

KSB Group Magazine 2023

streams

SHARED

Why collaboration is the foundation of successful companies.

→ P. 18

GLOBAL

How KSB teaches expert knowledge worldwide.

→ P. 34

COMMITMENT

What companies can contribute to climate protection.

→ P. 52



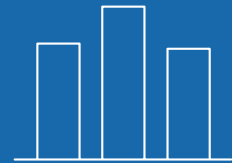
The 2022 Financial Year

Order intake



€ **2,862** million

Sales revenue



€ **2,573** million

EBIT



€ **169.1** million

Earnings before finance income /
expense and income tax

Employees



15,693

(31 December 2022)

Company profile

KSB is a leading supplier of pumps, valves and related support services. Its reliable, high-efficiency products are used in applications wherever fluids need to be transported, controlled or shut off, covering everything from building services, industry, petrochemicals and chemicals as well as water transport to waste water treatment, power plant processes and mining. Founded in 1871 in Frankenthal, Germany, the company has a presence on

all continents with its own sales and marketing organisations and manufacturing facilities. Wherever KSB's customers are in the world, service centres and around 3,500 service specialists are on hand to provide local inspection, servicing, maintenance and repair services under the KSB SupremeServ brand. The company's success is based on continuous innovation that is the fruit of in-house research and development activities.



The 2022 financial year
in 110 seconds

www.ksb.com/online-report-2022/110seconds

Global presence as a strength

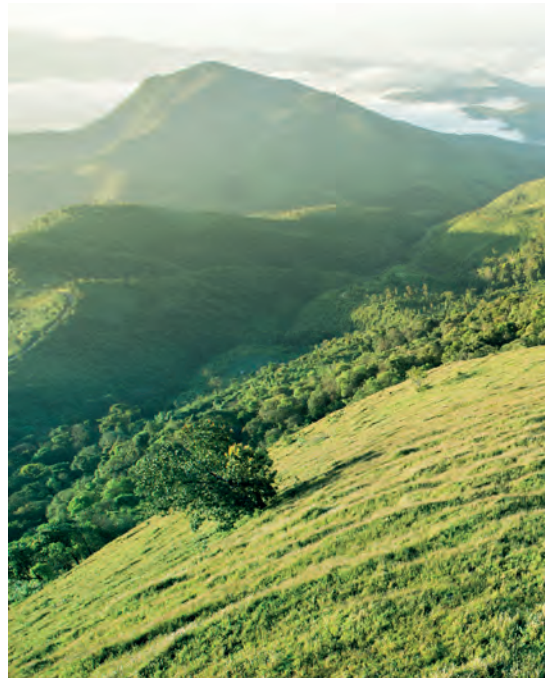
A network of around 100 companies with sales offices, manufacturing centres, service workshops and spare parts warehouses puts KSB close to its customers worldwide. This global presence makes the company stable and resilient even in challenging times. KSB's customers can thus count on reliable support with high-quality products and customised service designed to make people's everyday lives easier – across the globe.

18
SHARED



34
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COMMITMENT



Drawing strength from our achievements

Interview: KSB's Managing Directors explain why the company's growth will continue despite the current crises.



Knowledge shared is knowledge doubled

Ten KSB SupremeServ Academy locations worldwide provide know-how for professionals inside and outside the company.

Acting responsibly

KSB aims to achieve nine sustainability goals by 2025 at the latest. This should significantly reduce CO₂ emissions from production sites.

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IN ACTION AROUND THE GLOBE

All over the world, innovative technology is at work tackling demanding tasks across a wide range of applications. Products and solutions from KSB are a key part of this process.



Exploring new worlds



IN ACTION AROUND THE GLOBE

All over the world, innovative technology is at work tackling demanding tasks across a wide range of applications. Products and solutions from KSB are a key part of this process.





DANAIS CRYO

Facilitating rocket launches

Liquid hydrogen and oxygen provide the propulsive energy to launch an Ariane rocket in French Guiana. KSB's DANAIS TBT butterfly valve is used in the space centre's tank farm. The cryogenic valve is particularly well-suited to the needs of this sensitive system which handles highly explosive hydrogen.



More information
on the product



Air conditioning mega malls







EtaLine Pro

Reducing power consumption

The enormous shopping malls of the world's cities are housed in large-scale buildings requiring prime air conditioning systems. Here, pumps such as KSB's EtaLine Pro play a crucial role. This compact and versatile pump is extremely efficient thanks to an integrated control system. It thus makes an important contribution to protecting the environment.



More information
on the product





Ensuring reliable system operation







Sensor unit and smartphone with KSB Guard app

Operating data at a glance

Transparency, availability, operating reliability and efficiency – these are what pump system operators want. The KSB Guard digital monitoring solution is an all-in service package which allows operating data to be accessed round the clock via a web portal or app. In addition, the data is analysed by experts at the KSB Guard Monitoring Centre who can contact operators in case of anomalies.



More information
on the product





The COVID-19 pandemic is not yet over, with the Russian invasion of Ukraine adding to the situation. KSB looks back on 150 years of business, but the future will bring a range of challenges for the company. In this interview, Managing Directors Dr Stephan Timmermann, Dr Stephan Bross, Ralf Kannefass and Dr Matthias Schmitz explain why they nevertheless remain optimistic that KSB is on course for success.

DRAWING STRENGTH FROM OUR ACHIEVEMENTS

← Dr Matthias Schmitz, Dr Stephan Bross, Dr Stephan Timmermann and Ralf Kannefuss (from left) are optimistic about the company's future.

KSB's Managing Directors discuss the six pillars of KSB's corporate strategy: sustainability, technology, quality, fluid handling know-how, digitalisation and KSB SupremeServ. In addition, Dr Schmitz reports on upcoming challenges for finance, purchasing and IT, and explains which preparations are under way.

Dr Timmermann, while KSB is feeling the effects of the current crises, the company seems to be coping rather well with the challenges so far. How do you explain this?

Stephan Timmermann: Times like these reveal the strengths that make KSB what it is: relentless customer focus, a global footprint, a wide variety of products across numerous markets, our Market Area structure, the expansion of our after-market business and a healthy awareness of costs. The efficiency and effectiveness potentials we have generated and the excellent worldwide cohesion of our employees also play a role. It is this mixture that makes us resilient.

Looking to the years and challenges ahead, you recently spoke about weathering the storms while increasing profitability. What measures do you believe will make KSB even more weatherproof?

Stephan Timmermann: Withstanding the turbulence of world events means involving the workforce and holding it together, keeping everyone informed and showing appreciation for what has been achieved. This builds the confidence we need to navigate the ups and downs of the future. But this doesn't work without a plan. This was developed together with the managers of the Regions and Market Areas, and is named Strategy 2030+. The strategy is based on six pillars: sustainability, technology, quality, fluid handling know-how, digitalisation and the expansion of customer support via KSB SupremeServ. We think KSB has enormous potential for each of these six pillars – and this is what we need to tap into.

CRISES ARE PART OF EVERYDAY LIFE. SO NO MATTER WHAT HAPPENS: WE WILL HANDLE IT BECAUSE WE CAN DRAW STRENGTH FROM WHAT WE HAVE ACHIEVED.

— Dr Stephan Timmermann

Mr Kannefass, Dr Timmermann has explained the importance of the strategic pillars for KSB's growth. What measures will KSB take to become even more attractive to its customers, cementing its place as their preferred supplier of pumps, valves and services?

Ralf Kannefass: In terms of achieving profitable growth, we are focusing on three pillars: global expansion of spare parts availability, expansion of our business with standard products, and project business with customised products. Our spare parts logistics now cover 30 percent of our products already installed in plants. Our goal is to directly support at least every second customer with our maintenance business. To achieve this, we are expanding the global presence of KSB SupremeServ. By automating procurement of our standard products, we are simplifying customers' processes. Digitalisation will play an increasingly important role. This applies to know-how management and includes the digital sale of our products. We also want to know where our products are installed, and how they are running. This increases the focus on our products' efficiency.

We know that pumps account for 10 to 15 percent of global demand for electricity. So increasing the efficiency of our pumps means significant energy savings for customers' systems.

The service and spare parts business is extremely important for KSB – which challenges will it face in the coming months and years?

Stephan Timmermann: We support our customers at every step, from the sale of our products to their eventual recycling. In service, business is based on good contacts and customer loyalty between individuals. We must therefore ensure that more and more employees worldwide are appropriately qualified and perform their work in service with pride and commitment. It is already difficult to recruit such staff today – in the future it will only get harder. We therefore plan to focus on this important challenge.

Ralf Kannefass: Our customers expect solutions which are not only cost-effective, but also timely. In the end, what matters to our customers is that their systems work. This means that spare parts must be produced and delivered at short notice, if necessary with 3D printing or at spare parts factories based in different regions. In addition, trained staff must be available 24 / 7.

