purely technical aids, but also concerns social and cultural aspects – after all, it is people who work together: "We don't normally work from home," remarks Dr Liangya Cheng from China, where virtually the entire nation suddenly went to do just that. In Italy, too, this form of work only became popular in the first place thanks to coronavirus. "We are very sociable people. An office at home was not an option for us before. But we have had good experience with it because of this special situation," says Fabio Boselli, who can imagine a good mix of remote working and presence in the office in the future.

The inner attitude towards work from outside the company offices has changed during coronavirus: "Acceptance has increased. We have learned that it works

very well," says Jessica Kirch, Director Group HR Learning & Development at the Vaillant Group, responsible for Talent Management, Learning and Diversity & Inclusion. She was part of an extended task force for issues that affected human resources management – including working from home and how to deal with it. It should not be forgotten in her view that working from home is not always ideal, for example, if there is little space or if there are children to be taken care of. "People need social contacts. And face-to-face contacts determine our culture at the Vaillant Group," says the HR manager. For this reason, she herself held regular "Corona Mood Calls" with her team during the lockdown just to exchange personal information and also talk about individual worries. The interpersonal aspects of leadership now also play an ever greater role in training for managers.

However, the summary after just under a year of locally flexible working is predominantly positive. For this reason, a remote working policy will remain an integral part of the Vaillant Group's work organisation in the future. The experience from the coronavirus pandemic has shown that, with an ability to adapt, one can also make a virtue out of necessity.

After long months of living and working in the coronavirus pandemic, it can be said in hindsight that the Vaillant Group reacted quickly, prudently and decisively. This gave the company security and created a special sense of community. All employees did their part to overcome this unique challenge. And: the Vaillant Group continued on its course for growth in 2020 – despite the pandemic and all lockdowns.

Even though vaccines that are now available give hope for the end of the pandemic, it will be quite a while before the Vaillant Group returns to a "new old" normality. Whenever that may be, the solidarity that grew during the acute crisis and the lessons learned will be lasting.

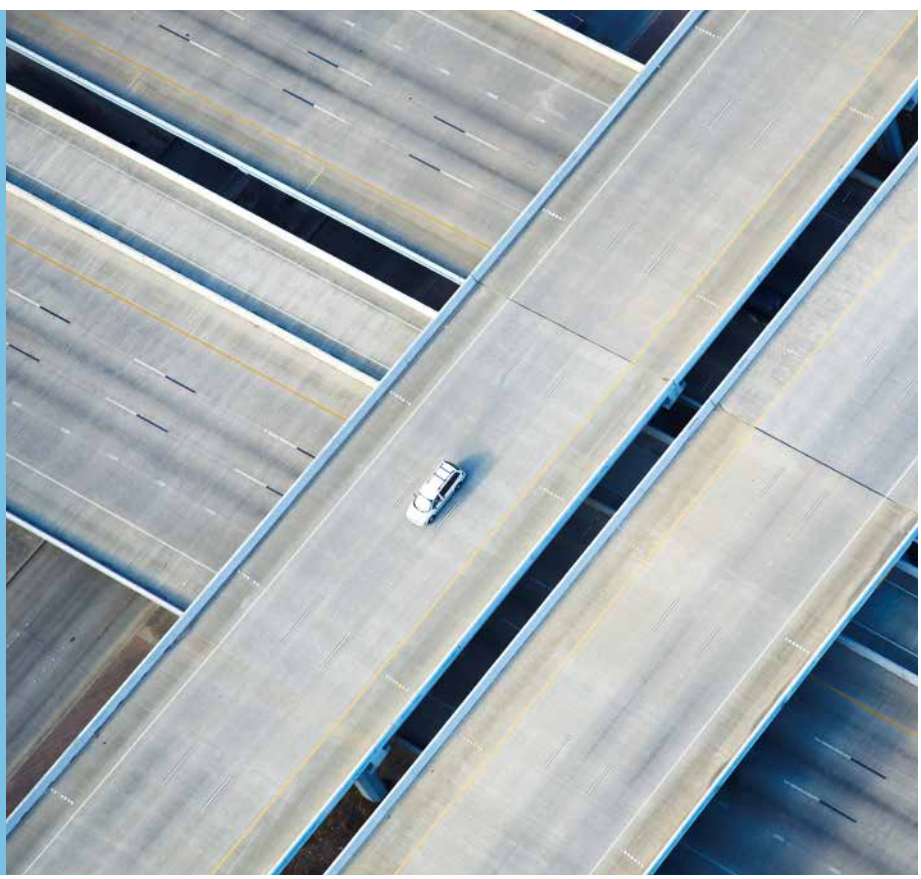
"Remote working is an important building block that has helped to master the challenges so well."

Jessica Kirch,
Director Group HR Learning & Development

Good for the climate?!

A world in lockdown also affects the environment. Factories were closed, traffic decreased, planes were grounded. As bad as this was for the economy, the climate benefited: according to the Global Carbon Project research network, carbon dioxide emissions fell by 2.4 billion tonnes in 2020. Fine dust pollution in large cities was also significantly lower in 2020. In India, the smog lifted. The water in Venice became clear. Dolphins and whales could be seen in the Adriatic Sea and on the Bosporus because of less shipping traffic.

The year 2020 was also quieter, as seismographic records showed. While these phenomena may be temporary and not have a long-term impact on the climate, they give rise to at least one thing: pause for thought.



Questions

for our colleagues.
How has the pandemic
affected you personally?

Nicolas Auffray,
Manager Product Communication
Saunier Duval, France

Jimson Chiew,
Business Development Manager
Vaillant China

Serena Cattaneo,
HR Manager
Vaillant Group Italia

Carmen Iglesias,
Head of HR
Vaillant Saunier Duval Ibérica

Adrian Simpson,
Process and Project Manager
Vaillant Group UK

Anders Zeeberg,
Country Director
Vaillant Netherlands

What have you stopped doing because of coronavirus that you would normally do?

The question would be: what we continue to do …?

The biggest impact has been restrictions on our ability to visit family and friends – for those with elderly relatives, as I have, this has presented challenges to overcome.

No hugs and handshakes.

Which coronavirus restrictions have had the greatest impact on you?

Wearing face masks and social distancing in public is a new normal that I personally felt uncomfortable with.

Right now, a 6 p.m. curfew, which means that after a day of work at home, I am not allowed to go out. A really strange feeling.

The limitations you have to follow due to the restrictions, meaning your "freedom" is challenged.

Do you have any specific plans for the time after coronavirus, or do you want to make up for something specific?

I am looking forward to … experiencing the world more freely. In particular, my wife and I have travel plans for the year ahead which we hope will prove to be viable – she may even get the chance to visit her relatives in Germany.

Travelling, meeting people without barriers, enjoying the taste of a lovely glass of wine with friends.

What I would like most is to travel … My plan is to visit the east coast of the United States.

Have you developed new habits during the coronavirus period that you would like to keep up in the future?

Well, new habits related to new technologies and digital tools, both in my professional and personal life, and I am sure there will be times when I will continue to use them.

During the coronavirus period, I have learned more about crisis awareness, discipline in following standard operating procedures and online communications …

Spending much more time with my children, and cooking … I found out that I really liked it.

Baking cakes will probably stay on board after coronavirus.

Have you learned something from the pandemic? Can you also draw something positive from it?

The pandemic has taught me to be fully alert and well prepared for the change of surroundings (and to) always think twice before making a decision … even though it has been a year since the first outbreak in Hong Kong.

A lot of pain and dramatic events occurred in Italy, especially during the first wave. But what I remember is the synergy of the organisation created through the "Diario di Bordo". It started via email and then became a book to collect thoughts, emotions and experiences. It kept us connected during lockdown and was a source of encouragement, resilience and hope.

For me, the flexibility, support and resourcefulness offered by my employer Vaillant, the local community where I live, and from health care professionals and scientists who have both cared for those in need and developed the vaccines to chart our future path are all big positives.

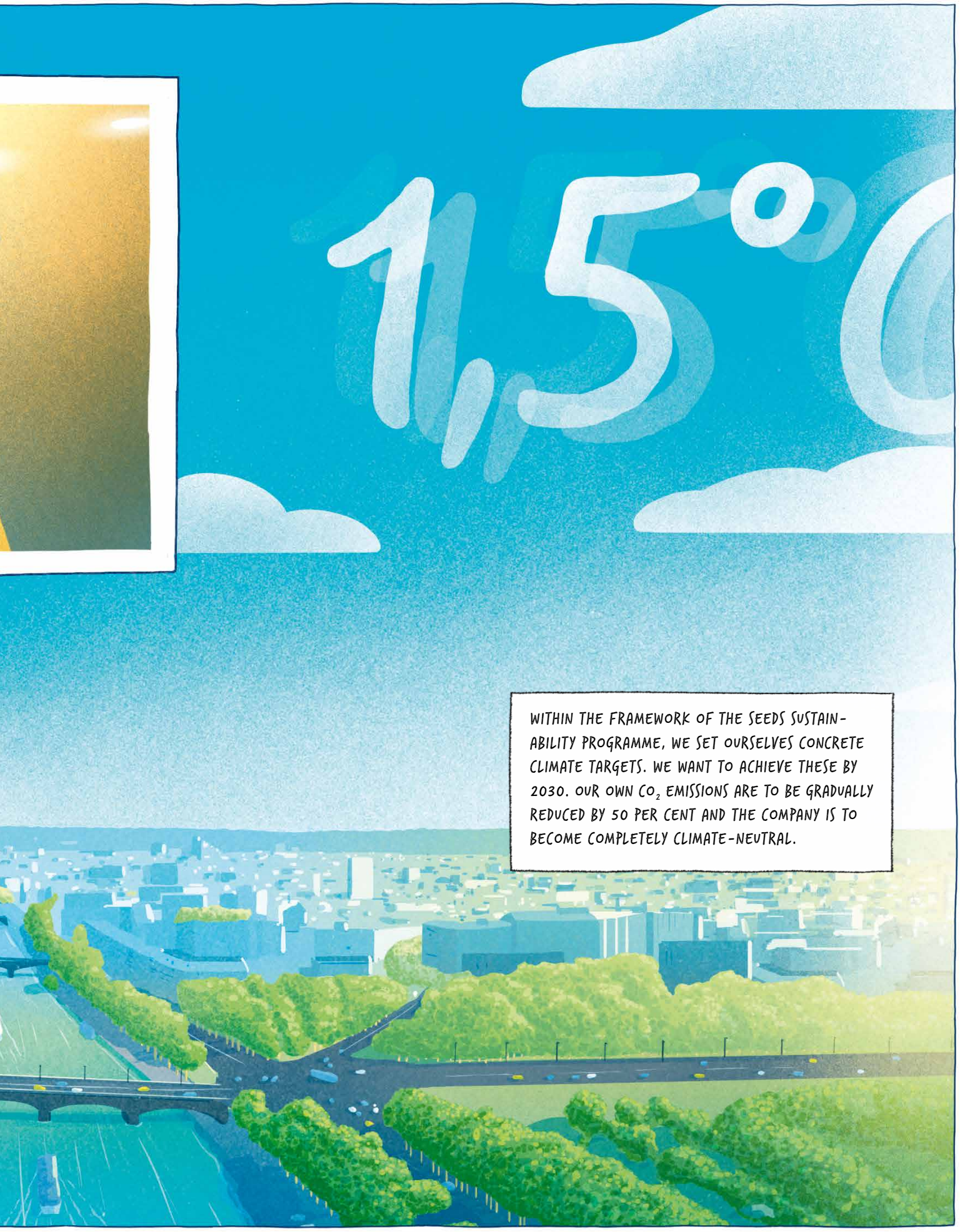
As a personal learning, I would say the ability to adapt to and normalise situations that a priori seem to be impossible or very complicated. In the end, change always offers new opportunities to learn from!

How fast and flexible we as an organisation can adapt to a new situation and way of working.

