KHS

SUSTAINABILITY REPORT FOR 2017/2018

Climate responsibility– our commitment to sustainable solutions

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Climate protection responsibility: our entrepreneurial commitment

For more than 150 years, we have been developing innovative filling and packaging systems for the international beverage industry. Whether innovation milestones of the first hour or further development into efficient high-performance systems. Whether initial container designs with completely new materials up to ultra-lightweight bottles or packing systems without secondary packaging - it has always been matter of offering our customers the best solution for their added-value processes while clearly focusing on conserving on or reusing resources. The big responsibility of which we are well aware. Important is seeing the overall picture from above which helps us to correctly recognize the challenges in the global context of climate protection and to act accordingly with foresight. We want to make our active contribution here with our own actions and innovations. How successful we have already been with this approach and which challenges that lie ahead are illustrated in this Sustainability Report.

We have intentionally titled our Sustainability Report 2017/2018 "Climate Protection Responsibility".

In conjunction with our customers and other stakeholders, and not least from the point of view of our employees, we see that this inter-company issue has long been the global challenge of our time in which we want to actively participate with solutions. We do this as a company that is bound by both tradition as well as future-oriented innovations. Our sense of tradition already geared towards solutions for tomorrow. With this attitude, we are also aware of the experience that these solutions often evolve in different ways and at different speeds.

The aim nevertheless remains to further reduce CO_2 emissions together with energy, material and thus resource consumption in our own company as well as in our product and service solutions. At the same time, we want to continue to increase the efficiency of our own performance as well as that of our systems through increased use of intelligent digitization options for example. We thus offer our customers best solutions for climate protection since sustainability issues are also becoming increasingly important not only to them but their end customers as well. When we develop plastic containers, for example, that, thanks to their low weight, save significant amounts of material, or are made of recycled raw materials or contribute to increasing the amount of recyclable raw materials, we improve the carbon footprint throughout the manufacturing process and packaging itself. This approach requires a continuous critical view of existing processes and our willingness to look beyond well-worn paths for solutions to the next steps.

For this, each individual step is equally as important as each and every employee in our workforce. Because every step towards our progress is backed by people from KHS who contribute their own ideas and sustainability efforts for more climate responsibility - they are the face of our entrepreneurial commitment.

About the KHS Sustainability Report

As an international company, KHS is committed to providing innovative filling and packaging systems manufactured according to the highest quality standards. This is also reflected in our demands placed on reporting.

Although we are a wholly owned subsidiary of Salzgitter's Klöckner-Werke GmbH and are currently not legally subject to reporting requirement, in 2015 we decided in favor of reporting about our sustainability commitment at two-year intervals. For the first time in this report, we have used the G4 Guideline on Sustainability Reporting of the Global Reporting Initiative (GRI) for compiling the structure and content of the report. In doing so, we want to achieve a high level of comparability with the content of other sustainability reports and want to be on par with compulsory reports in accordance with international standards.

As part of this process, we have identified and defined the content for this report through a multi-stage process for you as a reader. In the first step, we used the International GRI Guideline Catalog as a basic guideline and assigned the topics indicated therein to in-house functional departments. Next, internal stakeholders evaluated these GRI topics with regard to relevance for both KHS and the main topics for our customers.

In the third step, we reviewed the sustainability of our customers' primary fields of action and compared them with our content based on what is known as the United Nations Sustainable Development Goals (UN SDGs). In doing so, we discovered that we are primarily dealing jointly with numerous issues relating to climate protection and sustainable, responsible production and responsible consumption by each and every one of us. The topics that have been carefully identified as being essential ultimately constitute the structural and contentual basis for this Sustainability Report.

As a result, we agreed on "Climate Responsibility - Our Commitment to Sustainable Solutions" as the title for this topic that forms the central theme throughout the entire report. Nicole Pohl, Senior Online Manager Corporate Communication at KHS, is responsible for the Sustainability report project management and strategic contentual derivation process.

» For our third voluntary sustainability report, we are guided entirely by international reporting standards and guidelines. In this way, we offer our stakeholders the greatest possible contentual proximity to those sustainability reports that are legally required to work with these standards and guidelines. «

Nicole Pohl
Senior Online Manager Corporate Communication
Sustainability report project manager
KHS GmbH

Strategy and corporate management

Strategy and corporate management in the interest of sustainability

Experience and the competencies gained from this experience are our most valuable assets - in particular when looking back on our 150-year company history.

We offer innovative filling and packaging systems with a strong orientation towards the future and the related life cycle. We want our customers to be able to rely on our systems and we actively support them in their own goals for conserving resources and reducing the carbon footprint.

This is why it is crucial for us to further sensitize our employees to the issues of climate protection and sustainability and to combine their experience and competencies with these issues. Since only with systems that conserve resources in the long term will we be able to make a decisive contribution to reducing CO_2 emissions in our production processes and in our customers' packaging systems and additionally secure our most valuable assets and use these assets to meet the challenges of the future.

Chapter „Strategy and Corporate Management" contains detailed information about our sustainability management and efforts towards innovation. In addition, we provide insights on how we deal with other important issues such as compliance, a reliable supply chain and work with associations. The chapter is concluded with information about the contentual approach to this report, about the company KHS as well as important key figures.

» With more than 150 years of future-oriented competence in the field of filling and packaging, we now have a wealth of experience that serves as a valuable basis for sustainable actions. Our employees use this expertise to develop tomorrow's resource-efficient systems which are designed in the interests of our customers and enable us to live up to our responsibilities. «

Kai Acker
Chief Executive Officer
KHS GmbH

Dear reader,

For more than 150 years, KHS has stood for long-lasting and future-oriented filling and packaging systems for the beverage industry. Our pioneering achievements that still shape the industry today demonstrate our claim to have always acted in an economically sustainable manner and to implement holistic systems for our customers, helping them to achieve their own sustainability goals now and in the future.

It is therefore a matter of course for us to continue to consistently pursue this approach by establishing our actions even more firmly in the context of climate and environmental protection and continuously examining the process steps into which we can integrate further measures. This means that we have to navigate between the expectations of our customers, our own performances and the global agreements on climate protection. It is important to look at the big picture from the top down so that we can face the vast number of challenges awaiting us. In this way, we consciously and unerringly take every small and big step, even if the approach towards achieving our goals harbors unforeseen obstacles or takes longer than expected. With the title theme Climate Protection Responsibility, we are clearly committed to our claim to make our contribution to innovative and sustainable systems in this perhaps most relevant issue in today's global society. We are well prepared for achieving this goal with more than 5,000 experts worldwide.