For mechanical engineering companies, high quality and innovative technologies are paramount. Dr Bross, what adjustments does KSB need to make to remain a global leader?

Stephan Bross: We want our company to be perceived as the market leader for technology and quality. Our customers are our priority, and we offer them added value via appropriate solutions powered by the most reliable cutting-edge technology. As a quality leader, we meet customer expectations 100 percent. This applies not only to our products, but also to all associated processes. This means that technology leadership is very closely linked to quality leadership. The overall goal is to ensure that customers turn to the best company in the industry: KSB.

THE PILLARS OF KSB'S STRATEGY

Fluid handling know-how

KSB has expert knowledge on how to transport all types of fluids, and offers customers the right solution for their plant.

Digitalisation

KSB supports customers from initial interest to the purchase, operation and recycling of its products – a seamless digital and personal experience.

Technology

KSB supports customers from initial interest to the purchase, operation and recycling of its products – a seamless digital and personal experience.

Sustainability

KSB supports the 17 United Nations Sustainable Development Goals and is reducing its carbon footprint to protect the climate, for example.

Quality

As well as applying international standards, KSB enforces its own, even stricter quality criteria to satisfy customers. Quality is part of KSB's culture.

Service

KSB offers inspection, maintenance and repair services close to its customers. Spare parts available at short notice ensure smooth operation in customers' plants.



Ralf Kannefass (left) and Dr Stephan Timmermann discuss the next steps for driving KSB's growth.

Does the approach to quality inherent in our company culture also apply to sustainability, Dr Timmermann?

Stephan Timmermann: Sustainability is an indispensable part of any entrepreneurial activity. This is what our children, our customers and our suppliers demand – and ultimately something we owe to society itself. We must act in the interests of the planet and the future of humankind. This is also an area in which we can differentiate ourselves from our competitors, because sustainability is an increasingly important purchasing criterion for our customers. We have to make our production environmentally friendly and resource-efficient. If our manufacturing activities are to avoid harming the planet, our carbon footprint must be as small as possible. In addition to energy-efficient products and processes, the resources we use must come from the greenest possible sources. Waste must be minimised or recycled where possible. We are currently expanding our global sustainability network and embedding this topic in our strategy. This will lead to sustainability being incorporated into our guidelines, our leadership code and our system of values.

Beyond the Market Areas and Segments, KSB also has to deal with challenges in the areas of finance, purchasing and IT. For example, recent events have highlighted the importance of a robust IT defence against cyberattacks. Dr Schmitz: How does KSB prepare itself for setbacks in these three areas?

Matthias Schmitz: We have done our homework in purchasing and finance. Every percent we can save in material costs helps to keep our products competitive. This is essential, especially in the face of today's commodity price rises and supply chain interruptions.

IT did a great job during the cyberattack on KSB in April 2022, restoring functionality quickly and reliably. We have since raised security standards with the help of new software built on artificial intelligence. This enables us to detect and deflect possible attacks worldwide at an early stage. We also have experts who monitor our systems around the clock. So we are much better equipped to deal with a cybersecurity threat than we were previously.

In terms of politics and economics, the current global outlook invites scepticism about the future. Why do you remain optimistic?

Matthias Schmitz: From a financial point of view, the fundamental stability of our company is reassuring. We would of course be affected by an economic crisis, but it would have to be very severe for the company to be in danger. Despite all the adversity, we are doing quite well. This is the right time to be looking forward with a sense of confidence and belief in our hearts. KSB is 150 years old – we have survived a great deal. So a strong sense of confidence throughout the company is absolutely justified.



← Dr Stephan Timmermann explains how sustainability is an indispensable part of any entrepreneurial activity.



In this video, Dr Stephan Timmermann talks about fields of action central to KSB's strategy.



↑ Dr Matthias Schmitz (l.) and Dr Stephan Bross look positively to the future.

Ralf Kannefuss: Our approach to business is strategically focused, balanced and designed to increase market exploitation. Proximity to the customer is our top priority here. That is why we value local presence so highly, even in a digitalised world.

Stephan Bross: By thinking about KSB – and making appropriate preparations – we avoid worrying about KSB. But these preparations are imperative. It is now clear that we withstood the COVID-19 pandemic, the cyberattack and the Ukraine war because we had positioned KSB flexibly and made crisis response part of our strategy. We must prepare

ourselves for the reality of multiple future crises. Mustering a professional response will become our new normal.

Stephan Timmermann: Leading a company means leading it into the future. Making forecasts is fundamentally difficult, and will not become any easier. The core task of company management is to look ahead and act in a timely and entrepreneurial fashion. I would cast doubt on claims that today's crises are any more diverse than those we have faced in past decades. Crises are part of everyday life. So no matter what happens: We will handle it because we can draw strength from what we have achieved.

KEEP THINGS

FLOWING

Fluid handling know-how

Liquefied natural gas infrastructure is expanding worldwide. It involves highly complex systems posing enormous technical challenges. KSB has the right products for the task.

A large proportion of natural gas is liquefied prior to transport. Transforming gas into liquid form means cooling it to below $-164\text{ }^{\circ}\text{C}$. Liquefied natural gas (LNG) is reduced in volume by a factor of 600, facilitating transport and storage. This means that the largest tankers can ship almost 150,000 cubic metres of liquefied gas.

Extreme conditions

LNG's cryogenic temperatures leave most metals brittle with reduced strength. Special low-temperature materials are therefore required for mechanical components and sealing to ensure safe, reliable and long-term operation. KSB thus tests its valves for liquefied gas with liquid nitrogen at

temperatures of -196 degrees Celsius at the company's French factory in La Roche-Chalais. Valves in LNG systems also have to withstand enormous pressures of up to 100 bar which severely test their integrity.

Use on specialised ships

However, highly complex components such as valves are not only found on liquefied gas tankers. LNG logistics requires increasing numbers of specialised vessels to meet the surge in demand on the world market.

Today, the purification and liquefaction of natural gas usually takes place on land. In the future, offshore solutions will also be used for natural gas fields located far out at sea. These so-called FPSO (Floating Production Storage and Offloading) tankers are capable of extracting, purifying, storing and offloading natural gas. Elaborate infrastructure involving deep-sea pipelines is not necessary.

Floating storage and regasification units (FSRU) are another type of specialised vessel. These can be moored in a port for a short time to land, store and regasify LNG.



Natural gas on the move

1

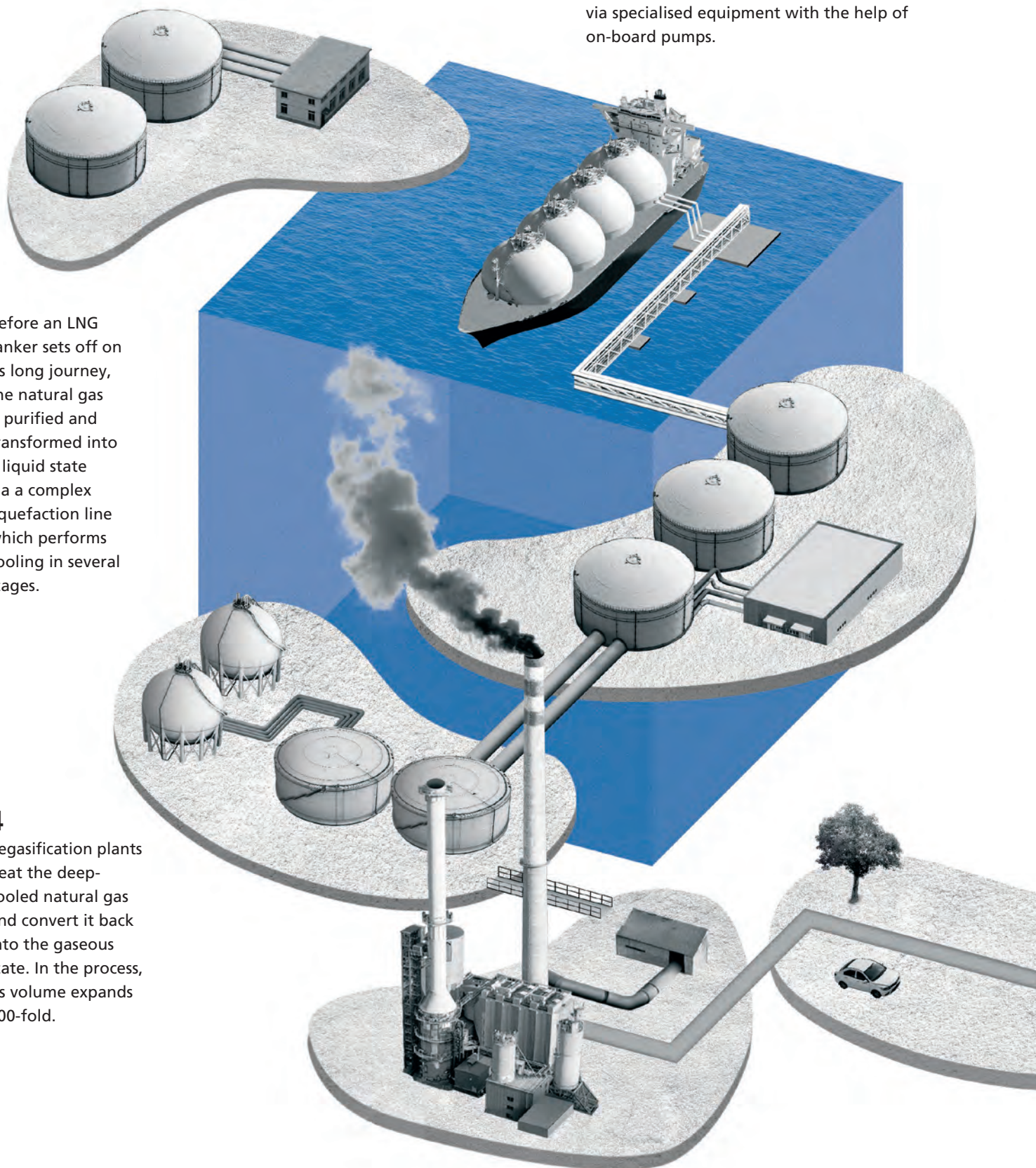
Before an LNG tanker sets off on its long journey, the natural gas is purified and transformed into a liquid state via a complex liquefaction line which performs cooling in several stages.