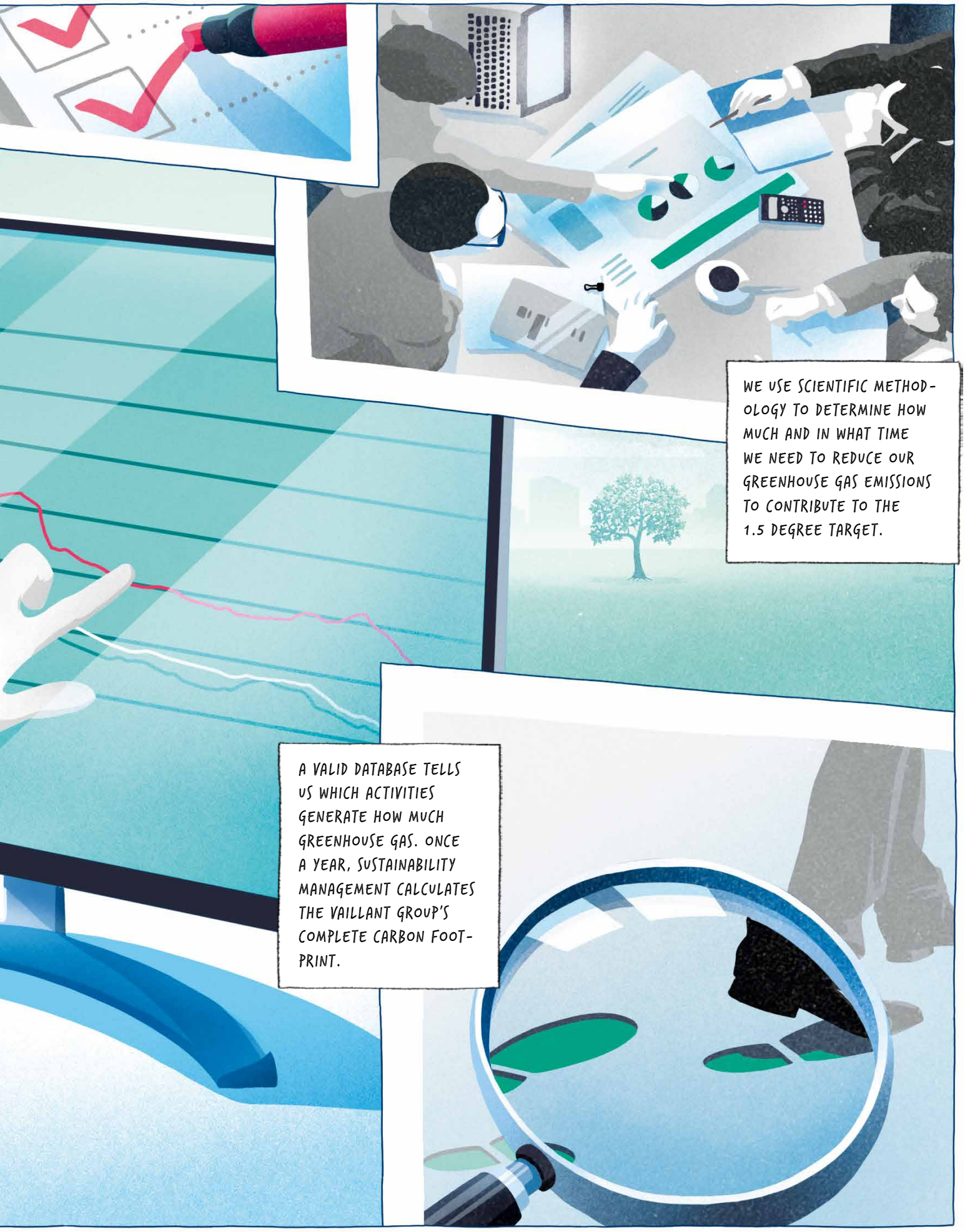
CLIMATE-NEUTRAL

IN ITS SEEDS SUSTAINABILITY PROGRAMME, THE VAILLANT GROUP HAS SET ITSELF THE GOAL OF MAKING THE ENTIRE COMPANY CLIMATE-NEUTRAL. TO ACHIEVE THIS, WE ARE REDUCING AND OFFSETTING ALL OUR CO_2 EMISSIONS.


WITH THE PARIS CLIMATE AGREEMENT, THE INTERNATIONAL COMMUNITY HAS COMMITTED ITSELF TO LIMITING CLIMATE CHANGE TO 1.5 DEGREES CELSIUS. THE VAILLANT GROUP IS MAKING A CONTRIBUTION TO THIS AS A COMPANY.

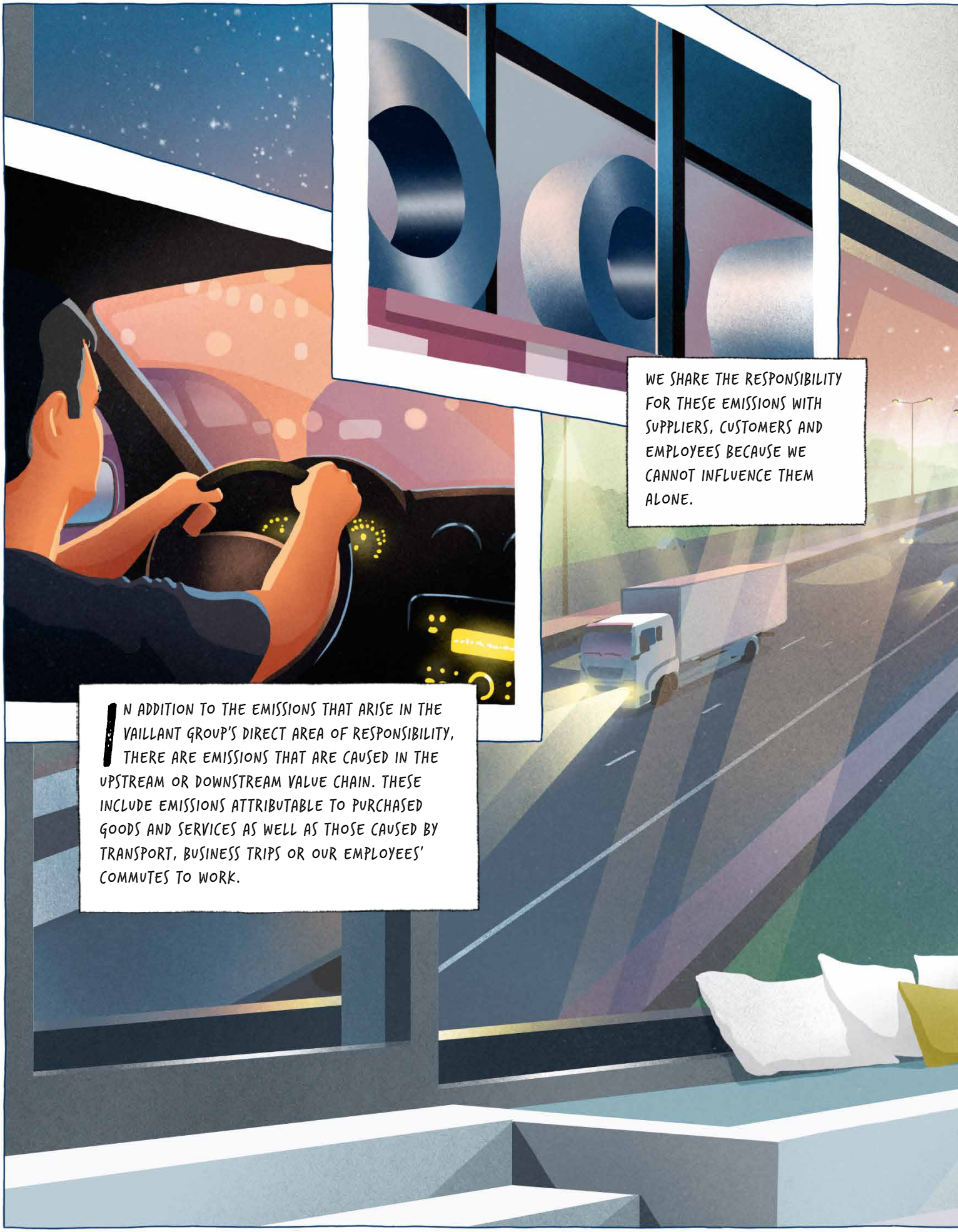

1,5°C
WITHIN THE FRAMEWORK OF THE SEEDS SUSTAIN-ABILITY PROGRAMME, WE SET OURSELVES CONCRETE CLIMATE TARGETS. WE WANT TO ACHIEVE THESE BY 2030. OUR OWN CO_2 EMISSIONS ARE TO BE GRADUALLY REDUCED BY 50 PER CENT AND THE COMPANY IS TO BECOME COMPLETELY CLIMATE-NEUTRAL.


VAILLANT GROUP
WE ACCOUNT FOR EMISSIONS ACCORDING TO THE INTERNATIONALLY RECOGNISED STANDARD OF THE GREENHOUSE GAS PROTOCOL. OUR GOALS ARE BASED ON THE SO-CALLED SCIENCE-BASED TARGETS.


WE USE SCIENTIFIC METHODOLOGY TO DETERMINE HOW MUCH AND IN WHAT TIME WE NEED TO REDUCE OUR GREENHOUSE GAS EMISSIONS TO CONTRIBUTE TO THE 1.5 DEGREE TARGET.
A VALID DATABASE TELLS US WHICH ACTIVITIES GENERATE HOW MUCH GREENHOUSE GAS. ONCE A YEAR, SUSTAINABILITY MANAGEMENT CALCULATES THE VAILLANT GROUP'S COMPLETE CARBON FOOTPRINT.


A MAJOR LEVER WITH WHICH WE ACHIEVE CO_2 SAVINGS IS THE USE OF ELECTRICITY FROM RENEWABLE ENERGY SOURCES. WITH GREEN ELECTRICITY, ESPECIALLY FOR THE PRODUCTION SITES, UP TO 18,000 TONNES OF CO_2 CAN BE AVOIDED ANNUALLY.


Vaillant
ANOTHER LEVER IS THE VEHICLE FLEET. BY 2030, EMISSIONS CAUSED BY COMPANY VEHICLES ARE TO BE SIGNIFICANTLY REDUCED: THROUGH MORE ECONOMICAL VEHICLES AND – WHERE POSSIBLE – THROUGH ELECTRIC CARS.
THE THIRD LEVER IS TO REDUCE ENERGY CONSUMPTION IN OUR PRODUCTION PROCESSES AND BUILDINGS. EFFICIENCY MEASURES ARE INTENDED TO SUBSTANTIALLY DECREASE THE VAILLANT GROUP'S GAS CONSUMPTION AND THE ASSOCIATED CO_2 EMISSIONS.


WE SHARE THE RESPONSIBILITY FOR THESE EMISSIONS WITH SUPPLIERS, CUSTOMERS AND EMPLOYEES BECAUSE WE CANNOT INFLUENCE THEM ALONE.
IN ADDITION TO THE EMISSIONS THAT ARISE IN THE VAILLANT GROUP'S DIRECT AREA OF RESPONSIBILITY, THERE ARE EMISSIONS THAT ARE CAUSED IN THE UPSTREAM OR DOWNSTREAM VALUE CHAIN. THESE INCLUDE EMISSIONS ATTRIBUTABLE TO PURCHASED GOODS AND SERVICES AS WELL AS THOSE CAUSED BY TRANSPORT, BUSINESS TRIPS OR OUR EMPLOYEES' COMMUTES TO WORK.