This Sustainability Report focuses on the people who work at KHS. They talk about their accomplishments and what they have achieved over the past two years. Each and every idea and development is backed by the know-how of these people who promote our economically sustainable actions. In this report, we present you with a number of data and facts as well as individual stories and background information to give you an illustrative view of the various fields of work of our employees and their concrete commitment to sustainability.

For we as a reliable partner want to continue to support our customers with our services in the future.

We wish you interesting and stimulating reading!

(from left to right) Dr. Johannes T. Grobe (head of Sales and Service), Kai Acker (Chief Executive Officer), Martin Resch (head of Finance and Information Technology)

Kai Acker
CEO

Dr. Johannes T. Grobe
CSO

Martin Resch
CFO

Sustainability management

In light of the increasing significance of climate protection and climate targets for society, our customers and their end customers, the importance of holistic sustainability management in our company is also increasing.

In recent years, KHS has concentrated its sustainability management in particular on the environment and occupational safety. As the scope and complexity of related topics continues to increase, we have defined responsibilities for sustainability issues in virtually all functional areas. They relate indirectly to each other and have a bearing on each other. For this reason, we are taking a closer look at our processes so that we can combine and bundle sustainability-related tasks even better in the future.

Our production sites in Germany are already pursuing their own climate goals and clearly rely on energy-efficient procedures and measures in their production and manufacturing processes. All KHS locations in Germany are now running production with green electricity. In addition, many measures initiated in 2016 and 2017 have brought about a further reduction in CO_2 emissions. Sustainability management has been given high priority not least through Salzgitter AG's YOUNITED mission statement. Projects such as a network for exchanging ideas and information have been set up as part of various sustainability initiatives in recent years and have had a direct impact on existing processes.

In general, our global customers, in particular, have cited the United Nations Sustainable Development Goals as being of paramount importance. SDG focuses on issues such as climate protection, responsible consumption, sustainable production, a healthy life and access to clean water. Accordingly, these subject areas have had a direct impact on our actions as a company in the beverage bottling and packaging industry. For this reason, we actively address the question of how we can integrate the UN Global Compact initiative even more consistently. To this end, we will continue to expand our sustainability management.

» In past years, we have laid a solid foundation with our sustainability management, which focuses primarily on occupational safety and environmental issues. The emphasis continues to be on minimizing process risks at all of our sites worldwide. This way, we are creating a solid basis for targeting future global tasks based on the UN Global Compact initiative. «

Florian Lerche
Head of Corporate
Communication & Quality
KHS GmbH

Innovations: Always one step ahead thanks to 150 years of experience

KHS has had a long tradition looking at future-proof solutions and new developments from day one. The successful company history began as early as 150 years ago with pioneering inventions. Thanks to our many years of experience, we are able draw on extensive cache of basic technological knowledge. The fact that we always think one step ahead shapes our approach, our claim, our attitude - and ultimately our success. Our competence in engineering means that our products meet maximum requirements and conquer markets with a strong orientation towards the future.

It is thus important for us to create and live up to a climate of innovation and error management culture within the company. What has been learned in the past is indispensable in order to be able redevelop and further develop trend-setting products and systems with an entrepreneurial attitude. For this reason, we also attach great importance to constructive exchange of ideas and favor a strong team culture and communication.

We protect our innovations with industrial property rights in order to safeguard and sustainably develop new technological developments that have already been achieved. KHS has more than 4,000 active patents and patent applications. With each product development and improvement, we strive to reduce energy and media consumption further to achieve the responsible consumption of natural resources and to protect our environment to the greatest possible extent. The Innofill Glass DPG ECO filler is a good example of how even a small change can make a big difference - and how important it is for us to consider the current and possible future needs of our customers.

Our Eco process for fillers is an excellent example of the sustainable further development of existing products. Thanks to a new evacuation and CO_2 purging process, we have been able to reduce the CO_2 consumption of the system by up to 50% and at the same time reduce the oxygen pickup in comparison to conventional methods. This resulted in the reduced output capacity of the vacuum pump, which in turn lead to significantly lower power and water consumption. With the help of a conversion kit, KHS is also able to equip older model fillers with the advantages of the Eco process.

Dr. Jochen Ohrem is in charge of "Innovation Management" and plays a crucial role in managing the development of new products and further development of existing products at KHS.

Compliance: voluntary commitment to sustainability

KHS is clearly committed to protecting each individual employee and supplier.

We apply the Modern Slavery Act (see info box) in our company worldwide and thereby clearly state our policy against forced labor, slavery and human trafficking for both our company and the entire value chain. It is important to us to create a working environment in which the skills and personal qualities of employees can be promoted and employees are able to develop freely. In order to comply with both legal regulations as well as our own claims, we attach great importance to regular training and further education on subjects such as anti-corruption and anti-trust laws. Our corporate policy is always committed to the ethical and moral standards of the KHS group.

KHS also has two codes that ensure a high level of compliance.

The Code of Conduct for Employees governs, among other things, the areas of applicable law, avoidance of conflicts of interest, fair working conditions, loyal and transparent reporting, safety and environmental protection, confidentiality and data protection. If they wish, our employees may confidentially contact a compliance officer appointed specifically for this purpose if they have any questions or are unsure about certain practices being in compliance with this code.

It is very important to us that our suppliers also pledge to uphold universal human rights and to abide by the law. For this reason, we have also established a Supplier Code of Conduct that is binding for all suppliers in the KHS Group as well as their subcontractors. We reserve the right to carry out random inspections at our suppliers' sites.

Marcel Moranz is responsible for issues related to compliance, insurance and data protection at KHS.

Modern Slavery Act

Great Britain published the UK Modern Slavery Act in 2015. Under this law, any company whose annual turnover exceeds £36 million is required to make a public statement indicating the measures the company is taking against slavery, bondage, forced labor and human trafficking in the supply chain.

Reliable supply chain

In order to be able to reliably provide sustainable products, it is a major prerequisite that we maintain a trusting and long-term cooperation with our suppliers and partners. Our customers can rely on us – and we can rely on our suppliers. Our customers' requirements are constantly growing in this respect: they are increasingly calling for proof of sustainable economy within the supply chain. This interaction between ourselves and our customers and suppliers places our commitment to sustainability on an important footing. It enables us to provide a high level of quality and product safety and ultimately ensures our success. This is how we secure our position on the market in the long term.