4

Regasification plants heat the deep-cooled natural gas and convert it back into the gaseous state. In the process, its volume expands 600-fold.

2

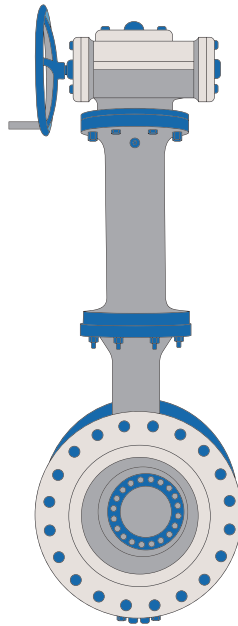
At the destination port, the vessel offloads the liquefied natural gas at a landing terminal. The LNG is transported onshore from the insulated spherical or membrane tanks via specialised equipment with the help of on-board pumps.



Animation of
an LNG terminal

3

Still in the cryogenic state, the natural gas awaits further processing in giant insulated tanks. It is temporarily stored under atmospheric pressure until further transport or regasification.

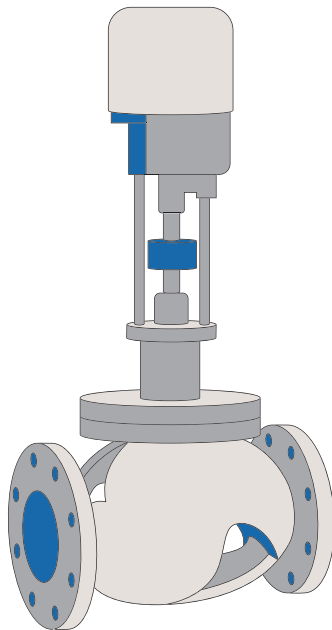


Cryogenic valves from France

High-performance TRIODIS valves are mainly used in natural gas liquefaction, regasification and transport. Their strength: reliable and absolutely leak-tight operation. The maintenance-free cryogenic valves are engineered to withstand operating pressures of up to 100 bar. A special design allows them to be operated by smaller actuators. TRIODIS is available in diameters from 20 centimetres to 1.20 metres.

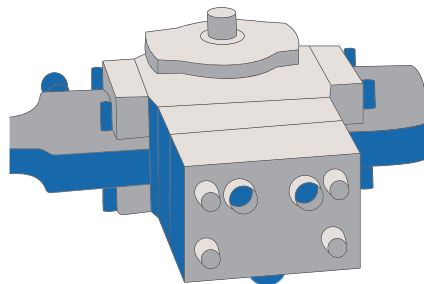
5

Finally, the gas can be fed into the transmission grid. This transports it to consumers in commercial enterprise and private households.



Control valves from India

KSB supplies various straight-way and angle control valves for the LNG market including MIL 21000, MIL 41000 and MIL 50000 via its Indian subsidiary, KSB MIL Controls Limited. They are ideal for controlling the flow of cryogenic fluids such as liquefied natural gas. The valves can handle the toughest conditions.



Actuators from South Korea

The HQ series from the South Korean manufacturer KSB Seil Co., Ltd. are hydraulic actuators for mounting on quarter-turn valves. They can be used to actuate butterfly valves and ball valves, for example when loading or offloading an LNG tanker at a terminal. The compact actuators are floodable and seawater-resistant – ideal for use on the world's oceans.

Made by KSB

Quality

KSB stands for exceptional performance. The company's internal Made by KSB certification guarantees a high standard of product and process quality as well as comprehensive environmental and occupational safety management – KSB-wide. The certification's requirements exceed those of most international standards for quality, environmental management, and occupational health and safety.

In addition to high quality, Made by KSB certifies short delivery times, swift and competent service, and optimised manufacturing processes. Mónica Antolín has been QEHS Manager at KSB ITUR in Spain for eleven years. QEHS stands for quality and environmental management, health and safety. Mónica Antolín reports on the importance – and the challenges – of such certification.

“We achieved our first Made by KSB certification at KSB ITUR in May 2016, after two years of hard work on our processes. It took serious motivation to overcome some obstacles. But as a subsidiary that supplies

products to other KSB factories around the world, it was important for us to be properly certified.

High standards

The certification goes far beyond compliance with the international standards ISO 9001 for quality, ISO 14001 for environmental management and ISO 45001 for occupational health and safety. Made by KSB also means adhering to KSB's internally defined procedures and processes, and applying these effectively and efficiently.



Mónica Antolín



Watch a short interview
with Mónica Antolín.

↓
Mónica Antolín in
conversation with a colleague

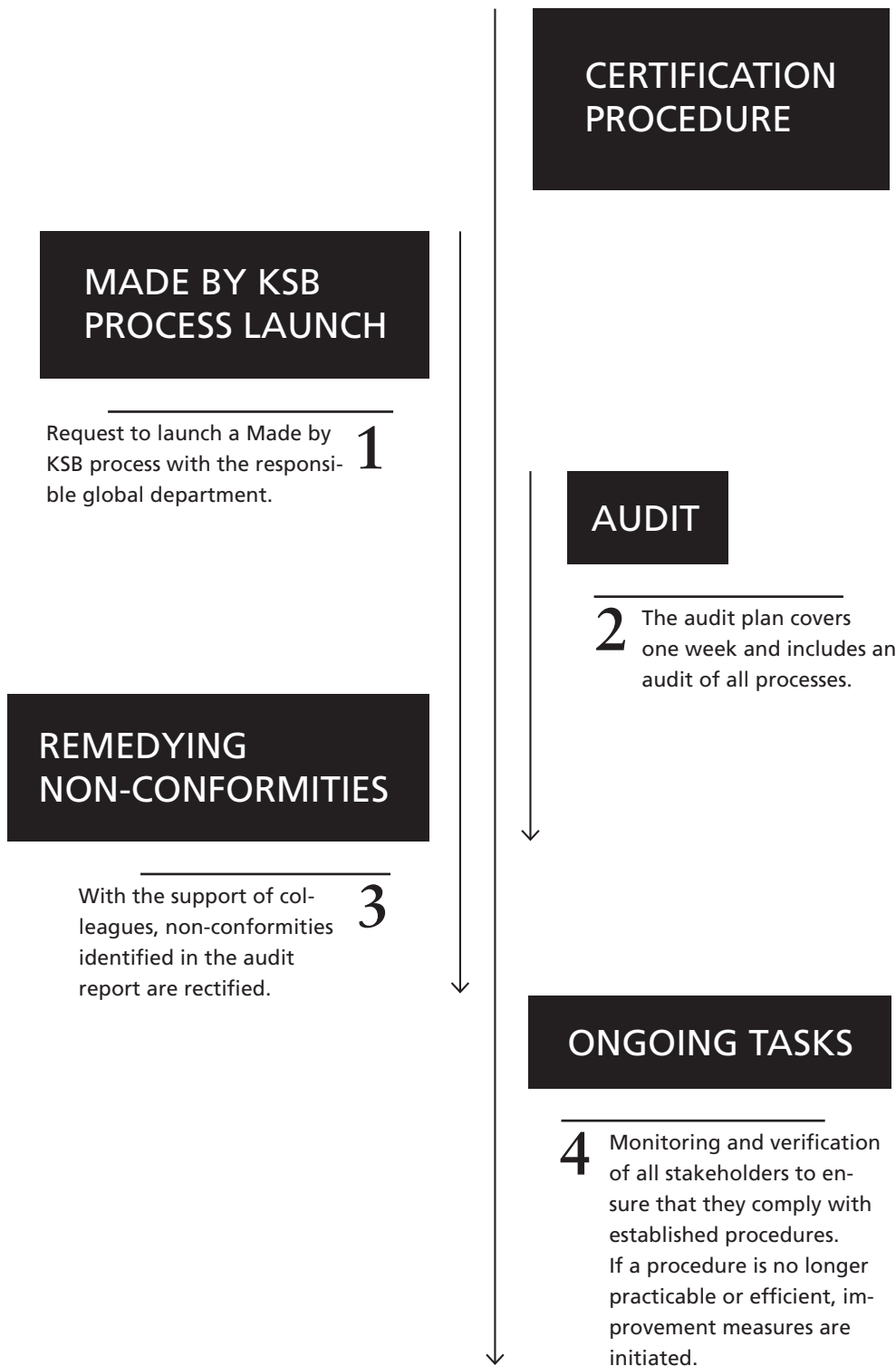


This certification guarantees that every KSB factory has the same level of quality, environmental management and safety, and the same general KSB processes and tools as those introduced throughout the company.