EMISSIONS ARE OFTEN PRODUCED DURING THE OPERATION OF A HEATING SYSTEM, DEPENDING ON THE ENERGY SOURCE AND INDIVIDUAL HEATING HABITS. REPLACING OUTDATED HEATING TECHNOLOGY MAKES A LASTING CONTRIBUTION TO CLIMATE PROTECTION.
Vaillant
TO HELP OUR CUSTOMERS SAVE AS MUCH ENERGY AND CO_2 EMISSIONS AS POSSIBLE, WE ARE GEARING OUR PRODUCT PORTFOLIO TOWARDS ENVIRONMENTALLY FRIENDLY HEAT PUMPS AND HIGHLY EFFICIENT GAS HEATING APPLIANCES.


Forests are able to capture CO_2. Part of the Vaillant Group's climate strategy is therefore to completely offset initially unavoidable emissions through afforestation projects. This will make the Vaillant Group climate-neutral as early as 2020.

UNTIL THE COMPANY'S OWN FOREST AREAS COMPLETELY OFFSET THE REMAINING EMISSIONS, THE VAILLANT GROUP ACQUIRES CO_2 CERTIFICATES FROM EXISTING, CERTIFIED AFFORESTATION PROJECTS.

WE WILL CREATE OUR OWN FOREST AREAS AS PART OF LONG-TERM PROJECTS. THE NEWLY PLANTED FORESTS WILL GRADUALLY REPLACE THE ACQUIRED CO_2 CERTIFICATES.

Avoid, reduce and offset

The Vaillant Group takes responsibility for its greenhouse gas emissions. In doing so, it makes a contribution to climate protection. One component of its corporate climate strategy is the purchase of CO_2 certificates.

That sounds easier than it is. Because behind every CO_2 certificate is a complex system of checks and controls. How is an emissions certificate actually created? Who are the sellers and how does the trading work?

The Vaillant Group is becoming climate-neutral. An ambitious, long-term climate strategy and the SEEDS 2030 sustainability programme will ensure this. In addition to the reduction of CO_2 emissions and the conversion to renewable energies, the compensation of unavoidable emissions is also an important component. In the long term, according to the plans, the company's own afforestation projects will offset the remaining emissions. Until that time, the Vaillant Group will acquire additional emission certificates from existing projects every year to achieve its climate neutrality.

The principle of compensation

In a CO_2 offset, a company acquires emission allowances in the form of CO_2 certificates. One certificate corresponds to one tonne of CO_2. In order to achieve climate neutrality, all CO_2 emissions that the company directly causes must be offset. The certificates come either from another company that has more emission rights than it needs or from a climate protection project.

The intention behind the offset approach is not to buy oneself out of the obligation to reduce CO_2. Instead, the issuance of CO_2 certificates is subject to strict rules aimed at a permanent reduction of greenhouse gas emissions.

Emissions targets and market mechanisms

Trading in CO_2 certificates goes back to the Kyoto Protocol of 1997, the year in which the industrialised nations agreed

for the first time on binding reduction targets for greenhouse gas emissions. Three market-based mechanisms were introduced at that time: emissions trading, the "Joint Implementation" and the "Clean Development Mechanism".

States that participate in emissions trading receive an "emissions budget" according to an allocation plan. This determines the permitted quantity of emissions within a certain period of time. If the permitted emission quantity is not reached, emission certificates can be sold to another state. If, on the other hand, the emission limit is exceeded, additional emission certificates must be purchased.

Alternatively, industrialised countries can implement or finance climate protection projects in other signatory states within the "Joint Implementation" framework of the Kyoto Protocol. The resulting emission savings will be credited to their CO_2 balance. It is also possible to realise climate protection projects in developing countries that do not belong to the group of Kyoto signatories. This is done on the basis of the "Clean Development Mechanism".

Offset projects can be measures aimed at reducing emissions (such as those from the renewable energy, energy efficiency and agriculture sectors), as well as projects aimed at the long-term storage of CO_2 (such as the creation of wetlands, afforestation or conservation projects).

Voluntary compensation

Companies like the Vaillant Group that not only want to reduce their own carbon footprint but also aim for climate neutrality can voluntarily offset emissions. To do this, they can use certificates from the "Clean Development Mechanism" as well as purchase CO_2 certificates from climate protection projects on the market for voluntary compensation. The providers of these certificates are the project developers who implement the climate protection measures, service providers who advise companies willing to offset, and specialised traders, so-called brokers. Since the voluntary market is not regulated, various standards have emerged in recent years according to which projects can be evaluated and selected. Among the internationally recognised quality standards with very high quality requirements are the Gold Standard or the Verified Carbon Standard.

In addition to climate protection, projects that seek certification according to these demanding standards contribute to sustainable development at the project site by adding value with regard to the UN Sustainable Development Goals. This can be done, for example, by creating jobs, building knowledge among the local population or improving air quality. Projects should also have a positive impact on the protection of human rights and biodiversity.

Quality criteria for CO_2 offsetting

Climate protection projects seeking certification must generally fulfil the "criterion of additionality". This means: the project could not have been implemented without the proceeds from the sale of the CO_2 certificates. In addition, it must be determined how the emissions would develop without the project. And it is also assessed whether the CO_2 savings are permanent and whether the implementation of the project could possibly cause adverse environmental effects elsewhere, also known as "leakage". The extent of the emission savings from the climate protection projects is determined using defined and approved procedures.

During the lifetime of the project, independent auditors monitor it at regular intervals. They verify what CO_2 reduction or capture has actually taken place by the time of the inspection. After this external verification, the project developer can offer and sell emission certificates on the offset market to the corresponding extent.

For CO_2 certificates in the voluntary market, pricing is influenced by several factors: for example, the price for offsetting one tonne of CO_2 is determined by the type, size, quality and complexity of the project. In addition, the costs of the technology used and the project location are also important. As in any market, prices arise not least due to an interplay of supply and demand.

To ensure maximum transparency, the certificates are recorded in a register. In contrast to the regulated market, there is no generally applicable public register for the voluntary emissions market. However, two registry operators in particular, APX and IHS Markit, have established themselves on the market. Some standards, such as the Gold Standard, also have their own registers. Based on the serial number assigned, it is possible to trace which company has acquired which certificates. If a company now wants to use the certificates to offset CO_2 emissions, the certificates are decommissioned by the registry operator so that multiple use is ruled out.

Protecting the climate and promoting development

The Vaillant Group obtains the CO_2 certificates it currently uses to offset its emissions directly from project developers in Central and South America. They are certified with the Gold Standard, which is one of the standards with the highest quality requirements in the voluntary market. By purchasing the CO_2 certificates, the Vaillant Group not only supports the afforestation of the region. It also contributes to sustainable development of the agricultural structures there. The effect: ecologically sustainable income opportunities are created for the local population and climate-damaging greenhouse gas emissions are reduced.

EXPERT TALK

Credible climate protection

Buyers of carbon offset certificates rely on independent certifiers such as the Gold Standard. They are there to guarantee the environmental and social sustainability of climate protection projects. We asked Sarah Leugers, Director of Communications at the Gold Standard Foundation in Geneva, how it can be ensured that projects deliver what they promise and why offset projects are often located in developing countries.

Ms Leugers, why is certification of climate protection projects important?

→ The quality standards ensure that the projects implemented to reduce CO_2 emissions verifiably meet certain quality criteria. Only when a project developer can prove that the project meets all criteria are the emission certificates issued. This way, buyers can be sure that the offsetting of their emissions has actually taken place and is of lasting effectiveness.

What conditions must be fulfilled for certification according to the Gold Standard?

→ There are some baseline requirements. These include proof that the project would not have been feasible without financing through emission certificates and that the calculation of emissions is methodologically correct. The Gold Standard also requires the fulfilment of several other criteria: first, the project measures to prevent emissions must not have any negative side effects at local level. Secondly, the local population should be involved from the outset. If there are concerns that cannot be addressed, the project design must be modified accordingly. And third, in addition to reducing emissions, the projects must also make a measurable and verifiable contribution to the sustainable development of the region. This means that the projects must achieve at least two of the development goals set by the United Nations in addition to the climate goal.

How do you assess whether the criteria have been met?

→ Before the project developer goes through the certification process, we already check on this.

In addition, the project is audited by an independent assessor, who also conducts an on-site inspection. If the validation process is successful, the project goes into implementation. Then the emission savings are measured and documented. Only after a second independent assessor has confirmed the climate protection effects and the achievement of the predefined development goals to the extent specified will the certificates be issued.

How long does such a certification process take?
→ On average, the entire process takes one year. For afforestation projects, certification may require up to two years. For renewable energy and energy efficiency projects, on the other hand, it can go more quickly.

Why are most projects for offsetting CO_2 emissions located in developing countries?
→ The financing of projects in developing countries is a cost-efficient approach to reducing greenhouse gas emissions and fosters sustainable development and growth in those countries. This is – apart from reducing CO_2 emissions – one of the major goals of international climate negotiations and a core tenet of climate justice. Moreover, it reduces the risk of double counting which might occur if these projects were located in an industrialised country which has signed the Kyoto Protocol.

Could you please explain this in more detail?
→ The Kyoto Protocol, the original climate treaty, set binding emission reduction targets only for industrialised countries. Climate projects for international trading would be implemented in developing countries, supported by funding from the developed world. Now, according to the Paris Climate Agreement, all countries must account for their emissions in their national climate inventories, making it even more complex to avoid double counting. For example: if France were to establish an afforestation project in its own country, the climate impact would be included in its national carbon inventory. Also, selling certificates from this project would constitute double counting.

Are there even enough project offerings to meet the increasing demand on the voluntary market for carbon offsetting?
→ At the moment, there is still a surplus of supply. Developers of offset projects that were launched several years ago are currently putting their carbon credits on the market. In addition, new projects are being initiated, so the supply will continue to increase. We are also currently observing that more and more companies are entering into long-term purchase agreements with project developers and even pre-financing projects. This improves the project developers' planning security. If the current development continues, it would certainly boost the emergence of further climate protection projects.

THE GOLD STANDARD

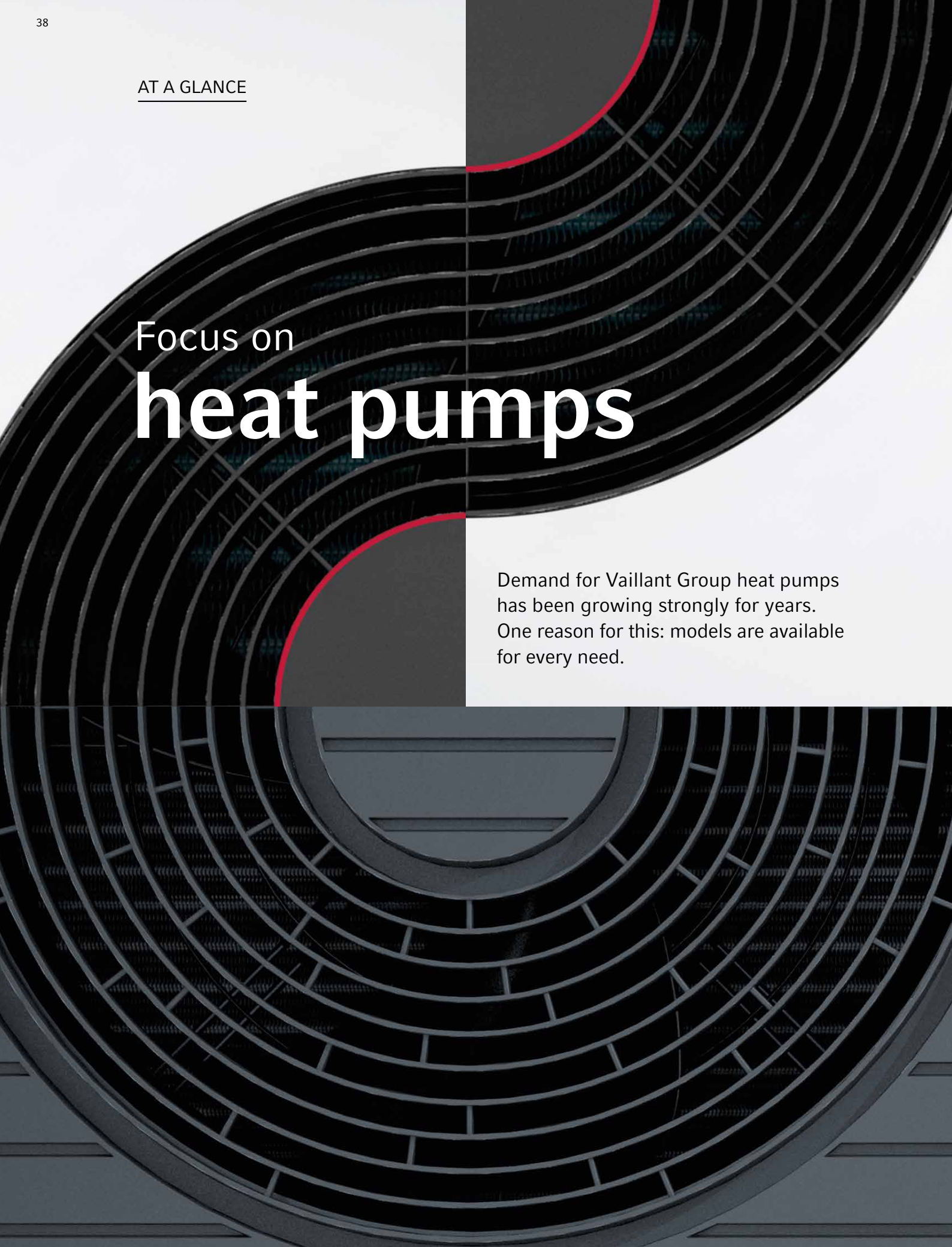
The Gold Standard is one of the world's strictest quality standards for carbon offset projects. It was launched in 2003 by the World Wide Fund for Nature and other environmental organisations. As an additional standard, it forms the basis for the certification of UN-registered projects and, since 2006, has also been used for projects within the framework of voluntary offsetting.