For these reasons we rely on strategic partnerships which guarantee stable processes within the supply chain. This demand for reliability not only affects the quality of our bought-in components and assemblies or the exact time of delivery or optimization of costs. It also applies in particular to the aspect of sustainability and to values which are relevant to society in general. When selecting potential new suppliers we therefore take the utmost care to ensure that our code of conduct for suppliers is strictly adhered to. This covers the following important points:

- Prohibition of child labor
- Prohibition of forced labor
- Adequate working hours
- Fair pay
- No discrimination.

Our code of conduct for suppliers also deals with various ecological aspects, such as environmental regulations, climate protection and the careful use of natural resources.

Adherence to our suppliers' code of conduct is taken into account and monitored by our supplier management system. The demands we make of our suppliers may not be any different from our own demands as a supplier. For this reason KHS was awarded a silver medal in the EcoVadis CSR rating in 2018.

Ulrich Schniedergers (head of Corporate Procurement and Supply Chain) and Katja Kuhlmann (head of the Procurement Management Dept.) ensure stable processes within the supply chain.

Profiting from active work in associations

Keeping up to date with the latest scientific research, swapping practical experience, achieving sustainable goals together: with its targeted commitment to select associations KHS gleans expertise relevant to the market and the industry, maintains important networks and actively contributes to the work these associations do.

Cooperating with specific associations allows our company to supplement its existing specialist knowledge with vital expertise and appraisals which can be put to good use in our commitment to sustainability. In doing so, we not only build an important foundation for our own basic research but also help to create a transparent competitive context by actively providing our own perspective on current and future problems in conjunction with the experiences made in the market environment. Networking and the exchange of information – which is of course always legally permissible and adheres to our compliance guidelines – help to regularly monitor our own strategic course. By actively participating in various workgroups, for instance, or answering questions from stakeholders at discussion meetings, we can react to relevant changes in good time and generate key incentives ourselves. KHS is particularly active in contributing to the definition and development of intercompany industry guidelines.

By working together within a strong organization, questions and issues relevant to our industry can also be put to politicians. Here, we have realized that issues of international relevance are becoming ever more important, such as the increase in networked manufacturing with new standards, the current progress in the field of artificial intelligence or how to deal with the consequences of trade restrictions. This is why we maintain a very special relationship with select major associations such as the German Engineering Association (VDMA). With its Blue Competence sustainability initiative, for example, this believes in encouraging many different bodies to work together – from manufacturers of components through system integrators to the customer.

KHS is committed to the above as a matter of conviction, for with component manufacturers, OEMs and users/operators all of the main stakeholders in the field of machine construction and engineering are gathered around a single table. We have thus taken the chair of the committee for the VDI 4066 guideline series: hygiene requirements for the beverage and dairy industries. We also take part in various VDMA workgroups, including Corporate Responsibility (CR), where since 2017 we have been discussing and working on sustainability issues from the industry's point of view. In doing so, we are heightening awareness for this topic within the association and among its stakeholders and in our company itself by passing on ideas to the relevant people responsible.

One specific example of our commitment is our work on the technical and scientific committees and in the workgroups of the Research Institute for Brewing and Malting Technology in Berlin (VLB). This helps to ensure an intensive exchange of ideas regarding basic technical research and development. The knowledge we glean from research and development is immediately applied to our new generations of machines. The upgrades derived from this make machines already installed more sustainable, for instance. As the main issues tackled by technical and scientific workgroups always reflect current market trends and developments, with our commitment we ensure that we are always up to the minute and able to apply new information directly to the relevant product areas.

Dr.-Ing. Matthias Schopp, head of Engineering Systems at KHS in Bad Kreuznach whose responsibilities include issues related to work with associations.

A company within the strong company group: 150 years of KHS

From an equipment dealer to one of the world's leading suppliers of innovative filling and packaging systems: KHS celebrated its 150th anniversary in 2018. To this day, our customers benefit from our extensive know-how gained over these many years.

Over the course of its history, KHS has united the expertise of numerous pioneers and predecessors under one roof. The company was founded in Dortmund in 1868 by Karl Kappert and Louis Holstein. Their vision was to conquer the market with solutions for bottling and packaging the then new bottled beer. Over the years, this passion for innovative and promising solutions has always been crucial to the success of the company. This success began with one of the oldest inventions such as a beer filter in 1878 and the bottle brushing machine in 1906, and extends from the first palletizer for the beverage industry in 1967 to the latest innovations such as Plasmax coating technology for PET bottles in 2002, the Nature MultiPackTM in 2013 and the innovative film-free packaging solution also for beverage cans that KHS launched to the market in 2018.

With this experience and successful developments as well as our claim to success, we, as one of the leading international bottling and packaging equipment manufacturers for the food and beverage industry, have a firm place in the strong Salzgitter AG Group and are a major pillar within the technology sector. Our worldwide sales and service network enables us to work directly and personally with our customers. All benefit from this network - since it is the local experts who understand the markets, the culture and the requirements of our customers very well.

Affiliation, locations, main topics

We have been part of the technology division of Salzgitter AG for the last ten years. In the YOUNITED mission statement, the concern advocates in-house commitment in processes and more responsibility in the company with the help of six defined values. The value for 2017/2018 is customer orientation and reliability, with the associated campaign entitled Focus on customers. Based on this value, we conducted numerous interviews with our customers around the world and have gathered constructive feedback. In the future, for example, we will be focusing on further improvement of the cooperative work across all divisions. The KHS Group includes the following three companies: KHS GmbH with headquarters in Dortmund, Corpoplast GmbH in Hamburg and NMP Systems GmbH located in Kleve.

Five of the eleven production sites are located in Germany. Here is where solutions for blocked filling and packaging systems are developed and independent competence centers are operated: in Dortmund for pasteurizers, labelers and conveying systems as well as all issues pertaining to complete filling and packaging lines; in Hamburg for PET stretch blow molding, coating and container systems; in Kleve for packaging machines, in Bad Kreuznach for process, bottling machines, keg systems and aseptic bottling machines and in Worms for palletizers.

Outside Germany KHS operates a total of six production facilities in the United States, Mexico, Brazil, India and China. The KHS is additionally represented in fifty-two countries by its own companies and offices.

Our key figures in black and white

From turnover figures to figures on power consumption: the facts and figures speak for themselves.

KHS opens its books and gives a broad overview of the most important key figures from the 2017/2018 reporting period. We have already achieved a great deal thanks to our energy and environmental guidelines and our fixed goals for 2025. At the same time, we are also aware of the challenges that lie ahead which, thanks to our committed employees worldwide, we are resolutely tackling.