We carry out quality checks on every critical process to verify that process outcomes match planned results. Although the focus must be on the processes, it is sometimes also necessary to verify the product.

Broad acceptance among employees

My QEHS team is very small. There are only eight of us in a company with 275 employees. It is therefore essential to work together with the other departments as a team. Although it has been a very challenging task over the last few years, I can say that KSB ITUR employees now understand that we are all part of the QEHS process."



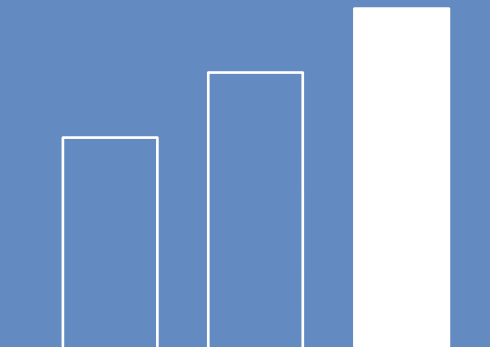
GOOD2KNOW

Using expert knowledge

KSB provides selection tools and planning aids. With their help, customers are sure to find the right pumps or valves for their systems.

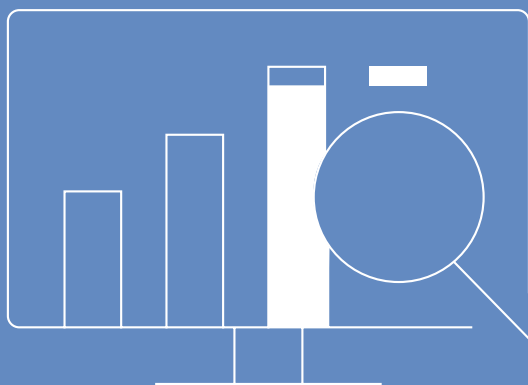


Learn more



On the up

KSB's order intake increased for the third year in a row from more than € 2.1 billion (2020) to around € 2.4 billion (2021) to over € 2.8 billion (2022).



In 2022, KSB invested around

56.3 million

euros in research and development.

KSB can look back on more than

150 years

of company history.



Learn more

Worldwide

KSB operates **5** central spare parts warehouses.

KSB's products are used in



6 markets:

- General Industry
- Energy
- Water / Waste Water
- Petrochemicals / Chemicals
- Mining
- Building Services



Highest quality

All of KSB's locations enforce internationally recognised standards to ensure exceptional levels of quality, environmental protection and occupational health and safety.

Learn more



Never far away



KSB SupremeServ employs more than 3,500 service specialists to support customers all over the world. They provide services in classic and digital form ranging from consulting and planning to installation, operation and maintenance.



More information on KSB's technical service portfolio

Around **200**
service centres around the globe



Knowledge shared is knowledge doubled





Peter Reisch, Head of the KSB SupremeServ Academy, trains service specialists.

Fluid handling know-how

The KSB SupremeServ Academy unlocks the expertise accumulated by the pump and valve manufacturer for worldwide availability. This provides benefits to employees – and customers. Its motto: Learning is an experience!

Since 2020, KSB SupremeServ Academy locations designed to spread the company's vast service knowledge have sprung up all over the world. KSB currently operates ten academies, with at least one on each continent.

"All of our training locations implement the same guidelines and quality standards," says Peter Reisch, who coordinates the KSB SupremeServ Academy from the company's headquarters in Frankenthal, Germany. "This enables us to ensure that all participants benefit equally from our know-how – regardless of the global region in which they train."

The training courses combine the pump and valve manufacturer's professional knowledge and practical experience. In 2022, the academies welcomed around 2,000 participants. The internal training courses are aimed at new service employees looking to acquire basic knowledge, and at experienced service technicians who want to improve and expand their professional qualifications.

At KSB, learning should be an experience.

— Peter Reisch,
Head of the KSB SupremeServ Academy

We offer added value

Our KSB SupremeServ Academy in Chile is a source of knowledge for participants from Spanish-speaking countries, primarily South America. The external customers we train are primarily from industry and mining. Our internal customers are mainly sales engineers from our South and Central American KSB companies.

We are always looking to exchange information, skills and ideas in our Region. This helps us to better understand the needs of our customers. By sharing knowledge, we strive to help meet the need for new and more complex skills and capabilities so we can compete globally.

My job is challenging and involves a great deal of responsibility, but it is also very enjoyable. Through contact with customers and colleagues from different countries and business units, I have a continuous overview of current technical issues, which I find very interesting.

Our academy is intended to be an instrument for pooling KSB knowledge. We also want to make sure that everyone in our company has the information to keep the business running, to promote innovative ideas and to increase efficiency.

Jorge Lufin
Service Manager,
Chile



Practical training

The courses offered by the KSB SupremeServ Academy are also available to service partners and customers. They are mainly engineers, technicians and practitioners who are interested in acquiring basic or in-depth knowledge through pump, valve and automation training courses. Training with a practical focus teaches participants about the special features of operating pumps, valves and systems.

Equipped with this new knowledge, academy graduates can recognise faults in pump systems more quickly and take timely action. Know-how also pays off in recurring tasks such as maintenance, servicing and repairs.

Customers can choose from the regular portfolio or order individual training sessions. Large orders – for power station pumps for example – often include training within their scope of supply. It is essential that on-site service personnel can fully understand and operate these highly complex machines.

Individual academies coordinate the range of training offered in their region. This guarantees a uniformly high level of quality far beyond the knowledge centres. Various training formats are available to participants at all locations – from face-to-face events to practical seminars and online courses.



Training is complemented by explanatory videos produced in-house and specially developed e-learning materials.

The KSB SupremeServ Academy is not always tied to one location. Depending on the training topic, it can make sense to hold the event at one of KSB's production sites. An example would be when training focuses on products manufactured at that location. If desired, training can also take place directly at the customer's facility.

With KSB being active in numerous markets, its academies differ in terms of their content focus. But thanks to networked cooperation, the right training can be provided for every interested party.

Making learning fun

"At KSB, learning should be an experience," Reisch explains. "The modern learning landscapes implemented in our academies reflect this." These include well-appointed training rooms and fully equipped workshops with exhibits and video technology for virtual trainings. "We want our participants to feel comfortable with us and leave with fond memories of KSB."

Tailored training

We see our KSB SupremeServ Academy as a knowledge centre. Our mission: To pass on our know-how to customers and colleagues. The first step is to identify the specific training needs and requirements in order to offer tailored training. We then select the best possible trainer for the required course.

Customers are primarily interested in KSB products and the theoretical fundamentals of pumps and hydraulics, but also in important international standards. The courses are always matched to the participants' level of knowledge. Our participants are mainly from Thailand and usually have a technical background.

We also frequently share our expertise with our Thai colleagues. While technical know-how remains a prerequisite for KSB's service staff, knowledge of our company's latest products is in particularly high demand. Understanding them is essential. This is especially true for sales staff and service specialists.

I really enjoy my knowledge-sharing work at the KSB SupremeServ Academy and as knowledge is infinite, it never gets boring. I am very grateful to be able to share it with others.

Piyachit Kiatkanarat
Head of KSB SupremeServ,
Thailand



Peter Reisch presents the KSB SupremeServ Academy in Frankenthal in a short film.

More information about the KSB SupremeServ Academy and the training on offer



A GOOD JOURNEY MEANS GOOD BUSINESS

Digitalisation

With E2E e-sales, KSB has created a seamless digital journey: Customers can find all relevant product data, prices and delivery times on one platform. The digital sales channel is now used by KSB all over the world.