Since 2018, the Gold Standard for the Global Goals (GS4GG) has incorporated the United Nations Development Goals set under the 2030 Agenda for Sustainable Development. Thus, in addition to reducing emissions, the projects identified with the GS4GG certificate must promote at least two of the 17 United Nations Sustainable Development Goals.

Gold Standard for the Global Goals

Focus on heat pumps

Demand for Vaillant Group heat pumps has been growing strongly for years. One reason for this: models are available for every need.



aroTHERM plus + GeniaAir Mono

The heat pumps of the Vaillant aroTHERM plus and Saunier Duval GeniaAir Mono series are air-water heat pumps with monobloc technology. The system consists of the heat pump installed outside and a compact indoor unit. The air serves as the energy source.

The heat pump works with a natural refrigerant which is particularly climate-friendly and enables high flow temperatures. This means that both the aroTHERM plus and the GeniaAir Mono can be operated efficiently with radiators. For this reason, both heat pumps are also suitable for heating system modernisation. They offer an environmentally friendly and energy-efficient solution for the replacement of an old oil or gas heater.

At 0.5 square metres, the outdoor unit requires very little space. Another important benefit is that the models are particularly quiet. At 28 decibels in night mode, measured at a distance of three metres, they are barely audible. This makes installation possible even in densely built terraced housing areas.

As monobloc heat pumps, the aroTHERM plus and the GeniaAir Mono generate heat directly in the outdoor unit and transfer it into the house. All essential components are integrated in the outdoor unit, including the refrigerant circuit. The installer does not need to have a refrigeration certificate for installation or maintenance. A 190-litre hot-water tank – suitable for a family of four – is integrated into the indoor unit.

The aroTHERM plus and GeniaAir Mono heat pumps are available in output sizes from 3 to 12 kW.

AT A GLANCE

- Environmentally and climate-friendly thanks to natural refrigerant
- High flow temperature allows efficient use with radiators
- Particularly quiet outdoor unit can even be operated in dense buildings

BEST SUITED FOR

- Heating system modernisation in existing buildings
- New construction of detached houses and semi-detached houses
- Cascade solutions or hybrid systems for apartment buildings or small businesses

aroTHERM Split + GeniaAir Split

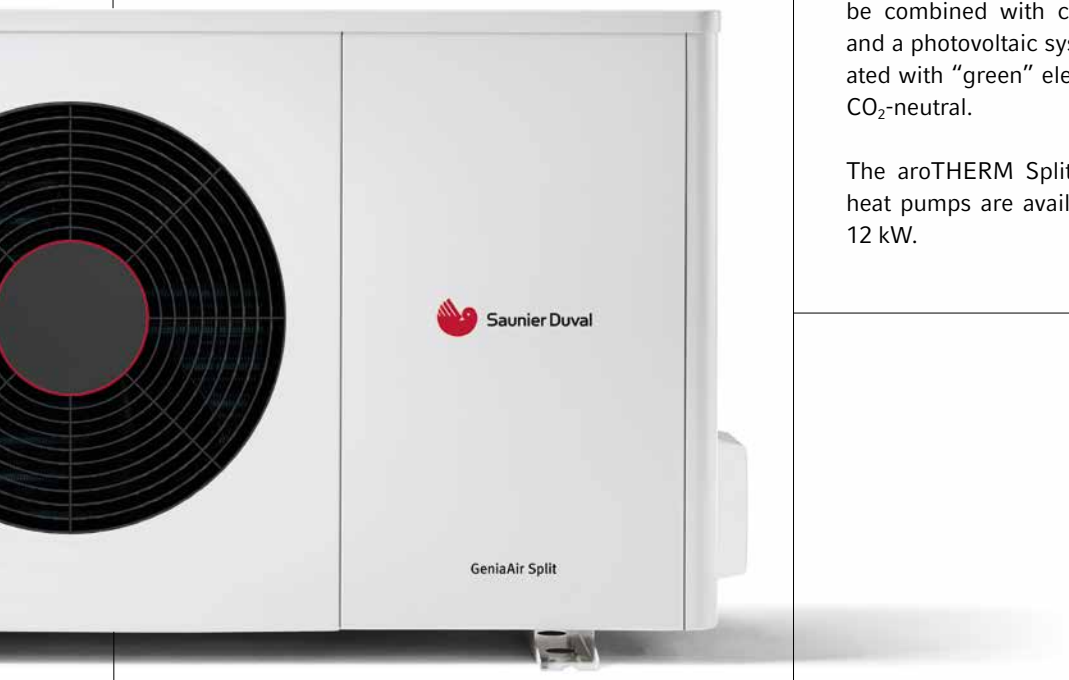
In the air-water heat pumps Vaillant aroTHERM Split and Saunier Duval GeniaAir Split, the refrigerant circuit is split between the outdoor unit and the indoor unit.

The connection between the heat pump installed outside and the indoor unit is made via pipes that are easy to install. Because refrigerant pipes are somewhat thinner and can be placed more easily than water pipes, the installation is somewhat cheaper. In addition, the refrigerant is freeze-proof. The distance between the outdoor and indoor unit can be up to 40 metres – this allows for great flexibility when it comes to the installation.

In a split system, the hydraulics, hot-water tank, condenser and compressor are contained in the heat pump's indoor unit.

In reverse operating mode, the heat pumps can also actively cool, which is a great advantage especially in southern European climates. Of course, they can also be combined with controlled domestic ventilation and a photovoltaic system. If the heat pump is operated with "green" electricity, heating and cooling is CO_2-neutral.

The aroTHERM Split and GeniaAir Split air-water heat pumps are available in output sizes from 3 to 12 kW.



AT A GLANCE

- Guaranteed freeze protection due to refrigerant split technology
- Simple and cost-effective installation
- Quiet and additional mode for night operation
- Space-saving installation in the garden or against the house wall

BEST SUITED FOR

- New construction of detached and semi-detached houses
- Energy-oriented refurbishment or for hybrid systems with gas or oil heaters in detached houses and semi-detached houses
- Cascade solutions or hybrid systems for apartment buildings or small businesses

flexoTHERM exclusive + flexoCOMPACT exclusive

Thanks to their system concept, the Vaillant flexoTHERM exclusive and flexoCOMPACT exclusive heat pumps can optionally use the air, groundwater or the ground as a heat source.

Both models are highly efficient indoor brine-water heat pumps that are combined with an outdoor air or groundwater collector. The system can also use thermal energy from the soil in conjunction with ground collectors or geothermal probes. A ground collector is laid as a horizontal surface around 1.5 to 2 metres deep in the ground. Alternatively, a ground probe is inserted 80 to 100 metres deep into the earth via a borehole.

The aroCOLLECT air collector and the fluoCOLLECT groundwater collector can be located up to 30 metres away from the heat pump. The indoor unit of the heat pump system contains the entire refrigerant circuit. The installation therefore does not require a refrigeration certificate for this model either.

The flexoCOMPACT exclusive is a model variant of the flexoTHERM exclusive. It has a 185-litre hot-water tank made of stainless steel. It meets the daily hot-water needs of a family of four. Both heat pumps can also be used for active cooling thanks to the reverse operation mode.

The flexoTHERM exclusive heat pump is available in output sizes from 5 to 19 kW. The flexoCOMPACT exclusive model from 5.8 to 11 kW.

AT A GLANCE

- Flexible modular concept for using the heat sources air, water or earth
- Resource-saving with efficiency class A++ or A+++
- Including Internet module for control via app

BEST SUITED FOR

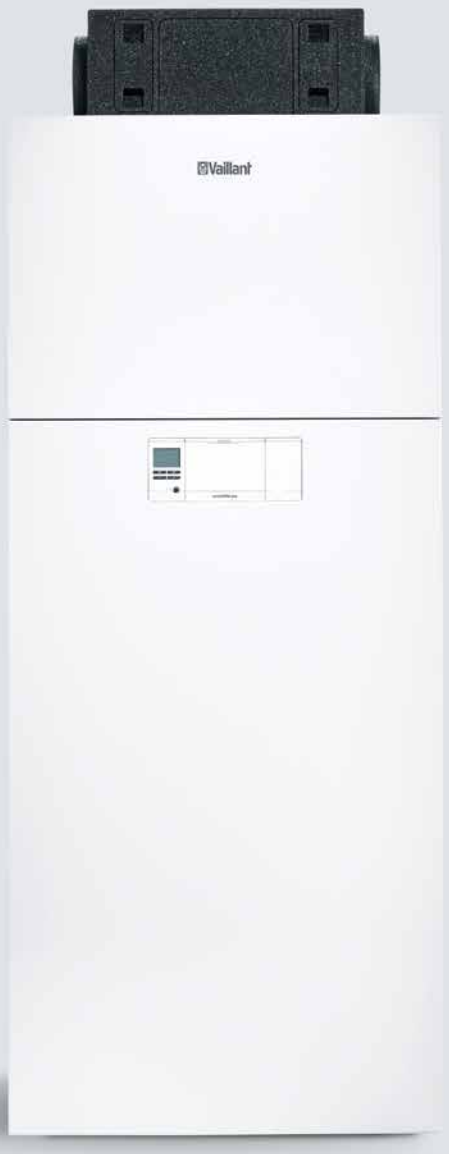
- New buildings or overall renovation projects of detached and semi-detached houses
- Cascade solutions or hybrid systems for apartment buildings or smaller businesses

versoTHERM plus

The Vaillant versoTHERM plus is installed completely indoors and does not require an outdoor unit. Here, too, the outside air serves as the primary energy source. The special feature of the versoTHERM plus is the many options for system integration.

The model can be combined with a central ventilation system or with an exhaust air ventilation system. Heat recovery of the residual heat takes place via the heat pump. For hot-water preparation, the versoTHERM plus can be supplemented with various hot-water and multifunctional storage tanks for households of two to six people as well as a solar system. Of course, the integration of a photovoltaic system is also possible.

The versoTHERM plus heat pump is available in output sizes of 3, 5 and 7 kW.