Key figures, social commitment

	2017	2018
Employees	5,070	5,081
Of which women	718	721
Of which apprentices and trainees	374	328
Employees under the age of 30	928	859
30 to 50 years old	2,541	2,553
Older than 50	1,601	1,669
Nationalities	75	81
Average age of the core workforce in years	44	44
Average age of apprentices and trainees in years	23	23
Average period of employment in years	13	13

Key figures for ecological awareness

	2017	2018
Electricity consumption per € million turnover [MWh/€m turnover]		
Group[1]	23.0	23.1
Bad Kreuznach[2]	29.2	31.4
Dortmund[3]	25.6	24.7
Hamburg	13.9	13.9
Kleve	25.1	26.1
Worms	20.8	21.5

	2017	2018
Gas consumption per € million turnover [MWh/€m turnover)		
Group[1]	30.4	30.5
Bad Kreuznach	65.2	73.4
Dortmund	19.1	17.8
Hamburg	13.7	10.0
Kleve[5]	23.9	28.9
Worms	79.5	86.7

[1] For the KHS Group the total consumption of all German plants is divided by the plants' turnover and converted into the relevant unit.
[2] Lighting replaced with LED and replacement of the central compressed air supply for production: 90,480 kWh per year
[3] Savings from LED lighting: 364,840 kWh per year
[5] Higher consumption resulting from expansion of production area

	2017	2018
Heat consumption per heating day and temperature difference in °C [kWh/d/ΔT]		
Group[1]	1,613.8	1,645.0
Bad Kreuznach	2,999.0	3,262.9
Dortmund	3,090.2	2,999.9
Hamburg	743.9	524.3
Kleve	441.8	532.5
Worms	1,164.3	1,302.7

	2017	2018
Water consumption per €m turnover [m³/€m turnover]		
Group[1]	67.0	61.4
Bad Kreuznach	181.1	145.6
Dortmund	53.0	50.0
Hamburg	24.8	27.6[4]
Kleve	34.2	34.5
Worms[6]	48.4	81.7

[1] For the KHS Group the total consumption of all German plants is divided by the plants' turnover and converted into the relevant unit.

[4] Commissioning of the new block solutions and the related bottling tests and expansion of the production area

[6] Fire water storage pond was filled with about 1,500 m³ of water.

	2017	2018
Diesel consumption per 100 km [liters/100 km]		
Group[1]	5.0	5.3
Bad Kreuznach	-	-
Dortmund	-	-
Hamburg	-	-
Kleve	-	-
Worms	-	-

	2017	2018
Generated waste per €m turnover [t/€m turnover]		
Group[1]	5.4	5.1
Bad Kreuznach	5.1	6.4
Dortmund	6.0	5.3
Hamburg	2.5	2.5
Kleve	7.9	6.9
Worms	9.4	7.5

[1] For the KHS Group the total consumption of all German plants is divided by the plants' turnover and converted into the relevant unit.

	2017	2018
CO_2 emissions per €m turnover [t/€m turnover]		
Group[1]	9.0	9.7
Bad Kreuznach	13.1	14.8
Dortmund	6.1	5.9
Hamburg	2.7	2.0
Kleve	4.8	5.8
Worms	16.0	17.4

	2017	2018
Total consumption per €m turnover [MWh/€m][7]		
Group[1]	65.7	68.5
Bad Kreuznach	94.4	104.8
Dortmund	53.3	51.2
Hamburg	27.6	23.9
Kleve	49.1	55.0
Worms	100.3	108.2

[1] For the KHS Group the total consumption of all German plants is divided by the plants' turnover and converted into the relevant unit.

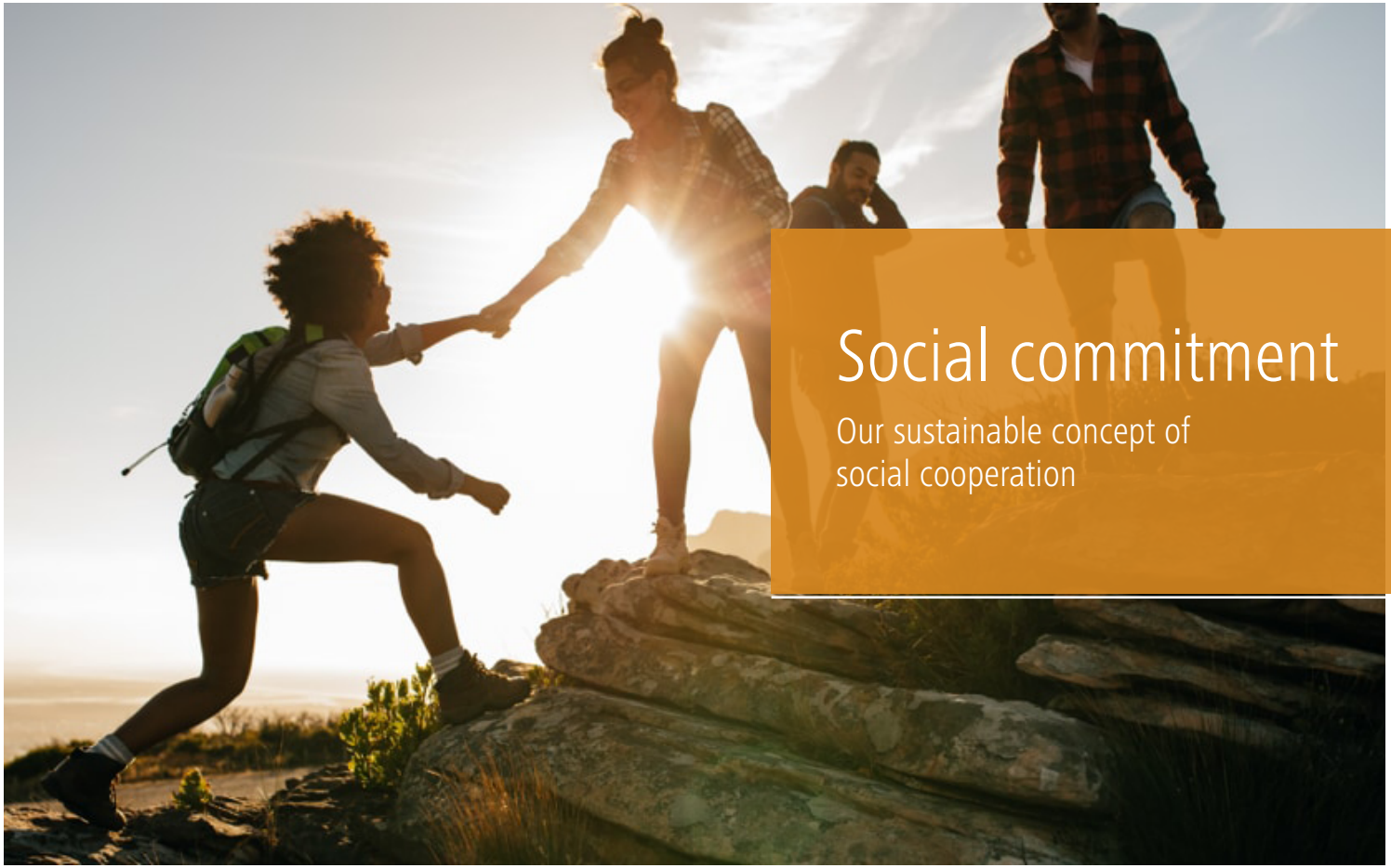
[7] Total consumption = power consumption + heating requirement.