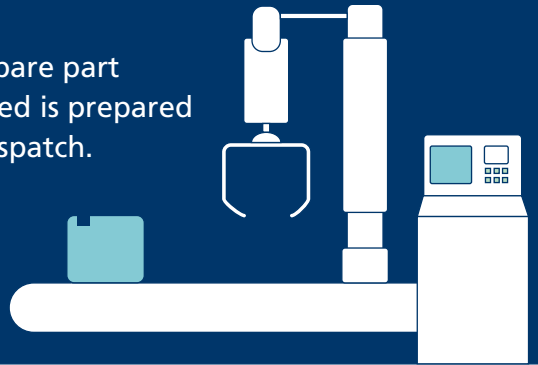
4

The customer completes the purchase with KSB online.



5

The spare part ordered is prepared for dispatch.



8

The order arrives and the customer can give feedback on the customer journey.



1

Customers look at the KSB web site during a meeting.

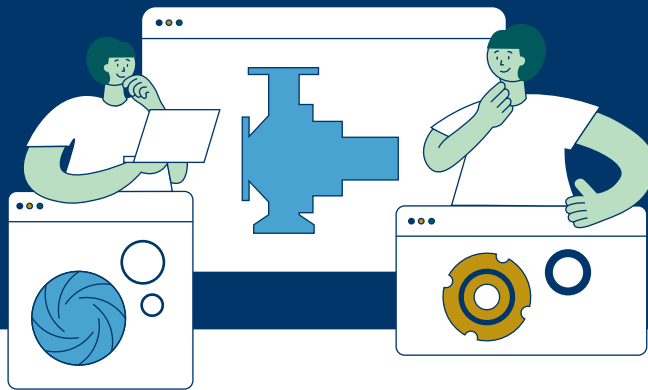


2

They contact KSB Customer Service via the phone number on the web site.

3

The customer selects and configures spare parts from KSB.



6

The order is shipped.



7

The customer can track the order and view the shipment status online.



Click Products and Spare Parts in Your Region to go to the digital sales channel in your country.



BETTER THAN THE ORIGINAL

Specialised machinery manufacturers sometimes leave the market or cease production of specific parts. Operators are left with nothing but a defective component – upon which the smooth operation of an entire system may depend. This poses a difficult problem. But KSB has the solution.

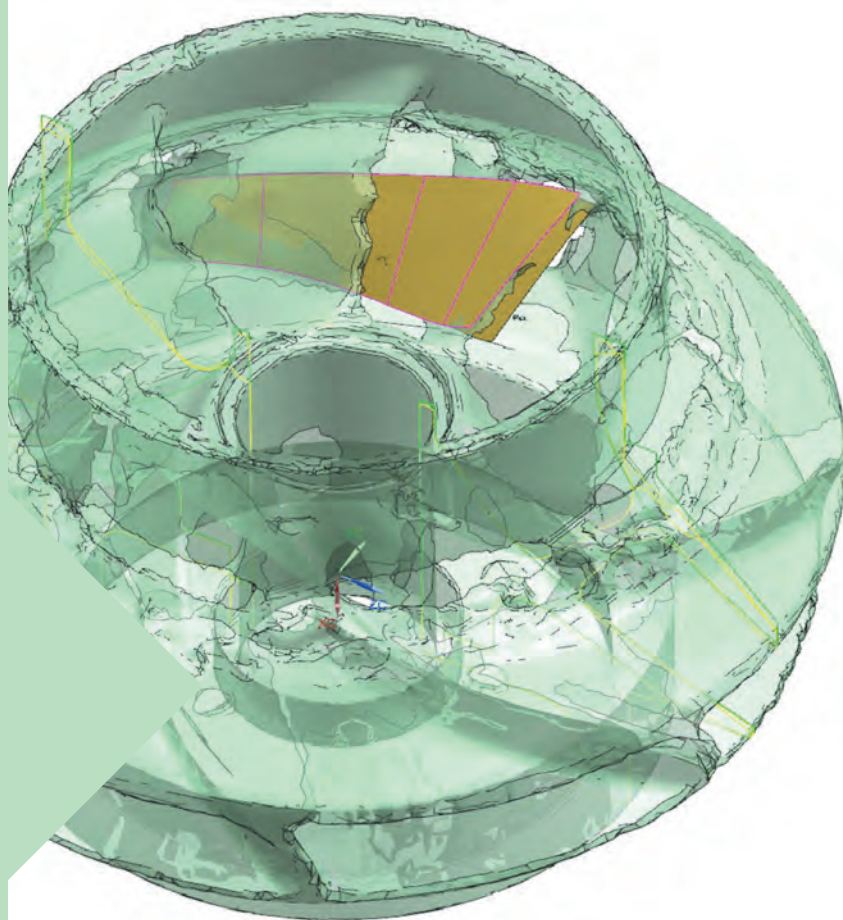
Service

Machines in power plants, refineries or rolling mills are sometimes used for 30 years or more. But what happens if a part in one of the plant's old motors, compressors or pumps is defective? Replacements are often difficult to obtain.



KSB CREATES A NEW COMPONENT USING THE DEFECTIVE PART AS A TEMPLATE

This is where reverse engineering comes into play. The process allows KSB's service specialists in locations including Germany, Pakistan and the USA to literally reconstruct individual components. The technology is not new. A well-known example are the activities of the Soviet design bureau Tupolev, which in the mid-1940s dismantled several huge American aircraft and rebuilt them piece by piece. However, at that time the effort required was gigantic and by no means economically reasonable.

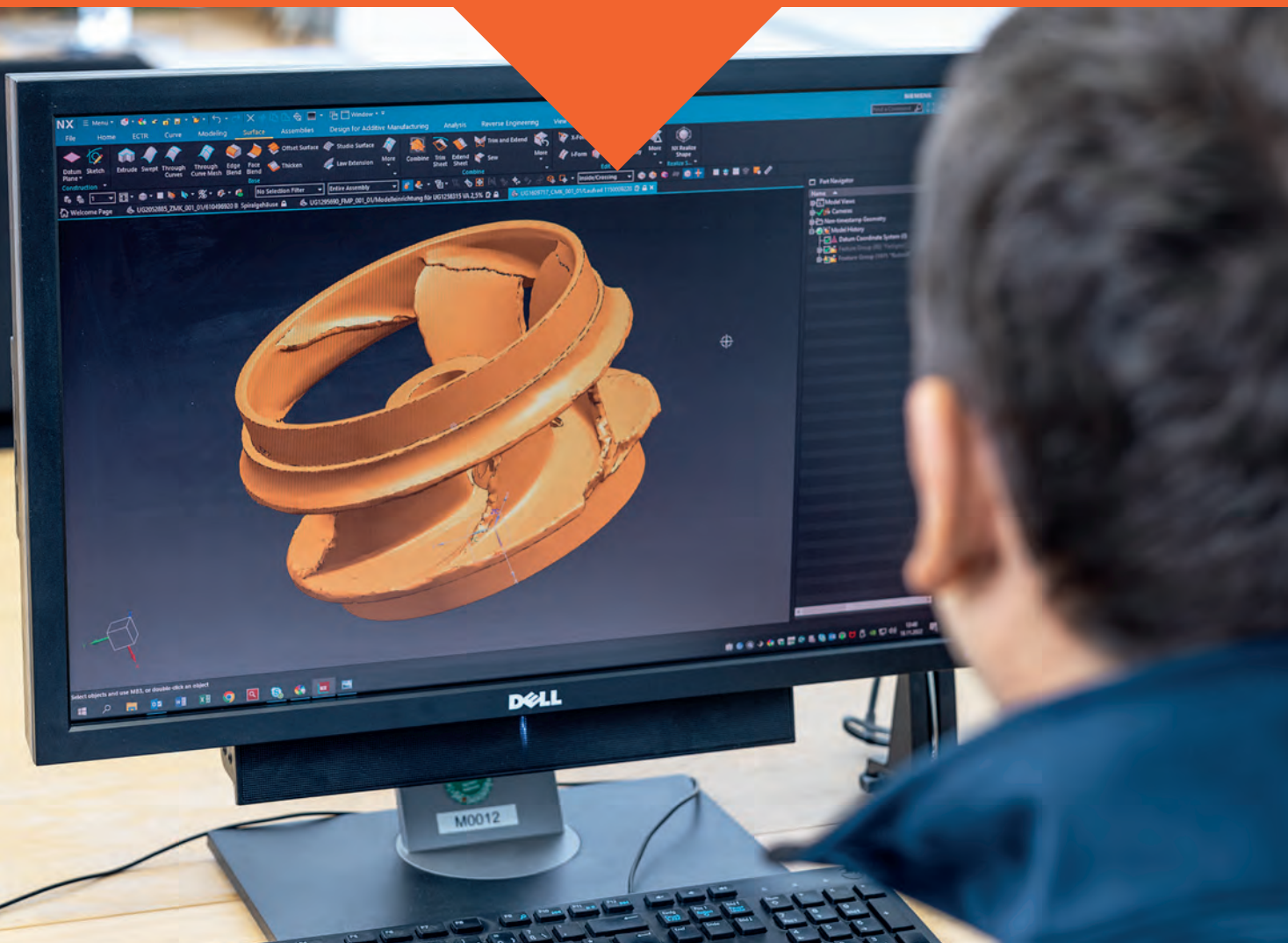


Digitalisation has dramatically reduced the work involved in reconstructing components. Today, high-performance three-dimensional scanners can be acquired for a low 5-digit euro amount. These devices can scan existing components with extremely high precision and map their contours in a so-called pixel cloud. Powerful computers then convert these into editable design files.