AT A GLANCE

- Fully indoor-installed air-water heat pump without outdoor unit
- Small space requirement
- Combinable with system components on a modular basis

BEST SUITED FOR

- New construction of detached and semi-detached houses, especially on small plots of land
- Replacement of older heat pumps
- Comprehensive energy refurbishments and hybrid systems

recoCOMPACT exclusive

The Vaillant recoCOMPACT exclusive heat pump is an all-in-one solution specifically for detached homes. The heat pump has an integrated hot-water cylinder, sufficient for a family of five, and controlled domestic ventilation.

The heat pump is installed indoors, without an outdoor unit. The air, which serves as the energy source, reaches the heat pump via ducts through the exterior wall.

The ventilation system supplies the house with fresh air. The heat recovery via the heat pump is up to 98 per cent and thus ensures additional energy efficiency. In reverse mode and with an appropriate set-up, the recoCOMPACT exclusive can actively cool the building via the underfloor heating system. Heating, cooling, ventilation and hot-water preparation can be conveniently controlled via app. The amount of heat and electricity that is consumed can be monitored.

The recoCOMPACT exclusive has an energy efficiency rating of A++ according to the Ecodesign Directive. In combination with a photovoltaic system, an almost CO_2-neutral operation is possible with minimal costs.

The recoCOMPACT exclusive heat pump is available in output sizes of 3, 5 and 7 kW.

AT A GLANCE

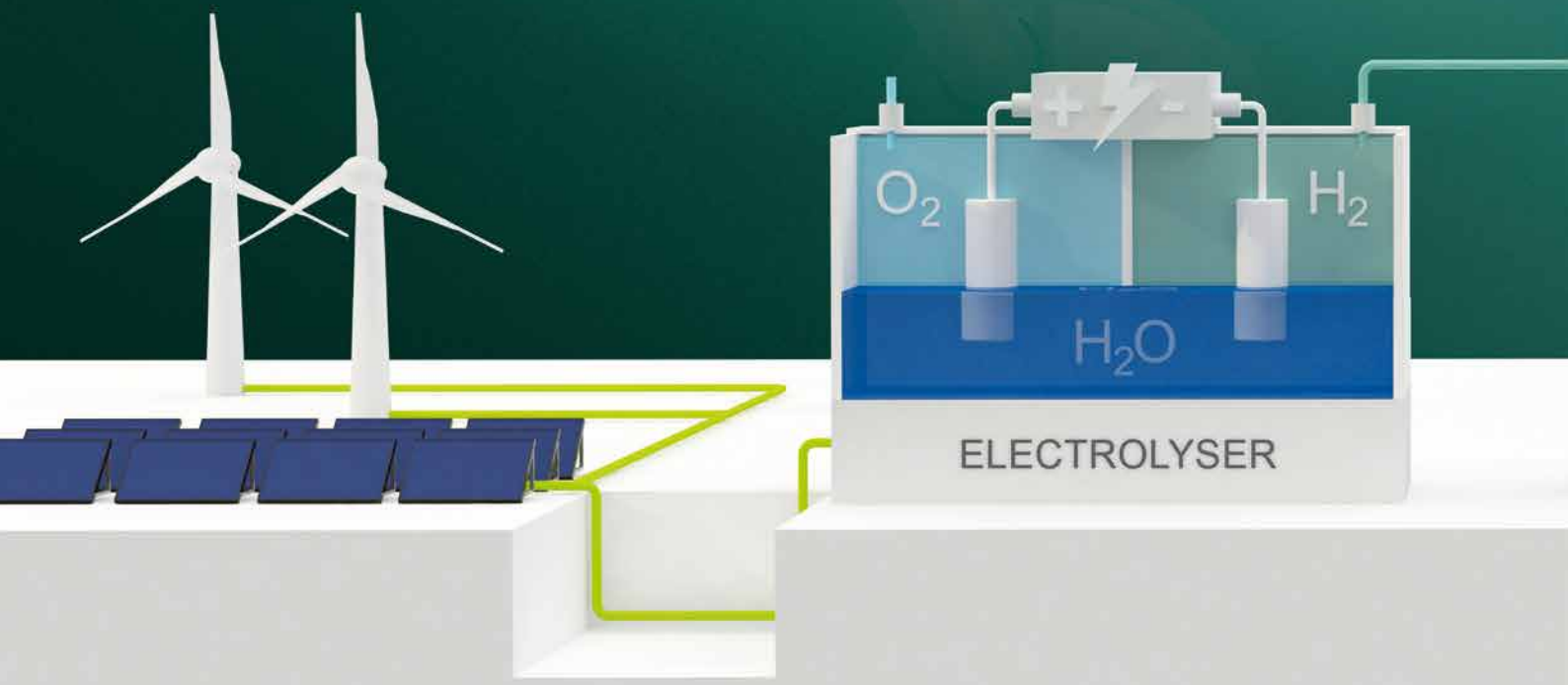
- Heating, cooling, ventilation and hot water combined in an all-in-one solution
- Fully indoor-installed air-water heat pump without outdoor unit
- Compact design and space-saving compared to individual units

BEST SUITED FOR

- New construction of detached and semi-detached houses, especially on small plots of land
- Comprehensive energy refurbishments

FOR A BETTER CLIMATE

HEATING WITH **HYDROGEN**



The Vaillant Group develops heating appliances based on hydrogen. As a CO_2-neutral gas, hydrogen can contribute to the decarbonisation of buildings. It's not just the environment that benefits.

hen it comes to a forward-looking energy supply, hardly any other topic is currently being discussed more frequently than hydrogen. Hydrogen in industry. Hydrogen in traffic. Hydrogen for building supplies. As a fuel, hydrogen releases no CO_2 emissions if it is produced from renewable energy sources. It can contribute to decarbonisation across sectors. It can be utilised very flexibly. And it is easy to transport and store due to its compatibility with different states of aggregation.

In the industrial sector, a major challenge is to make highly CO_2-emitting sectors of industry more environmentally friendly, such as the steel industry or the chemical industry. In traffic and transport, the focus is on using hydrogen in local public transport, heavy goods transport and in shipping and aviation. In buildings, hydrogen could also become an integral part of the energy mix as a green gas. As a second mainstay alongside electricity-powered heat pumps.

SETTING THE POLITICAL COURSE

The EU has by now developed a comprehensive hydrogen strategy as part of a climate-neutral Europe. The heating sector is also part of this strategy. By around 2030, so-called hydrogen valleys, i.e. regional hydrogen ecosystems, are to be created. In these, residential and commercial buildings are to be supplied with heat from locally produced hydrogen that is transported over short distances. Environmentally neutral and sustainable.

To support the EU hydrogen strategy, the European Clean Hydrogen Alliance has been founded. The alliance is an association of decision-makers along the entire hydrogen value chain. Roadmaps as a basis for political decision-making processes and viable investment projects are being developed here. The Vaillant Group is one of the members of the alliance and contributes its know-how. “As a member, we have the opportunity to actively shape planning processes and projects,” says Christoph Schreckenberg, Senior Manager in the Association and Standardisation department. “Our primary goal is to firmly integrate the building sector into the strategies and plans around hydrogen use.”

At national level, hydrogen has long been a topic of attention. In Germany, a national hydrogen strategy has been in place since 2020. A national hydrogen council has been set up to implement the federal government’s strategy. Germany is earmarking €7 billion for the market ramp-up of hydrogen technologies, plus €2 billion for international partnerships.

The Netherlands, France, Spain, Portugal and Norway also developed their respective national hydrogen strategies in 2020. Followed by Austria and Poland. Other European countries are currently working on it. Italy and Slovakia, for example.

In the UK, the realisation of an actual hydrogen economy is even more advanced than in the EU. In addition to a national hydrogen strategy, measures are already being implemented and legal foundations discussed, as Mark Wilkins, Technologies and Training Director at Vaillant UK, explains. “Currently, people are considering whether gas appliances will very soon have to operate with an admixture of 20 per cent hydrogen. This technical requirement will likely be implemented once the safety case is proven and would have far-reaching implications for the market. In addition, there is currently a significant amount of activity looking at the feasibility of using 100 per cent hydrogen. For this to become a reality, it is likely that ‘hydrogen ready’ boilers will be mandatory from 2025. A hydrogen-ready boiler leaves the factory for use with natural gas but is certified for later conversion to operate with 100 per cent hydrogen.”

In order to be prepared for changing technical requirements, the Vaillant Group is active throughout Europe in various associations, committees and networks. Work is being done on future standards for European and national gas quality and for energy-efficient gas heating appliances. The focus is also on

technical aspects with regard to the admixture of hydrogen into the existing natural gas grid or the use of 100 per cent hydrogen heating appliances.

HYDROGEN IN THE HEATING MARKET

Hydrogen undoubtedly has the potential to be a cornerstone of the European energy transition. For this to happen, however, the hydrogen must be produced CO_2-free on the basis of renewable energies, as so-called green hydrogen. So far, no large quantities of green hydrogen are available. Hence, it will take time for hydrogen to develop its full potential. Production capacities have to be created, as well as pipeline and distribution networks, transport and storage facilities. In addition, uniform technical standards still have to be defined. For at present, there are no harmonised standards for the percentage of hydrogen that may be added to existing gas grids. The percentage varies between zero and ten per cent across European countries. European harmonisation is a long-term undertaking.

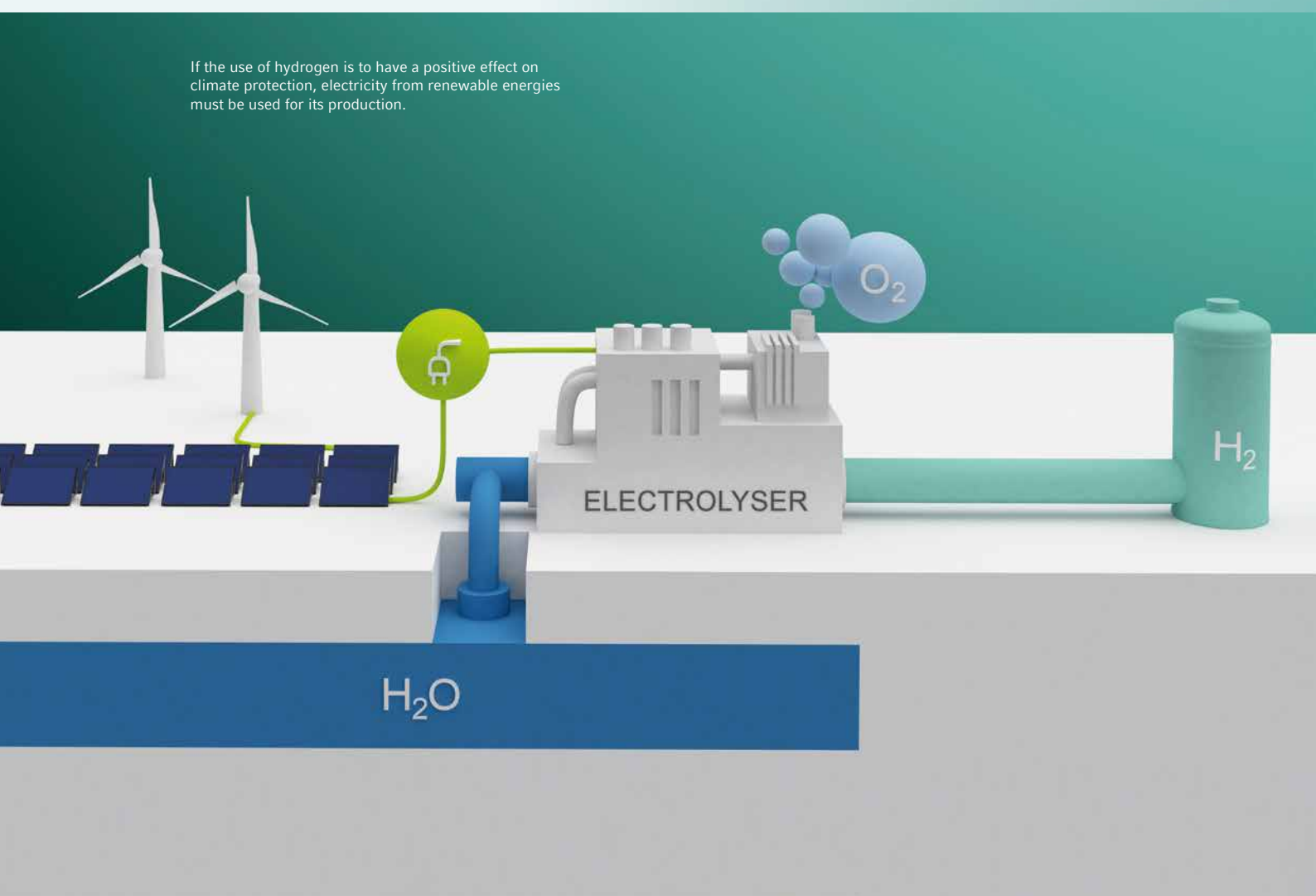
In the heating market, two scenarios are currently being pursued in order to do the "homework" as a sector: first, as a transition scenario, a hydrogen admixture in the existing natural gas grid of 20 per cent. Secondly, the use of hydrogen in its pure form as a completely CO_2-free fuel. More of a long-term goal for the period between 2030 and 2050.