Key figures, economic responsibility

	2017	2018
Turnover (Salzgitter consolidation) in €m	1,138	1,161
EBIT (Salzgitter consolidation) in €m	-5.2[1]	21.4
Total number of business locations	52	52
Quantity of products sold[2]	945	778
KHS Group donations to charitable purposes in € thousand	151	42

[1] including provisions of €13 million for the KHS Future Program

[2] Products manufactured by KHS within the scope of system and single machine business of the KHS Group not including conveying systems



Social commitment

Our sustainable concept of
social cooperation

Building employee loyalty with foresight: our social commitment begins with our employees

The motor of a company are its employees, who, as the determinative factor in the success of a company, are driven by their motivation, their creativity, their knowledge and their identification with the company. This is where our responsibility begins.

It is our job to protect and promote the health of our employees. After all, a company is only as strong as its most important resource. With sustainable human resource development and through reliable protection at the workplace, we increase the efficiency of our employees and our company. It is also important to preserve and develop existing know-how in the company through measures to promote employee loyalty and through close cooperation between younger and more experienced employees. At KHS, sustainable work also means working in an environmentally conscious manner: we are well aware of our responsibility to the environment - in particular with regard to future generations - every day. The related knowledge is continuously developed at KHS, passed on and consistently integrated into the company's processes.

» Employees and their know-how are invaluable to KHS. The goal is to ensure and promote the efficiency of employees through various personnel development measures and effective occupational health and safety. «

Rolf Staab
Head of Human Resources
KHS GmbH

General key figures

	2017	2018
Employees	5,070	5,081
Of which women	718	721
Of which apprentices and trainees	374	328
Employees under 30 years old	928	859
30 to 50 years old	2,541	2,553

	2017	2018
Older than 50	1,601	1,669
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Average age of core workforce in years	44	44
Average age of apprentices/trainees in years	23	23
Average period of employment in years	13	13

Personnel development: individual and targeted support

At KHS, Personnel Development (PD) communicates the concept of sustainability to the most important resource of any company. Our PD team sees itself as an internal service provider to whom the individual needs of our employees are particularly important.

The personnel development team develops education and training opportunities specifically for KHS employees. The aim is to provide each employee with professional and personal training. We also want to create framework conditions that support our employees in the best possible way in order to enable them to work effectively and efficiently now and in the future. This is why the subject of employee loyalty also plays a decisive role in the development of human resources.

General key figures

	2017	2018
In-house training courses	589	776
Personnel development activities[1]	3,755	3,014
Trained employees	1,549	1,542
Expenditures for training[2] (e.g. campus, single courses, etc.) (in € thousand)	1.033	779

[1] Fewer individual measures as these are bundled to create courses of further training.

[2] Costs saved by the KHS Future program.

Personnel development as an in-house service

Qualified, motivated, and satisfied employees are most important factor of our success. In order to gain the loyalty of these employees to our company in the long run, we make every effort to offer them attractive and long-term career perspectives. We achieve this through targeted and individual career and development planning, regular employee appraisals, the creation of talent pools and a structured knowledge transfer. For our managers, we have launched a special development program.

Acting farsightedly

Because the development of the markets often requires changes in the qualification profiles of employees, continuous and agile personnel development is an important key to the future. We are constantly adapting our continuing education program in order to remain competitive on current topics such as IoT and Industry 4.0.

Consistent promotion bears fruit

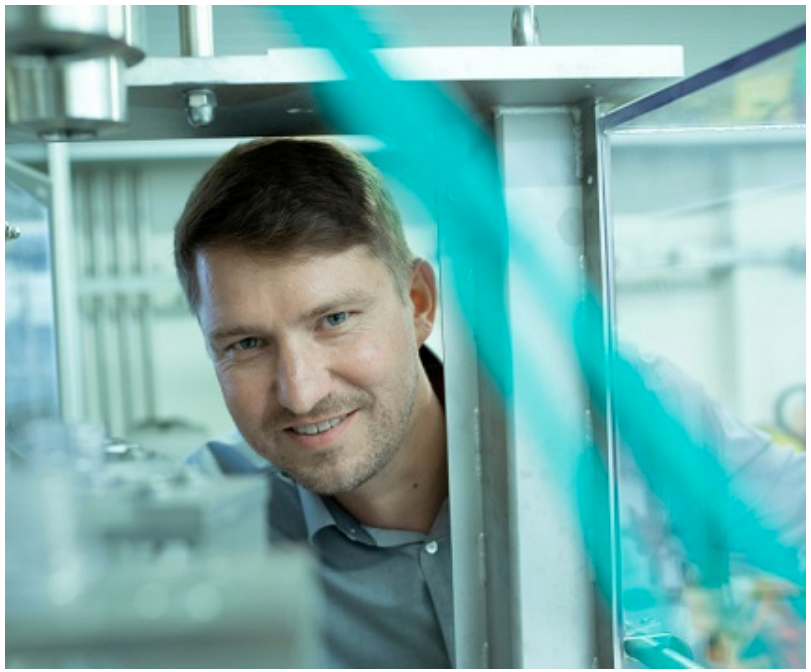
We permanently hire an average of eighty percent of our apprentices every year. They are still active today and are traveling around the world for KHS at locations such as our installation sites, in the Service Dept. and at our other sites in a wide range of different departments such as Design Engineering and Product Support. Many KHS colleagues began their careers at KHS during their studies - as student interns, trainees or while completing their bachelor or master thesis. They have remained with KHS because they value the innovative work environment and the rapid transfer of responsibility. And today, we can regard all trainee programs carried out at KHS to date as successful. Most of the employees who have started their professional careers at KHS in the past five years have developed their skills as equally comprehensively as well as profoundly. They are already working in positions that have a decisive influence on the future of KHS.