HIGH-PERFORMANCE 3D SCANNERS

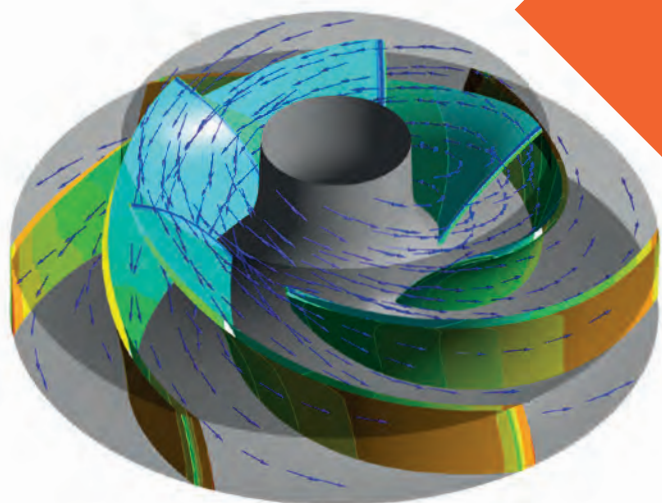
REPAIRING THE DAMAGE DIGITALLY

The components being rebuilt are often worn or even damaged. The designer can “repair” this damage on a screen by digitally adding missing parts, corners, edges and material thickness data. This may sound simple, but it requires an enormous amount of experience and knowledge of the function and materials of the component to be made. It includes taking into account the forces transmitted to and by the component, the temperatures at which it is used, or the abrasion to which it is subjected.



VIRTUAL DESIGN COMPLETED

Once the virtual design is complete, KSB's reverse engineering team can optimise the component where necessary and then manufacture it. For example, developers can simulate a virtual flow through a pump impeller or casing to improve its contours in terms of strength or hydraulic characteristics. Ideally, the component subsequently manufactured offers significantly improved performance over the old part.



After the design work is completed, production of the component can commence. KSB often uses new manufacturing processes such as additive manufacturing. This allows swift production of new components up to a certain size, depending on the print capacity of the available printer. KSB applies the so-called laser powder bed fusion process, in which a laser beam is used to build up the component layer by layer from powder. For larger components, manufacturing methods include casting techniques using computer-controlled milling machines, plastic or sand printers to produce negative moulds and patterns with core prints.

PRODUCTION OF THE NEW PART





THE REPLACEMENT IS READY

At the end of the process, KSB's customer receives a component that often surpasses the original in terms of quality and performance. What is more, the new component may significantly increase the service life of a pump set or system.

A video on reverse engineering by KSB





THE ENERGY CARRIERS OF TOMORROW

Technology

Today, the demands of energy-intensive sectors such as the bulk chemicals and the metal industry continue to be met with fossil fuels. In the future, these fuels will be at least partially replaced with green hydrogen. Pumps and valves promise to play a decisive role in the transition.

Almost every industrial sector recognises green hydrogen as a future energy carrier. As well as powering vehicles, it can be used to store energy generated from renewable sources. In refineries, it could replace at least part of the grey hydrogen used so far to desulphurise the precursors of petrol and diesel. The steel industry is already running pilot projects which use green hydrogen for the direct reduction of iron ore. The cement, glass and ceramics industries, too, are looking for new ways of converting their processes to deliver CO₂-neutral production.

However, this transition can only succeed with the development of a hydrogen industry that is both efficient and profitable. This includes production, importing, transport and storage.

Strategic partnerships for clean energy

Green hydrogen production is most feasible when sufficient renewable energy is available for water electrolysis. The German Federal Ministry of Education and Research is therefore focusing on strategic partnerships with Southern Africa,

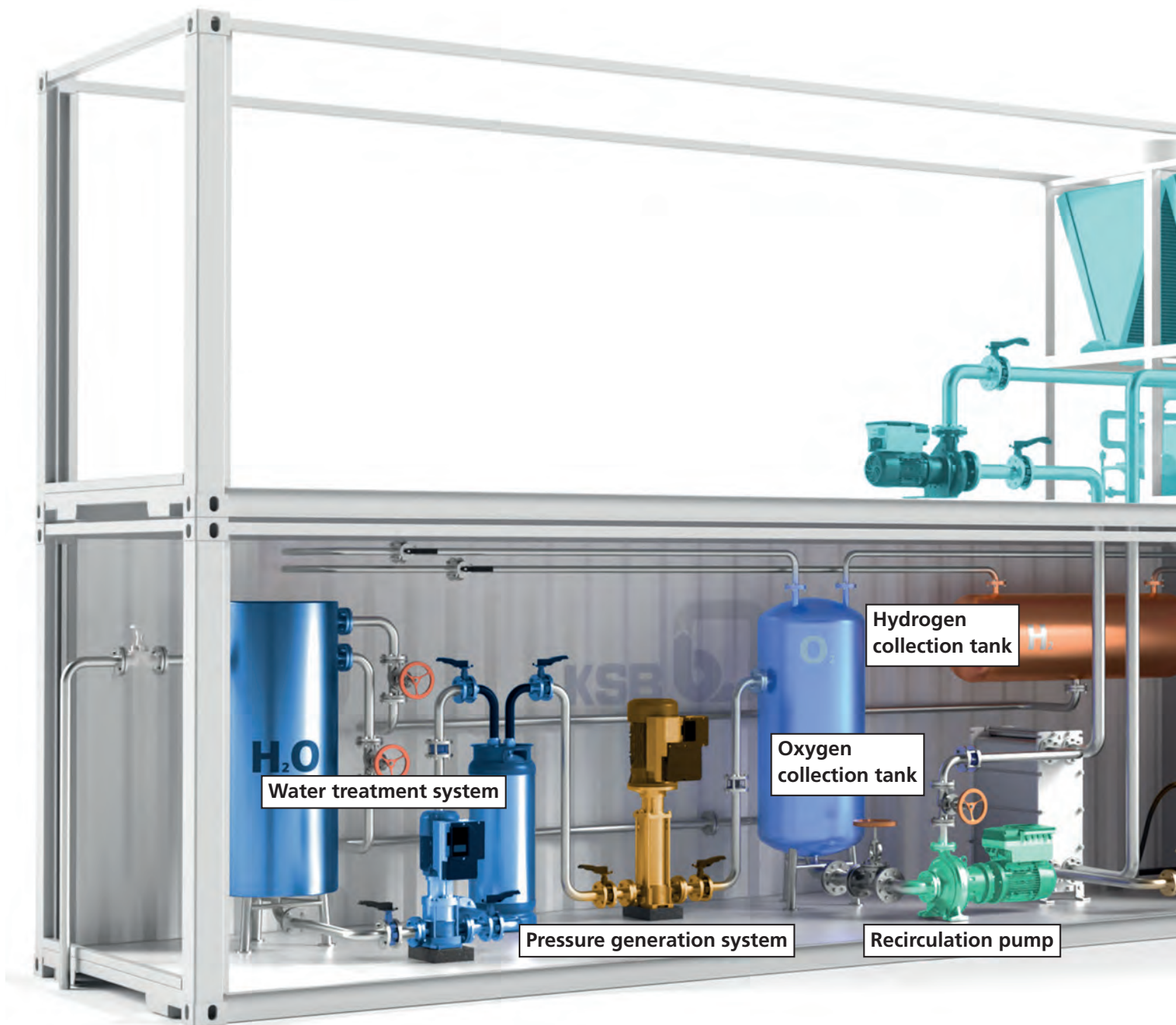
Western Africa and Australia. These regions offer excellent conditions for producing electricity from wind and sun on unused land. In Germany, the federal government plans to establish an electrolysis capacity of at least ten gigawatts by 2030.

Fields of application focus on industry

Green hydrogen is planned to be initially used where simpler, climate-neutral alternatives remain unavailable in the foreseeable future, and where hydrogen is needed in large quantities, making economical transport more feasible. In concrete terms, this means industry first. Demand for green hydrogen is particularly strong in the chemical and steel industries.

A challenge associated with hydrogen projects is that requirements can still vary widely in terms of the components and materials used. Many questions concerning the use of pumps and valves in various hydrogen processes will ultimately only be answered when development is further advanced.