In the UK, in Germany and in the Netherlands, field tests by gas utility companies are now under way, which are providing insights into possible blending rates.

READY FOR THE MARKET LAUNCH

In the segment of gas condensing boilers, CE certification for a 20 per cent hydrogen admixture is currently being prepared for several Vaillant appliance generations. These include the ecoTEC plus and ecoTEC exclusive model series. Both are equipped with the gas-adaptive IoniDetect combustion system. This enables the appliances to automatically adapt to fluctuating gas qualities, includ-

If the use of hydrogen is to have a positive effect on climate protection, electricity from renewable energies must be used for its production.



ing those with hydrogen content. In the latest generation of appliances, the proportion of hydrogen can even be around 30 per cent.

The Vaillant Group is also prepared for the use of pure hydrogen as a completely CO_2-free energy source for gas heating appliances. A ready-for-series appliance for the combustion of 100 per cent hydrogen is being tested. “Special challenges arise with this technology because of the different properties of hydrogen and natural gas,” explains Michael Paul, who is responsible for the “100 per cent hydrogen” project. Due to the specific combustion properties of hydrogen, a new burner must be used, among other things, and other components of the heat cell must be adapted to the properties of hydrogen.

Besides CO_2-neutral combustion for energy generation, hydrogen has other positive qualities, especially in the heating sector: heaters based even on pure hydrogen can be constructed in such a way that they have the same dimensions as natural gas boilers. This simplifies appliance replacement in existing buildings and means that installers will not have to deal with new requirements. Only the gas meter and the pressure controller would have to be replaced in the building installation. The efficiency of the appliances is also similar to that of gas condensing boilers. Consequently, existing radiators and condensing gas flue systems can still be used after replacement. Customers benefit from all these advantages.

LOOKING AHEAD

Planned next steps are participation in demonstrator field test projects. At present, hydrogen pipelines and infrastructures are being built locally within the framework of stand-alone projects, for example in the UK, the Netherlands and Germany. The Vaillant Group is in close dialogue here with the responsible energy utility companies and research institutions. As a manufacturer, the Vaillant Group thus ensures that its customers and partners are prepared for the coming hydrogen era, even before it has really begun.

HYDROGEN COLOUR CODE

What is the difference between blue, green, turquoise and grey hydrogen?

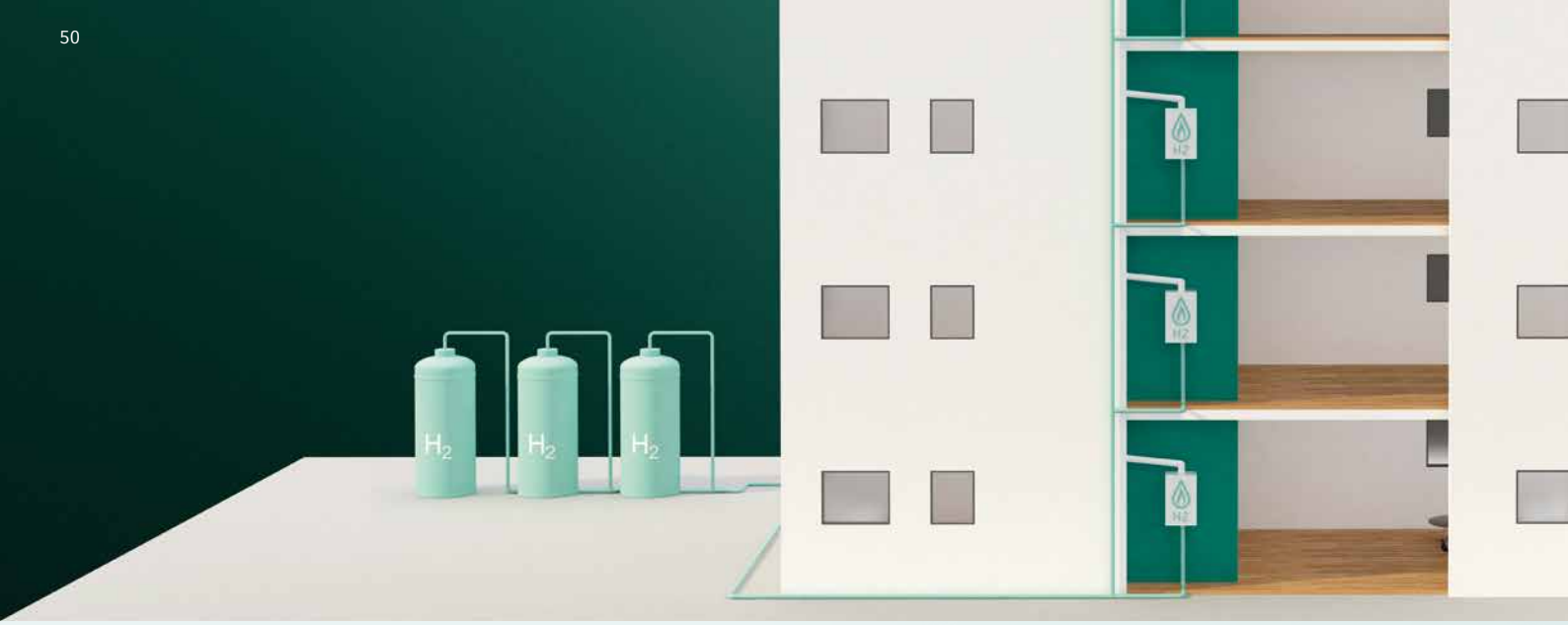
BLUE HYDROGEN is a result of so-called natural gas steam reforming. In this process, natural gas is split into hydrogen and CO_2. However, the CO_2 is not released into the atmosphere, but stored directly or processed in industrial applications (CCS = carbon capture and storage). This means that blue hydrogen is not CO_2-neutral, but it does not cause any direct environmental pollution.

GREEN HYDROGEN is produced by electrolysis of water, i.e. the splitting of the water molecule into the two elements oxygen and hydrogen. Only electricity from renewable energies is used for this process. This produces no CO_2; the hydrogen obtained in this way is completely climate-neutral.

TURQUOISE HYDROGEN is produced when natural gas is split into hydrogen and solid carbon using a process called methane pyrolysis. This does not directly produce CO_2, but natural gas is used as the base material. The prerequisites for the CO_2 neutrality of the process are the heat supply of the high-temperature reactor from renewable energy sources and the permanent binding of the carbon.

GREY HYDROGEN is produced from fossil fuels such as coal or natural gas, obtained by steam reforming. During the extraction process, around ten tonnes of CO_2 are produced as a waste product for every tonne of hydrogen. The CO_2 is released into the atmosphere. The use of this form of hydrogen does not contribute to climate protection. The use of this form of hydrogen has no environmental benefit.

The Vaillant Group will bring hydrogen heating appliances to market that are designed for both H_2 admixture and operation with 100 per cent H_2.



GREEN LIGHT FOR HYDROGEN

The British government is considering the increased use of hydrogen in buildings as a source of clean energy. With funding from government, two major projects are currently ongoing, "Hy4Heat" and "HyDeploy", which are looking into the use of hydrogen for heating.

The Hy4Heat project is dedicated to confirming that hydrogen is a safe and viable way to decarbonisation. This involves the use of hydrogen in its pure form. The first two field tests under the umbrella project Hy4Heat are expected to start in 2021. One of the sub-projects, H100, will take place in Levenmouth, in Fife, on the east coast of Scotland. The second field test is called HyNet and will be located in the Manchester and Liverpool regions in the north-west of England. Here, the hydrogen suitability of the gas grid is also being tested.

These projects will consider the end-to-end supply of hydrogen, from production to use in the home, and how the process of converting the country from natural gas to hydrogen could be conducted. A major element here is the likely mandating of "hydrogen-ready boilers" from 2025. A hydrogen-ready boiler is one that leaves the factory ready for natural gas, but which is certified for later conversion to 100 per cent hydrogen.

The second project, HyDeploy, focuses on an admixture of up to 20 per cent hydrogen in the gas grid, something which is likely to happen once the safety case is proven.

One question that remains unanswered in all of this for now is: how can hydrogen be produced in large enough quantities in a sustainable, environmentally friendly way?

H_2 READINESS MAY SOON BECOME MANDATORY

The projects are highly relevant, as the use of hydrogen in the UK could possibly be made a legal requirement very soon. The Confederation of British Industry, the Committee on Climate Change and several other organisations have made recommendations on mandating the installation of hydrogen-ready gas heating appliances in the UK from 2025. Whether this will in the end actually become law cannot yet be said with certainty, but there are certainly very strong indicators that this will happen.

"Hydrogen-ready heating appliances" could become mandatory in the UK as early as 2025. All new gas heating appliances would then have to be technically convertible to H_2.

The considerations in the UK are more concrete than in other European countries.

For heating technology manufacturers, such a decision would have far-reaching consequences. Gas heating appliances would then have to undergo certification for operation with both natural gas and hydrogen. The boilers would have to be technically able to operate with natural gas or an admixture of 20 per cent hydrogen and be convertible to 100 per cent hydrogen operation through exchange of some components. It can be assumed that such or similar targets will be found in the UK's national hydrogen strategy, which is expected to be officially published in the course of 2021. In this case, a change in the law will be necessary in the UK to allow an admixture of up to 20 per cent hydrogen in the first place. At present, only 0.1 per cent is permitted for the gas grids.

HYDROGEN ENERGY PROJECTS IN THE UK

The Vaillant Group is participating in the HyDeploy project in the UK. This involves a 20 per cent hydrogen admixture. In a first phase, extensive laboratory tests were carried out with two identical gas heating appliances from each of several manufacturers, including appliances from Vaillant. One of the appliances ran on natural gas, the second with 20 per cent hydrogen. The test operation lasted from winter 2019 into the summer months of 2020. In this way, it was possible to determine how identical appliances behaved under the same external conditions with the two different types of gas.

Taking it a step further, 20 per cent hydrogen was added to the gas grid at Keele University in Staffordshire. The university has the largest private gas grid in the UK. The campus with its resident students is similar in size to a small town – with university buildings, apartment blocks, detached houses and more. All buildings are connected to the university's private gas grid and equipped with older gas heating appliances. The project in Keele was delayed somewhat during the year by the coronavirus pandemic, but is now nearing completion. And it is now safe to say that the existing gas appliances have run very reliably, even with a 20 per cent hydrogen admixture.

MORE FIELD TESTS TO FOLLOW

After completion of phase 1 at Keele University, HyDeploy will move on to a larger field test in a public gas network in the north-east of England. Phase 2 started in the town of Winlaton in spring 2021. For 670 households in the trial area, as well as the church, primary school and several businesses, 20 per cent hydrogen will be injected into the local gas grid for a period of around ten months. The goal here is also to understand how the already installed old appliances will react.