Dr. Robert Grefrath is responsible for Personnel Development at KHS.

In order to be able to offer talented university graduates direct entry into the company, we have developed both commercial and technical trainee programs. Through multi-level trainee phases, we give young top performers the opportunity for quick advancement to responsible positions. Meet our former trainee Dr. Jochen Ohrem and learn more.

„I was like a sponge constantly absorbing new things“

From postdoc to R&D manager in four years: The *Engineer4Future* trainee program was just what Dr. Jochen Ohrem was looking for.



With our KHS trainee programs, we offer university graduates and postdocs the opportunity to acquire valuable knowledge and practical experience - and with clear perspectives of being able to specifically apply this knowledge and experience later. Our clearly defined goal is to transfer exciting tasks and responsibilities to them upon completion and to have them remain in the company. Just how well this concept works is demonstrated by the career of Dr. Jochen Ohrem, who today is in charge of Research and Development at KHS.

Dr. Ohrem, how did your decision to take part in the Engineer4Future trainee program for postdocs at KHS come about?

During my doctoral studies, I had a clear idea of what my professional career should be like. I wanted to combine the many subjects that were part of my studies in a company. I then saw the job advertisement for the Engineer4Future trainee program for postdocs at KHS and it immediately appealed to me: It offers a supported, multi-faceted path from university research into industrial practice. The direction in which one develops can by all means come about and even change again during the course of the program. As an engineering company for the beverage industry KHS appeared to me as being an employer that would suit me perfectly: here, bioengineering is as much in demand as plant and process engineering as well as my major in process analysis in technical chemistry. That's why I immediately submitted my application and was invited to interesting job interviews that heightened my good feelings. The prospect of creative freedom which KHS offer me as well as the entire corporate culture and the company's international presence quickly convinced me to accept the offer. I began the trainee program in 2014. It took a total of 21 months and even exceeded my expectations. I learned so much during this time - I was like a sponge constantly absorbing new information.

What kind of information? How was the program structured?

I regularly attended seminars on soft skill subjects and project management together with the other trainees, as well as technical block training courses. A special aspect were the team projects, which involved working on a special project topic in small groups company-wide for over a year and a half. In our team, we developed a research promotion strategy to focus on cooperation and promotion of important research projects and to generate the greatest possible practical benefit for KHS. We coordinated on this closely, which has also sustainably improved cooperation between the various functional departments. At the same time, we were able to put methods that we had learned into practice such as the Scrum project management method.

Added to this was the daily work routine: I passed through eight different stations and learned something new every day. This included processing engineering for fillers, visiting installation sites in Germany and abroad and included the training department. An absolute highlight of my time as a trainee was my three-month stay in Brazil where I became familiar with an entirely different mentality. For example, employees often spend their free time with colleagues such as barbecuing together on the factory premises in the evening after work. Such activities are very conducive to cooperation among employees. I still have contact with my Brazilian counterparts today, and if anyone in my area has a question about the site, I'll set up the contacts.

Dr. Jochen Ohrem and Dr. Robert Grefrath met in the trainee program.

What main topics did you discover and focus on during the trainee program?

There are subject areas that I have repeatedly been involved in: from a methodological standpoint this is product development and, from a technical standpoint, process engineering, which can vary considerably for different machines and as well as for various locations. I was able to combine these two topics thanks to the trainee project on research promotion strategies. I've been intensively involved in determining how we can promote product development at KHS by having the state subsidize the research and acquiring support from well-known partners. As a result, we have gained solid cooperation partners and created a process with which new tenders can be monitored and responded to in defined processes. Thus, during the training period we initiated concrete research projects in which we had a plenty of creative freedom.

How did things progress for you?

KHS gave me the opportunity to be in charge of three of these research projects, and I was glad to have the chance. One year later, I also took over my own product development projects. And a year ago I was assigned an additional task as manager of Research and Development. The avenues and opportunities that have developed for me are very enriching and exciting.

What role does sustainability play in research and development and what is the significance of this subject area for you?

I personally consider this a very important subject with enormous potential. The particular challenge in the industry is to integrate sustainability into our products in such a way that our customers become interested. This is always the case when we find the intersection between sustainability and cost efficiency. This especially appeals to me. Energy conservation and lower CO_2 consumption play a major role in our research projects. Among other things, we have collected measurement data and made it processable, for example, so that we can obtain reliable figures on energy consumption. Based on figures of this kind, we can develop realistic alternative scenarios and, for example, compare the savings potential with the acquisition costs of a sustainable machine. My vision for the future would be that these considerations be positive and compelling for all involved.

Introduced: Dr. Jochen Ohrem

- Born 1981
- Studies in bioengineering majoring in microbiology and environmental engineering in Aachen
- Master's degree studies in plant and process engineering at the TU in Cologne
- Doctorate in technical chemistry majoring in process analysis at the University of Cologne
- Participation in Engineer-4Future trainee program for postdocs at KHS
- Project manager for research and development project at KHS
- Manager of Innovations/R&D Management at KHS

Occupational health and safety: Commitment with a success factor

For us, occupational health and safety means our responsibility for maintaining the well-being of all employees. Occupational health and safety is more than an obligation for KHS. We know that safety and health-conscious actions make a decisive contribution to the success of our company.

Physical well-being at work is a requirement of the German constitution, the Basic Law, and is firmly anchored in many statutes around the globe. Occupational safety and health protection are aimed at meeting this requirement. Measures such as risk assessments, including fire safety, building safety and security, manufacturing process and hazardous material management, are practical approaches that ensure the safety and health of people working for KHS worldwide. Occupational safety and health protection are more than just a legal obligation for KHS. For us, they are also instruments for achieving employee loyalty.

Our long-term goal is therefore not only to prevent accidents, but also to continuously bolster the health of our employees and their awareness of their own well-being. We show and prove to our employees every day how important they are to us. People who go to work with the awareness that their employer is doing everything it can to bring them home safe and sound every day enjoy working, remain productive in the long term, and have a relationship based on trust with *their* company.