Hydrogen container

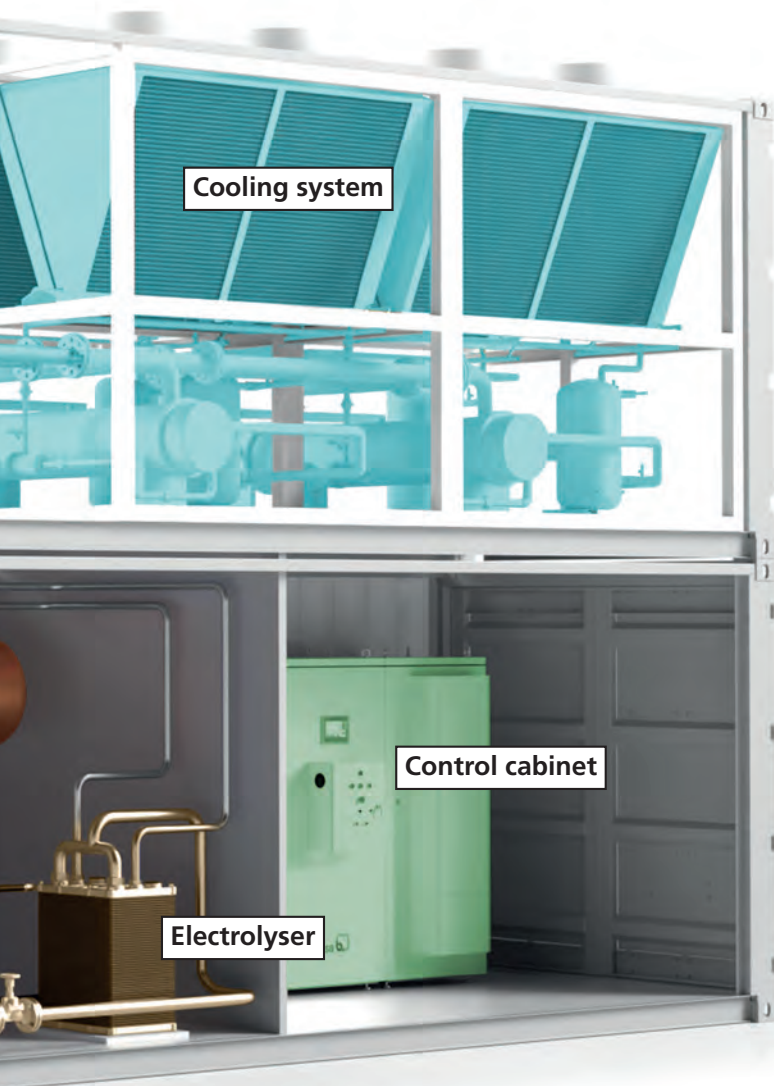


Another unresolved issue in the development of new hydrogen production systems concerns the size of the plants. Today's electrolyzers are usually modular in design. In terms of energy efficiency, it remains unclear whether individual electrolyzers should be equipped with their own cooling systems, or whether several parallel electrolyzers should share a common cooling unit.

Will container solutions or large plants see more demand in the future? The answer to this question directly impacts pump and valve selection. Container solutions would have flow rates of about 10 m³/h, but large plants may exceed 800 m³/h. Likewise, the operating pressure may range from

6 to 40 bar. Larger, modular facilities may also require more control systems to ensure optimum interaction between their components. Suppliers of pumps and valves will need to offer a wide product range to cover a broad field of applications. In addition, detailed knowledge of systems engineering, operating modes, materials and energy efficiency will be of crucial importance. This is especially relevant since several different technologies for green hydrogen production are available or emerging.

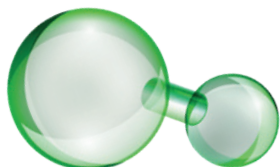
KSB's products cover all of the key technologies involved in green hydrogen production including alkaline electrolysis (AEL), proton exchange membrane electrolysis (PEM) and future technologies such as anion exchange membrane electrolysis (AEM) and high-temperature electrolysis (HTEL).



As a climate-neutral energy carrier, hydrogen could become an essential building block for replacing oil, gas and coal.

— Ulrich Stahl, hydrogen expert at KSB

The science of hydrogen

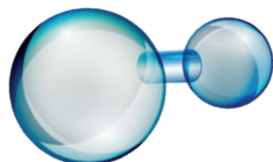


Green hydrogen

This type of hydrogen is produced via the electrolysis of water. In this process, electric current breaks down the water into hydrogen and oxygen. The electricity required for electrolysis comes exclusively from renewable energies. As a result, both the electricity used and the production of hydrogen are CO₂-free.

Grey hydrogen

This fuel is produced using fossil sources. For example, natural gas is converted into carbon dioxide and hydrogen. The resulting CO₂ is released into the atmosphere, adding to the greenhouse effect.



Blue hydrogen

Blue hydrogen is essentially grey hydrogen. The difference: In the case of blue hydrogen, the carbon dioxide is captured and stored. This type of hydrogen production is therefore considered CO₂-neutral.

Yellow hydrogen

This hydrogen is also produced by electrolysis. The electricity required comes from nuclear energy. Climate-critical CO₂ is not produced, but radioactive waste is.



Turquoise hydrogen

This fuel is produced via methane pyrolysis. Instead of CO₂, solid carbon is formed. To make this type of production CO₂-neutral, renewable energies must be used and the carbon must be permanently sequestered.



A close-up of polycrystalline solar modules

A proven technology with disadvantages

Known for more than a century, alkaline electrolysis is among the most highly developed electrolysis technologies. However, it can no longer offer much potential for reducing costs. It nevertheless remains more durable and reliable than other technologies, so its disadvantages are accepted by industry.

Innovations with potential

PEM electrolysis is a much more recent technology. Its benefits are reliability, ease of use and a high degree of flexibility. Compared with alkaline electrolysis, this technology offers considerable potential for technical developments and cost savings, and it does not require the use of any risky chemicals. Setting aside the toxic electrolyte, the application conditions for pumps and valves are similar to those of alkaline electrolysis. The new technology promises to deliver particular benefits once hydrogen production from renewable energy sources becomes widespread in future.

KSB is also equipped for future technologies such as anion exchange membrane electrolysis (AEM) and high-temperature electrolysis (HTEL). Here, the challenge is dealing with high temperatures that place exacting demands on materials.



Film: This is how an electrolyser works.

Acting responsibly

Sustainability

KSB has set itself nine binding sustainability goals which the company aims to achieve by 2025 at the latest. One of these goals is to reduce greenhouse gas emissions at production sites worldwide.

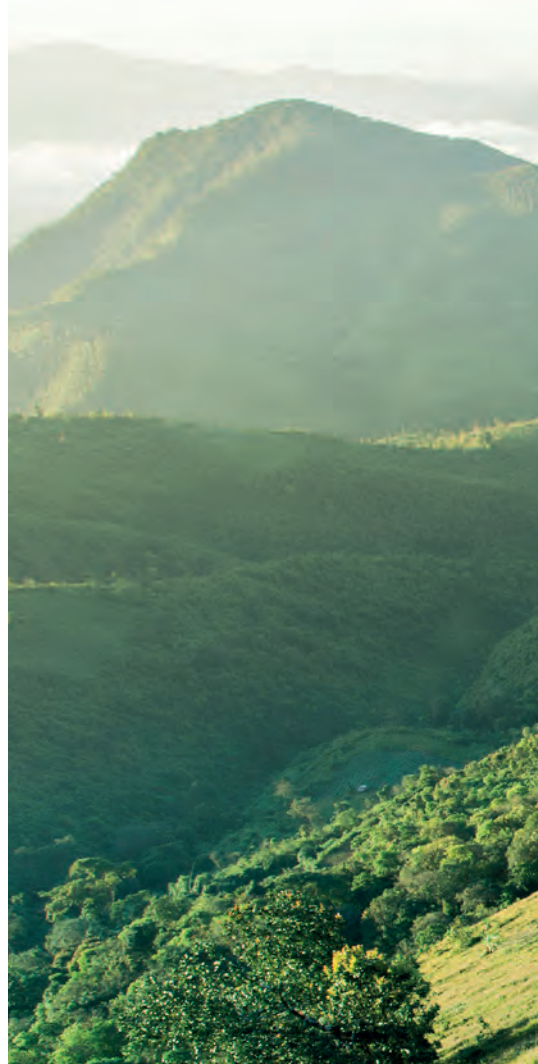
Sustainability lies at the core of KSB's corporate strategy. This includes the responsible use of resources and the environment as well as the company's responsibility to employees and corporate social commitment.

The 17 Sustainable Development Goals (SDGs) set out by the United Nations express the central challenges and guiding principles of a global sustainability policy. They aim to preserve natural resources by ensuring that

development remains sustainable. As a global company, KSB influences economic, ecological and social developments.

Setting ambitious goals

KSB supports the 17 Sustainable Development Goals set out by the United Nations. 2019 saw the company develop its own nine global sustainability goals based on the





The nine KSB sustainability goals for 2025



1

Production sites reduce their CO₂ emissions by 30 percent.



2

More than half of newly developed products are subject to ecological assessment.