The utility company Northern Gas Networks operates the Winlaton gas grid. The project has strict safety requirements. Prior gas safety testing has taken place on all appliances in all properties receiving the mixed gas. There are also numerous Vaillant heating appliances in operation in the test region.

Although all the ongoing field tests are still yielding further valuable findings, the results so far are already consistently positive. Everything points to the fact that existing gas heating appliances, even the older ones, can continue to run on 20 per cent hydrogen – without any technical changes to the appliance or loss of comfort for the owners. This means that modern gas condensing technology can continue to make an important contribution to decarbonisation in the future.

At the same time, the Vaillant Group is also testing gas heating appliances that use 100 per cent hydrogen as an energy source. Participation in demonstration projects in the UK and other European countries is planned.

In conclusion, it can be said that the UK is placing its focus in particular on green hydrogen for decarbonisation in buildings, in addition to electrification, and the country wants to be a pioneer in this area. The British market alone, on average, has an annual volume of 1.6 million gas heating appliances. A considerable number of these come from the Vaillant Group. Accordingly, it is important to push the issue of hydrogen in gas heating appliances in order to be H_2-ready.

SUCCESSFUL WITH DIVERSITY

Diversity and inclusion is part of good corporate governance today. The Vaillant Group also attaches great importance to this topic.

Diversity can take many forms in a company. Whether age, gender, ethnic or socio-economic background or religious affiliation: every person is unique. Appreciating individual differences in everyday work and treating each other with respect are the prerequisites for a motivating corporate culture. Different backgrounds, experiences and perspectives as well as the promotion of diverse talents are decisive factors for entrepreneurial suc-

cess at the Vaillant Group. After all, around 15,000 employees from 73 nations come together in the company.

MORE INNOVATION AND GREATER SATISFACTION

There are unconscious stereotypes and biases in all of us, known in the technical terminology as "unconscious bias". This is because our brain simply copes better when confronted with familiar patterns. "We are not responsible for our first thought, but for our first action," explains Jessica Kirch, Director Group HR Learning & Development at the Vaillant Group. "Those who are aware of the fact of the unconscious bias can behave in a deliberately inclusive way in everyday work," says Kirch. Great diversity in the company is of no use if you are not able to accept and integrate differences with inclusive behaviour.

That can be tedious. But it is worth it. Diversity and inclusive cooperation not only foster a good working atmosphere, but also make the company more successful economically. This has been proven by numerous studies: a 2016 survey of German companies by the PageGroup HR consultancy, for example, shows that employees in a diverse work environment were more content, felt more connected to the company and experienced less stress. Employees were also less sick and worked more productively.

Moreover, companies that promote diversity are often particularly innovative and interesting as employers for young talent. This is confirmed by a study conducted by the consulting firm Bersin by Deloitte in 2015 with 450 companies worldwide. According to the study, companies that made diversity and inclusion (D&I) a core topic of their human resources management were more successful in developing leadership talent than their competitors.

According to a recent survey of 1,000 companies in 15 countries by the management consultancy McKinsey, the probability of being more profitable than average increases by 36 per cent for companies with particularly pronounced ethnic diversity, and by 25 per cent for companies with a balanced gender ratio. The comparison with previous studies also shows that the correlation – i.e. the link – between diversity and overall company success has increased in recent years. "Homogeneous leadership teams have a hard time surviving in today's business world and finding the right answers to current challenges," explains Julia Sperling, partner at McKinsey, commenting on the study results. A decisive factor in improving diversity and thus also the company's success sustainably is an inclusive corporate culture: "It's no use if the quota of women is right, but women are not invited to the meetings that matter or are not heard," Sperling explains further. Therefore, companies should specifically make sure that the environment is designed in such a way that diverse talents have the confidence to speak their minds.

VARIOUS CHALLENGES

So there are good reasons to see diversity and inclusion as an important part of the corporate culture. For the Vaillant Group, the topic therefore plays an important role and is to be given an even higher priority in the future. "We have identified three areas in which we – like many other companies – can become even better," explains Kirch. For example, the proportion of women and especially of women in management positions is to increase. Currently, women are still significantly under-represented – typical for technology industries. Only about a quarter of employees are female. Another challenge is a balanced age structure, especially since the average working life will gradually increase. In addition, international mobility within the Vaillant Group is to be further expanded.

CONCRETE APPROACHES

"We don't just want to create awareness. Our goal must be to demonstrably improve in the three areas mentioned," says Kirch. To achieve this, various projects were already initiated last year. Since the beginning of 2020, there has been regular internal communication on the topic of diversity and inclusion on company channels. Monthly interviews with employees and managers, useful tips for intercultural cooperation within the Vaillant Group, the introduction of an international D&I calendar and campaigns on various themed days such as International Diversity Day and International Women's Day are intended to regularly put the topic on the agenda and raise awareness among employees.

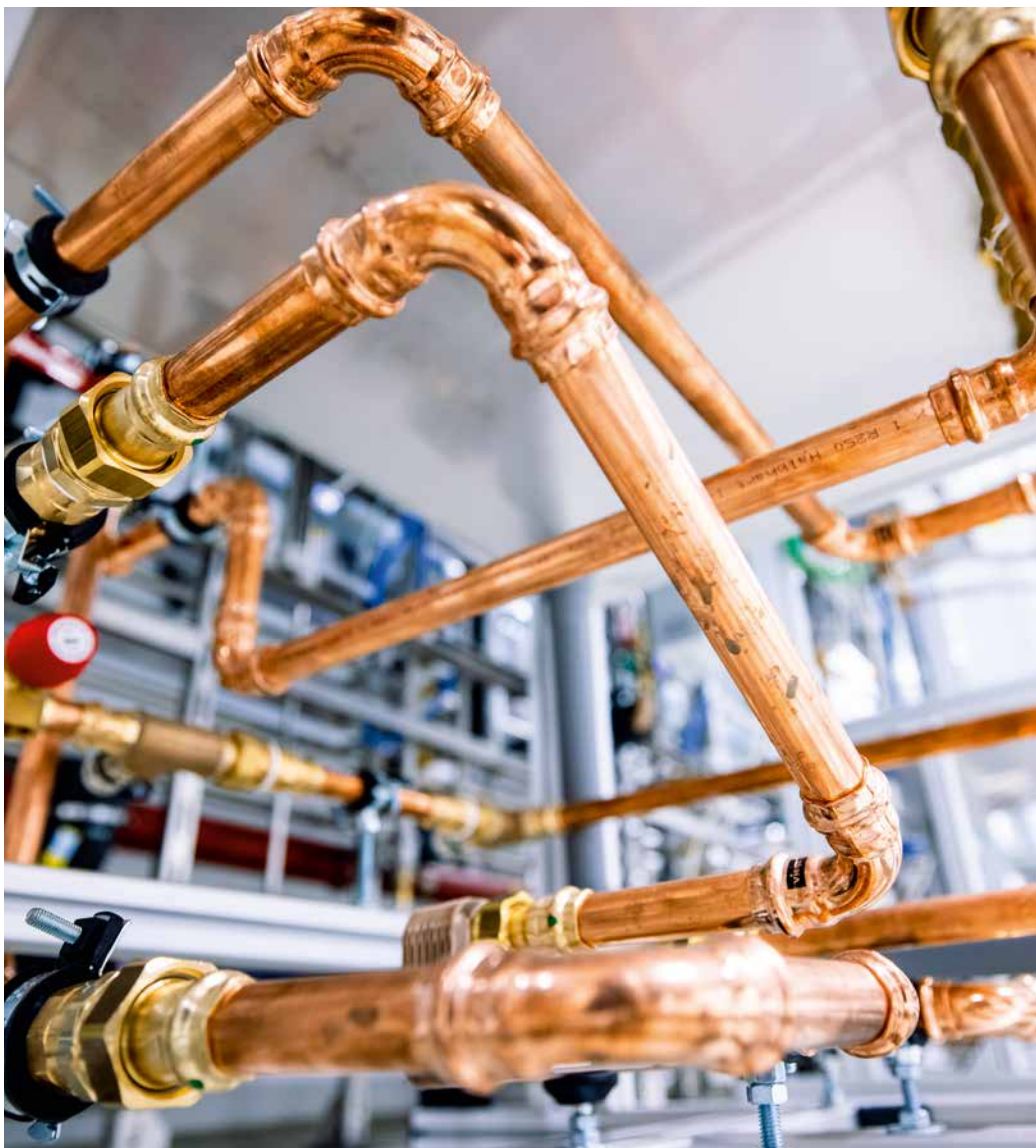
Since last autumn, managers have been receiving training on the topic of unconscious bias. "Every leading manager who fills a position should ask themselves whether their personnel decision is influenced by unconscious bias. Our goal must be to recruit the most qualified person for a position – regardless of any attributes," says Kirch. The importance of such awareness and training measures is also emphasised by McKinsey consultant Sperling: "When selecting talent, we tend to choose those who remind us most of ourselves. Therefore, consideration of D&I needs to start very specifically here." It is then in the culture of promotion and the evaluation of performance that the company shows how serious it is about diversity and inclusion. "Diversity and inclusion must be an integral part of the company's DNA," Kirch sums up. In the end, everyone benefits individually and the company as a whole.

BOOSTING INNOVATION

JOHANN VAILLANT **TECHNOLOGY CENTER**

The Test Center in the new Johann Vaillant Technology Center has gone into operation. Here, we put products and technologies through their paces. After all, the quality must be top-notch for the customer.

The Vaillant Group produces around two million gas heating appliances per year, which are used by our customers in over 60 countries. The quality of the gas varies from country to country. Nevertheless, the appliances have to generate heat reliably all over the world. The extensive functional tests of gas heaters also include the admixture of corrosion-accelerating gases or the enrichment with hydrogen in increased concentration. For operational lifetime testing, the duration of the test cycle amounts to several months.