Extensive package of measures

Our commitment to travel risk management is particularly innovative in this context: With travel risk management, we ensure that our employees are fully covered on business trips and receive advice and support as needed on site. We have expanded this service considerably in recent years: by providing full resources and complete information on business trips, risk assessments in the project offer and pre-project states, and effective crisis management in case of emergencies, we are able to ensure the safety of employees on the one hand while creating a sense of security among our traveling employees on the other. We involve our customers to some extent in the chain of measures to ensure safe completion of the project process. We are especially pleased to have been presented the Duty of Care Award in 2017.

With our *crisis management* and external *security audit*, we have developed important measures that guarantee the safety and health of our employees holistically when working on particularly demanding customer projects. We have installed personal emergency call systems to protect against hazards that may arise when employees work alone. We additionally provide our employees with individual prescription safety glasses. We have successfully completed all monitoring audits for ISO 14001, ISO 50001 and OHSAS 18001 standards. All KHS locations are SEDEX certified. By carrying out regular in-house communication campaigns on occupational safety, we sensitize and inform our employees continuously regarding this essentially important topic. We are currently planning to purchase an occupational safety software package to help us to bundle processes and to create holistic risk assessments. The company health management program has been revamped with cooperations and actions, among other things, to provide employees with a wide selection of health protection products.

Our customers also apply occupational safety measures

The fact that we are on the right track with our commitment is also confirmed by our customers, who attach great importance to sustainable safety concepts in their projects. Occupational safety and health are becoming increasingly relevant when it comes to ensuring the competitiveness of companies. A convincing performance in terms of work safety is not only recognized by customers, but also rewarded - when in doubt, they opt for companies that work safely. KHS has been benefiting from this for years. This approach is also reciprocal. We in turn expect from our customers that their and our employees work in a safe environment.

Heiko Stötzel, Manager HSSE (Health, Safety, Security, Environment) is pleased about the Duty of Care award.

Working across the generational divide: passing on knowledge for the future

Experience cannot be purchased. It is one of the most important commodities securing the future of our company and must be cultivated accordingly in the longest possible term.

At KHS people work together across the generations in order to achieve just that. In the light of various demographic factors companies and employees alike thus benefit equally from the different perspectives and experiences of both their younger and older colleagues.

KHS promotes structures and projects in which employees of different age groups specifically work together. Provided that there is a healthy age structure within the company, the generational factor is positively exploited in this way. Ideally, the workforce encompasses people at all stages in their careers from apprentices, trainees and graduates through a great number of experienced colleagues to those who are set to start their well-earned retirement a few years hence.

Learning from one another together

If knowledge is to be transferred within the company, it is essential that all age groups work together. This goes far beyond simply showing respect for one another at work. Intergenerational cooperation is not only fueled by an atmosphere of trust and mutual appreciation but also by a powerful fount of knowledge. While young employees often pass on their fresh and unconventional ways of looking at things and an in-depth understanding of new technologies to the older generation, older members of the workforce have an endless wealth of experience and knowledge which many younger colleagues have already profited from.

We form long-term relationships

We endeavor to keep our employees loyal to our company with an eye to the future. To this end, we offer them a long-term perspective. We present career paths which are tailored to the individual wishes and skills of our employees – from their joining the company to the end of their active working life. Creating perspectives, working together in a cross-generational team, having the chance to actively contribute and assuming responsibility early on in particular all encourage individuals to strongly identify with our company – a decisive factor prompting many employees to stay with us for many years.

Knowledge past and present

Intergenerational cooperation helps to keep expertise and experience gained over many decades and critical to our success and innovative spirit within the company. This is why we have created structures and processes which help us to secure our knowledge within the corporate group in the long term. In addition to the successfully applied methods of knowledge transfer the active and sustainable planning of employees' successors is also important, however. Here, we specifically foster talent and invest in the further development of our personnel, for example through specific successor planning. In doing so we ensure that valuable expertise is retained and permanently anchored in our company.

There is still a lot to do

In the future we will concentrate even more strongly on working across the generational divide between the KHS production sites in and outside Germany. By globally networking our employees we are building up an abundance of knowledge which can constantly grow.

Best practice: how Lothar Sevenich and Heiko Stötzel are securing the future down the generations

"So that knowledge and experience don't retire" – with this slogan Personnel Development is consciously supporting managerial staff in the transfer of knowledge between people leaving the company when they reach the age of retirement and their successors.

Thanks to the Transferwerk program, a method of knowledge transfer practiced by Salzgitter AG, we are able to permanently keep the valuable expertise of our future pensioners within the company. KHS' Personnel Development Department takes on the role of consultant and facilitator here. The first step is to process and document the knowledge harbored by the employee soon to leave the company. In the second step this documented knowledge is gradually transferred to that person's successor. We would like to demonstrate just how this initially rather abstract process works through the example of our employees Lothar Sevenich and Heiko Stötzel.

Creating conditions for the transfer of knowledge in good time

Lothar Sevenich has worked for KHS since 1989 and been head of the Occupational Health and Safety and Environmental Management Department for 21 years. On September 30, 2019, the 65-year-old will start his well-earned retirement. Heiko Stötzel, 42 years of age, is to succeed Lothar Sevenich in his post. He has been his deputy since 2016. "The knowledge transfer process began with preliminary talks, in which we were familiarized with the overall procedure and agreed on specific terms," reports Heiko Stötzel. "During the above it became clear that through our many years of working together in occupational health and safety we'd already created excellent conditions for the transfer of knowledge."

Implicit knowledge must also be made accessible

"At the next stage in the process a facilitator from Personnel Development presented a knowledge structure chart with the help of what's known as a job map," Lothar Sevenich explains. "In it important experiences and implicit knowledge from my day-to-day-work of the last 15 years were logged in a mind map and documented in detail with the help of specific questions and suggestions. I wouldn't have thought that so many topics had to be transferred!" Heiko Stötzel emphasizes, "The job map is extremely practical and valuable to me. Right from the start it's given me a good, additional overview of my future field of work plus a number of useful tips – for instance, all of the relevant contacts at KHS both in house and externally."

Everything is important – from content through transfer method to schedule

On the basis of the job map a detailed transfer plan is drawn up for all identified areas of knowledge which contains everything crucial to the further transfer of expertise – from a list of contents through a selection of suitable transfer methods to a fixed schedule. In the case of Lothar Sevenich and Heiko Stötzel the following fields for transferal were specified: environmental management, the company suggestions scheme, occupational health and safety, company health management and issues of leadership. Since then the two have worked continuously on their transfer plan, checking the status of their transfer of knowledge at regular intervals in mentored feedback meetings. In this way Lothar Sevenich's expertise and experience is sustainably secured for and used and further developed by KHS in the long term.