UN initiative. KSB aims to achieve them by 2025 at the latest. The nine goals address issues in the areas of the environment, employees, social matters and supply chain sustainability. The focus is on climate pro-

tection, the promotion of decent working conditions and sustainable economic growth, and health and well-being. In addition, KSB is committed to doing even more to promote gender equality. The company also intends

to gather more comprehensive information on how suppliers deal with sustainability issues. KSB is dedicated to combating poverty and hunger as well as to ensuring the availability of clean water and education through social projects. Developing the knowledge of employees is another binding target.

One of the most important goals of the United Nations calls for action on climate protection. KSB is part of the drive for sustainable

Numerous measures implemented worldwide

KSB's second largest location in Germany, the manufacturing plant in Pegnitz, has been using green electricity from renewable sources exclusively since the beginning of 2022. "This saves more than 5,000 tonnes of carbon dioxide annually," says Pegnitz Site Manager Harald Hofmann. "More and more



3

KSB's water pumps save an annual 850,000 tonnes of CO₂.



4

Each employee invests at least 30 hours per year in training and development.

change and is engaged in concrete measures to combat climate change and its effects. The company intends to reduce CO₂ emissions in its manufacturing plants by 30 percent worldwide by 2025 at the latest, based on the corresponding figure for 2018.

Measures undertaken to achieve this goal include reducing energy consumption and switching to green electricity.

customers are interested in how our products are manufactured and the environmental footprint we leave behind." Other production sites within the Group have also made the switch to green electricity, and more are to follow.

Some of the Group's locations have even gone one step further and are already climate-neutral. In Italy, for example, KSB



Solar panels on the roof of KSB's factory in Concorezzo, Italy



was awarded the Zero Emission certificate. Located near Milan, the company's plant in Concorezzo does not produce any carbon dioxide. "A few years ago, we started to take a close look at the energy data of all the buildings at our plant," says Oscar Bellotto, who oversees sustainability-related issues at the site. This was followed by concrete measures such as the use of photovoltaic systems to generate electricity and solar collectors to provide hot water. "In addition, 100 percent of our electricity comes from renewable energy," explains Bellotto.



5

Women make up at least 20 percent of management staff.



6

Employee satisfaction is at 80 percent (engagement index).



7

The number of working days lost due to occupational accidents is reduced to fewer than 0.3 days per employee per year.

It is part of our corporate social responsibility to reduce greenhouse gas emissions.

Seeing the big picture: Oscar Bellotto is responsible for sustainability issues at KSB in Italy.





8 KSB is involved in at least 25 social projects worldwide every year.

9 90 percent of key regional and global suppliers have their sustainability performance assessed.

In India, KSB operates a green factory in Shirwal. The planners of the manufacturing facility for high-efficiency power plant pumps, which opened in 2017, designed all of the buildings to consume as little energy as possible. The production halls, for instance, are designed to make the most of the natural light available so that employees do not need artificial lighting at all for at least eight hours a day. The buildings also feature environmentally friendly and energy-saving air-conditioning systems. They work solely via evaporation and require no refrigerant.

In Shirwal, KSB uses its own solar plants to generate much of the energy it needs. Cutting-edge machinery and systems meet the highest efficiency standards and consume as little electricity as possible.

Green investments at headquarters

At its Group headquarters in Frankenthal, KSB is also driving forward a number of climate protection measures and reducing its carbon footprint. For example, a new heating system is currently being built at the pump and valve manufacturer's largest location at a cost of around 15 million euros. Thanks to a more efficient plant design and a higher proportion of renewable heat from biomass, the new facility will save around 3,700,000 kilowatt hours per year – or 900 tonnes of CO₂ – compared with the previous heating system.

The new IT headquarters in Frankenthal built in 2022 also meet the latest energy requirements. Around 100 people work in these 3,000-square-metre premises. The air heat exchangers installed and the photovoltaic elements on the roof meet almost all of the building's energy needs.

For KSB, the goals for 2025 are only an intermediate step. The company will keep striving to make every aspect of its business activities sustainable, and play its part in securing an ecologically sound future for the world.



Learn more about KSB's sustainability goals.

Sustainability at KSB

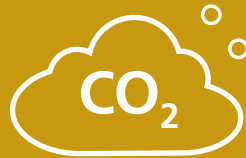
Power consumption



50.4 %

Share of renewable energy in the Group's electricity consumption in 2022; in Europe this was 82.2 %.

Greenhouse gases



-7,909^t

Reduction in carbon dioxide emissions in 2022 compared with the previous year

Social commitment



Social initiatives and projects supported by KSB in 2022



Carbon neutral
Print product

ClimatePartner.com/10954-2303-1002



Contacts

Published by

KSB SE & Co. KGaA
Corporate
Communications
Sonja Ayasse
Johann-Klein-Straße 9
67227 Frankenthal,
Germany
Tel. +49 6233 86-3118
www.ksb.com

Editors

Marc Sproß (resp.)
Alexandra Leiner
Christoph Pauly
Heike Stauber

Editorial office contacts

marc.spross@ksb.com
alexandra.leiner@ksb.com
christoph.pauly@ksb.com
heike.stauber@ksb.com

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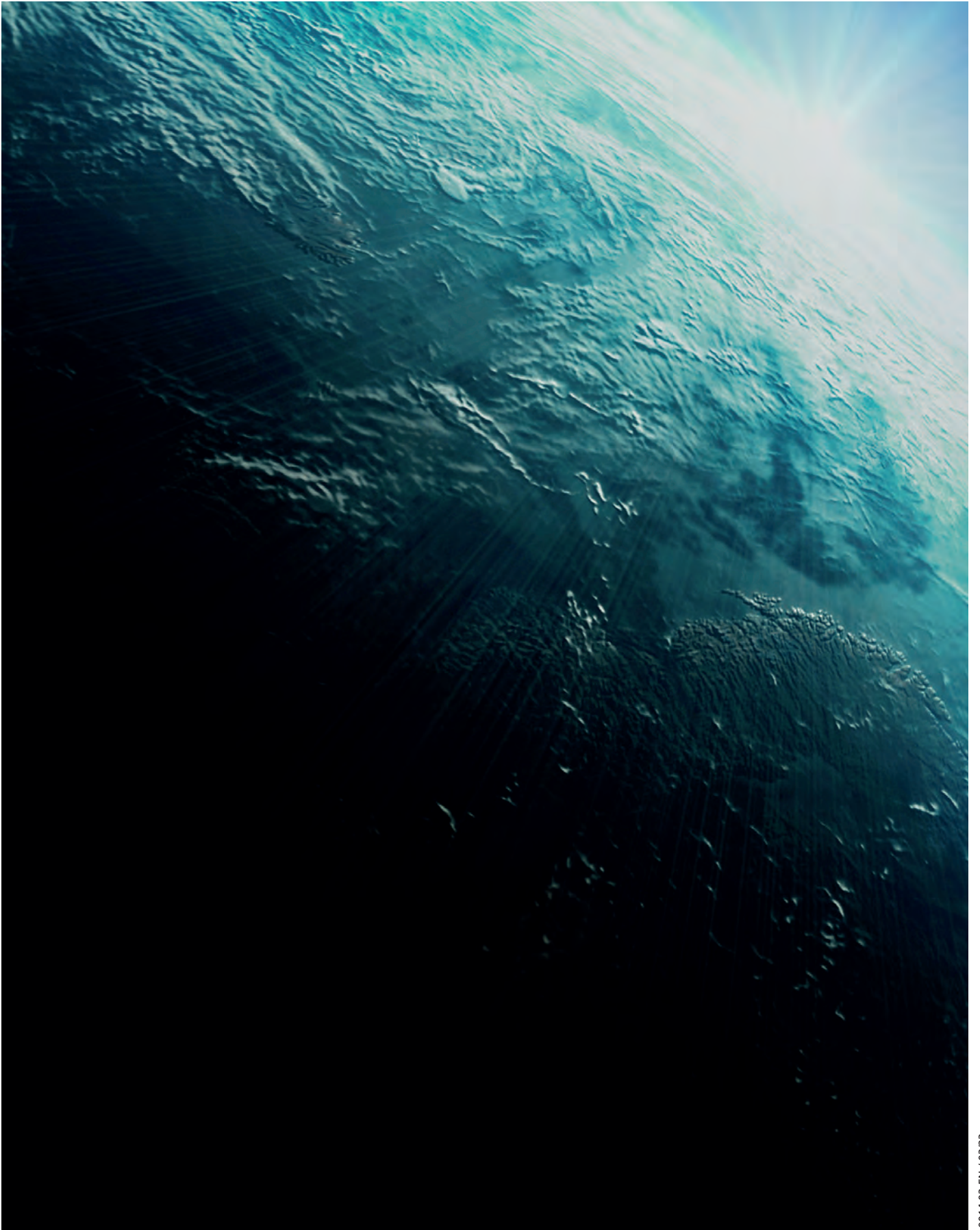
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