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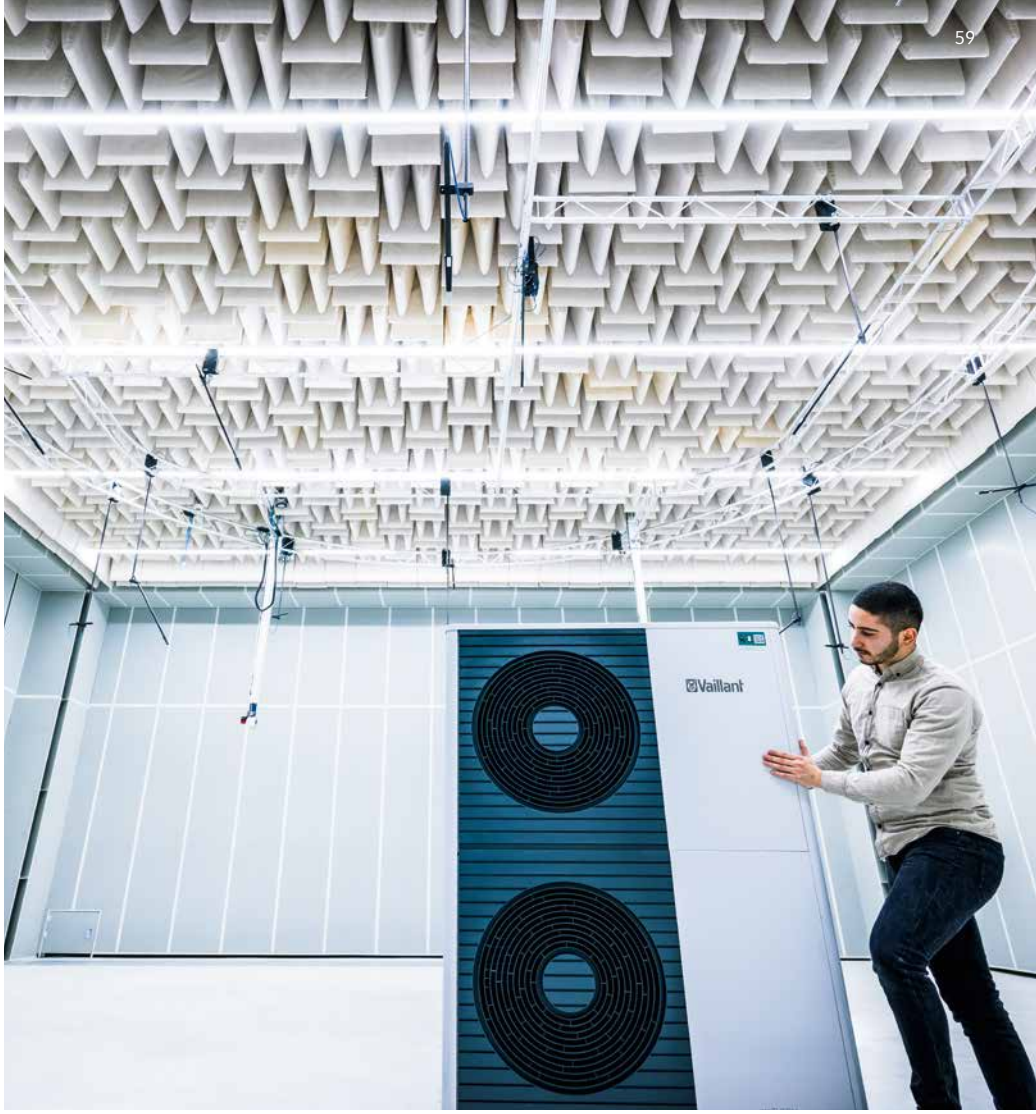
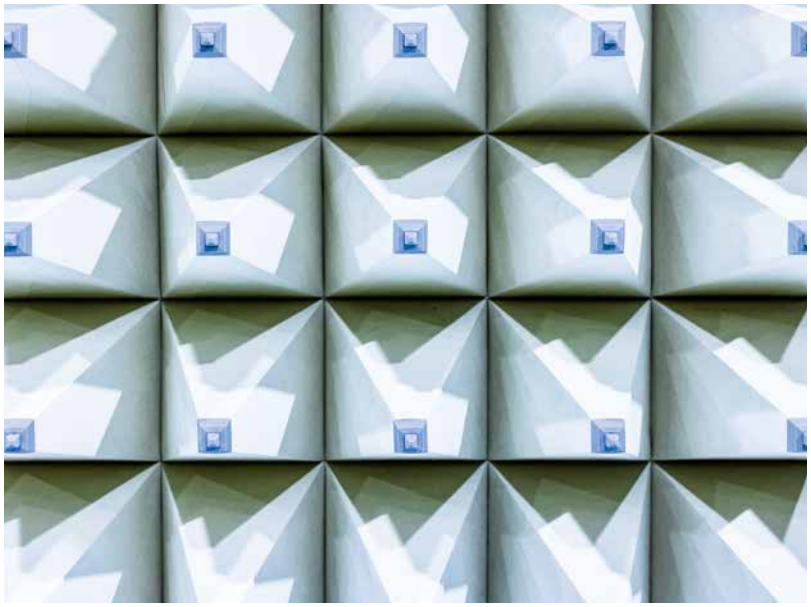




Every product technology undergoes over 100 different tests at the Vaillant Group. In the process, knowledge is also gained about material properties, noise emissions or electromagnetic compatibility. The highly modern test rigs and special laboratories in the Test Center allow the Vaillant Group to check, examine and certify all stages of product development, from the prototype phase to series production. Everything under one roof.

At the Vaillant Group, we monitor every single step in the product development process. For this purpose, the Test Center has nine different laboratory areas and over 180 test stands. These include a drop test room, a wind test room and also the sprinkler laboratory for testing protection against moisture. Tests are carried out both according to standard procedures and in specifically set-up test configurations.

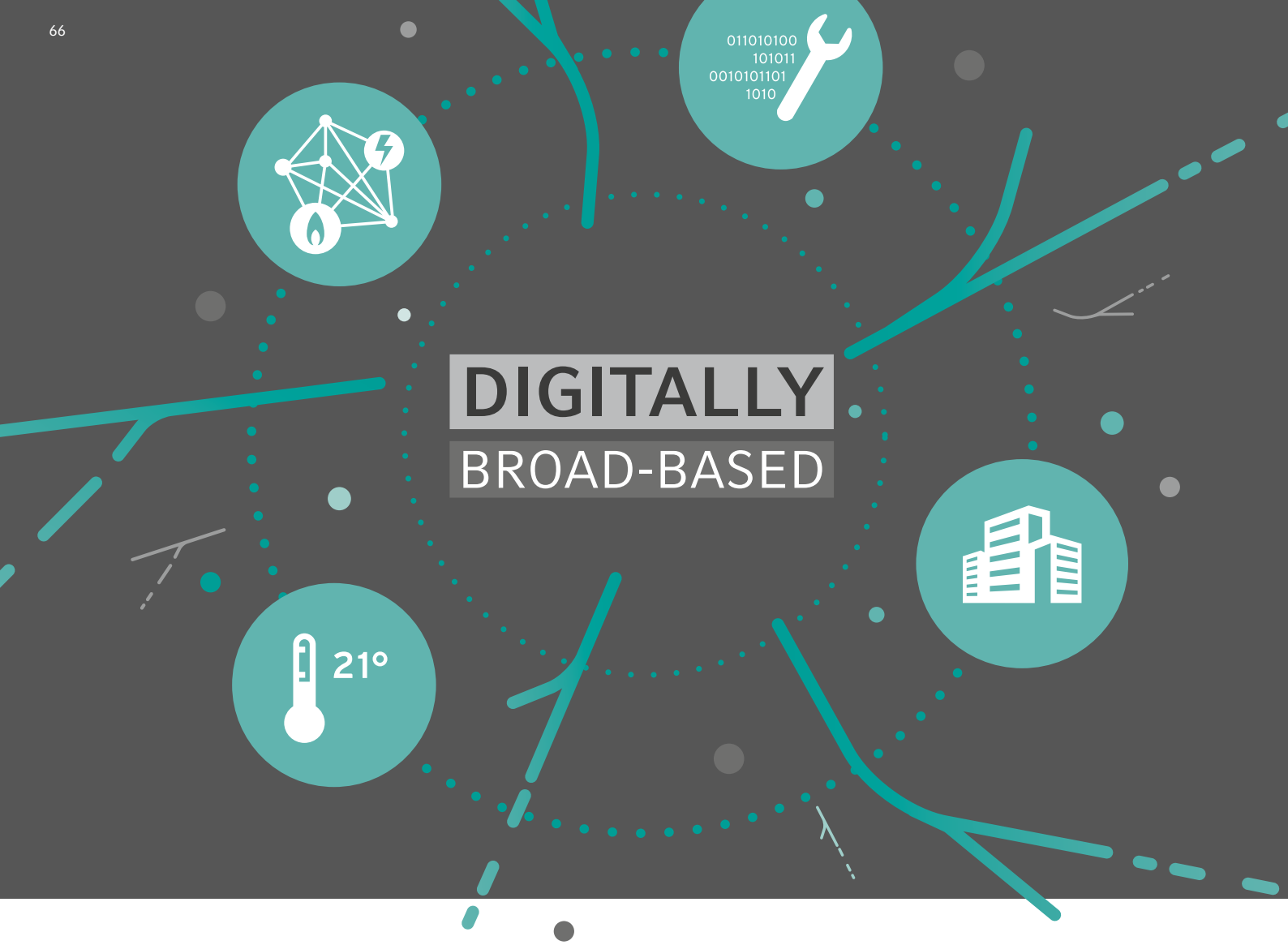

Vaillant

The Vaillant Group is developing heating appliances for the use of hydrogen. Operational tests are currently being carried out in the Test Center with appliance models from available product series and from older boiler ranges. Among other things, the admixture of hydrogen in different quantities is being tested. At the same time, the Vaillant Group development teams are testing a series-ready appliance with 100 per cent hydrogen – as another technology with the potential to contribute to a low-carbon future.


Vaillant
H2


Wasserstoff

The Vaillant Group exposes its products to extreme conditions to ensure their quality, safety and efficiency. A heat pump, for example, undergoes over 100 tests during its product development process. Among them is testing of its functional reliability under a range of climatic conditions. In the climate chambers, temperatures from –20 to +30 degrees Celsius and humidity levels from 30 to 95 per cent are simulated. This prepares the unit for use in virtually any location in the world.



DIGITALLY BROAD-BASED

Digitalisation offers growth potential. And for the Vaillant Group, an opportunity to develop new solutions for heating comfort. Particular attention is paid to offers in the area of heat as a service, energy management, digital support for installers in their day-to-day business and the management of larger appliance parks.

CLIMATE SERVICES

Customised solutions

Customers are looking for solutions that make their lives easier. This also applies to heating. Comfort and efficiency are important to most people. In addition, the heating system should function simply and smoothly – preferably without breakdowns. Whether gas boilers, heat pumps, photovoltaic systems, storage tanks, control technology or mobile operability. Service is increasingly becoming an important purchase factor. With new solutions, the Vaillant Group is already thinking ahead in terms of service offers.

For example, in the form of service contracts that specifically use the connectivity of the heaters – i.e. the

possibility of exchanging data via the Internet. This has advantages. The customer benefits from fast response times when maintenance or repair is necessary. Checking the operating data of the appliance can also help to detect problems even before the customer notices them. With connected devices, failures can often be avoided.

ENERGY MANAGEMENT

myVAILLANT and MiGo

With energy management solutions, we give our customers the opportunity to individually optimise their energy consumption and generation in order to improve their carbon footprint and reduce their energy costs. This is done via the new myVAILLANT app (Vaillant) and the new MiGo app (Saunier Duval). With them, the heating can be adjusted to personal needs. The focus is on energy transparency and recommendations on how the user can save energy. Regular updates provide new functions. In the future, more complex use cases will also be possible with myVAILLANT. For example, the energy management of heat pumps and photovoltaic systems or the integration of the heating system into the smart home.

INSTALLER & SERVICE ENABLEMENT

Smart service and more

The Vaillant Group works with around 340,000 partners worldwide who install, service and maintain the company's products. The customers of our partners have a growing desire for digital services when it comes to heating. While the appliance owners get digital solutions for more comfort and their energy management, the installers have myVAILLANT Pro and MiGo Xpert at their disposal.

These applications enable installers to remotely diagnose and control the heating system in consultation with their customers. For this purpose, the technicians receive data from connected devices, maintenance notes and malfunction messages. The early detection of possible defects avoids loss of comfort for the customers. If necessary, a technical assessment of the situation is carried out without having to visit the system beforehand. If an on-site appointment is necessary, the installer knows in advance which spare parts to bring or what work is required. Access to all data is only granted with the prior consent of the customer via the encrypted cloud of the Vaillant Group.

HVAC PARK MANAGEMENT

Business solutions

The digital solutions of the Vaillant Group not only benefit installers and service partners, but also larger organisations: companies, for example, that manage entire appliance parks. The Vaillant Group offers a corresponding digital service for housing associations and energy suppliers. These companies own a large number of heating appliances and have to ensure their operation and maintenance. Whether in their buildings or within the framework of contracting business models. For this purpose, a technical interface of the Vaillant Group is available for data exchange – the so-called Application Programming Interface (API).

The reduction of repair work alone is associated with a large cost-saving potential. Via a Web-based solution, customers from the housing industry or large service companies can call up appliance data that is of interest to them. Which data is relevant in each individual instance can differ from case to case. However, the benefit is always to reduce time and effort. Through easier diagnosis, real-time monitoring and management, the assessment of failure codes and the quick planning and scheduling of service calls. In the end, there is more comfort for the customers and cost savings for the companies.

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