Expertise used to continuous effect within the company

"I'm pleased that in this way my expertise continues to be available to the company," says Lothar Sevenich. Heiko Stötzel also finds the transfer of knowledge very positive. "The transferal of knowledge gives me the good feeling that I won't forget anything in the future and won't find myself facing some unpleasant surprises! The extras I've learned from Lothar during our handover of expertise gives me a sense of security and provides me with a great basis for new ideas of my own."

The method of knowledge transfer described above is not only suitable for successor processes when people retire but also for handovers necessitated by an employee changing department or leaving the company.

Employee loyalty: without them, nothing happens

Long-term success works only in conjunction with our employees. We want to shape the future with them.

KHS pursues a far-sighted personnel development strategy whose goal is to employ not only highly qualified but also motivated and satisfied employees. A very low turnover rate of less than two percent for many years is proof of our successful work in this area.

Fair cooperation and long-term employment relationships are important to us and enable us to create real prospects for the future. We communicate transparently and explicitly and indicate to each employee his or her individual path to a future with KHS. We plan careers individually always with the focus on the abilities of our employees.

We promote talent in every stage of development.

Employees at all levels of the hierarchy benefit from further education measures that are tailored specifically to the needs of the employee. We not only train employees, but also offer trainee programs in various fields, for example the *Softwerker4Future* IT program praised by the German government as a best practice example. We further the development of our employees with management responsibilities through *Fit4Leadership*, a specially created management development program.

A practiced work-life balance offer also ensures a high level of satisfaction and work motivation.

Our customers expect reliable and efficient filling and packaging solutions from us. KHS can only live up to this claim by giving its employees the best possible support in their daily work enabling them to acquire their personal work-life balance through flexible working time models. In addition to flexitime and trust-based working hours models, we offer many employees the opportunity to temporarily do office work at home.

Our employees additionally find support in our comprehensive, high-impact health management program. For example, sustainability days are held at our sites, which in addition to the subject of health, are also dedicated to the topics of occupational safety, environmental and energy management. Regular campaigns, such as Cycling to work promote activities to keep our employees in shape and at the same time support charitable organizations.

In order to maintain our high level of efficiency, we regularly survey our employees and check their degree of satisfaction and their general working conditions. Based on the feedback, we derive appropriate measures to best support our employees.

Knowledge as a factor of production

As an operational resource, knowledge in a company becomes more and more a decisive production factor. In order to retain and further develop this knowledge in our company we use a special method that allows the know-how of employees who leave the company group to remain active. The CAMPUS knowledge organization motivates our employees to share their knowledge with others with the help of convenient software applications.

Demonstrating equal opportunity

The direction a company takes depends on the values on which it is oriented. We stand up for equal opportunity worldwide. We demand and promote equal opportunity for all people, regardless of sex, age, or ethnic origin. Examples include campaigns against bullying at work, mentoring programs, and career promotion measures for women.

Ecological awareness

Resource efficiency and sustainable production motivate us to constantly improve our range of products and services.

Assuming ecological responsibility

Set goals, assess the results, use potential for improvement, fully exploit opportunities, practice self-criticism: in our opinion, all this and much more means assuming responsibility.

For us as an internationally successful company with a 150-year history, it is a matter of course to analyze ecological aspects in detail and also to face tasks the fulfillment of which is still a challenge. In addition to the current key figures for our German locations for the 2017/2018 reporting period, this chapter gives you an insight into the goals we have already achieved and an outlook of our demands for the future. Our stated goal is to further reduce CO_2 emissions in conjunction with concrete facts and figures for the year 2025.

We will show you how we are already making targeted investments our locations to support and promote the reduction of emissions both on a large and small scale. Measures and projects that focus on resource efficiency such as relocation of the pickling shop and the new concepts in the manufacturing process, which we will describe in detail, will contribute to ensuring that our locations remain competitive and ready for the future in the long term. They enable our sites to cope with the growing demands of audits and other certification processes.

» In order to improve our carbon footprint, we rely primarily on technical innovations that allow us to achieve significant efficiency effects - ranging from new LED lighting to intelligent building equipment. We also specifically use CO_2-neutral green electricity at all locations in Germany. Of particular importance to us, however, is the sensitization of our employees: the ecological awareness and concrete sustainability concepts of our employees make our company what it is today.

Ralf Pentinghaus
Director Facility Management
KHS GmbH

Key figures for ecological awareness

	2017	2018
Electricity consumption per € million turnover [MWh/€m turnover]		
Group[1]	23.0	23.1
Bad Kreuznach[2]	29.2	31.4
Dortmund[3]	25.6	24.7
Hamburg	13.9	13.9
Kleve	25.1	26.1
Worms	20.8	21.5

	2017	2018
Gas consumption per € million turnover [MWh/€m turnover)		
Group[1]	30.4	30.5
Bad Kreuznach	65.2	73.4
Dortmund	19.1	17.8
Hamburg	13.7	10.0
Kleve[5]	23.9	28.9
Worms	79.5	86.7

[1] For the KHS Group the total consumption of all German plants is divided by the plants' turnover and converted into the relevant unit.
[2] Lighting replaced with LED and replacement of the central compressed air supply for production: 90,480 kWh per year
[3] Savings from LED lighting: 364,840 kWh per year
[5] Higher consumption resulting from expansion of production area

	2017	2018
Heat consumption per heating day and temperature difference in °C [kWh/d/ΔT]		
Group[1]	1,613.8	1,645.0
Bad Kreuznach	2,999.0	3,262.9
Dortmund	3,090.2	2,999.9
Hamburg	743.9	524.3
Kleve	441.8	532.5
Worms	1,164.3	1,302.7

	2017	2018
Water consumption per €m turnover [m³/€m turnover]		
Group[1]	67.0	61.4
Bad Kreuznach	181.1	145.6
Dortmund	53.0	50.0
Hamburg	24.8	27.6[4]
Kleve	34.2	34.5
Worms[6]	48.4	81.7

[1] For the KHS Group the total consumption of all German plants is divided by the plants' turnover and converted into the relevant unit.

[4] Commissioning of the new block solutions and the related bottling tests and expansion of the production area

[6] Fire water storage pond was filled with about 1,500 m³ of water.

	2017	2018
Diesel consumption per 100 km [liters/100 km]		
Group[1]	5.0	5.3
Bad Kreuznach	-	-
Dortmund	-	-
Hamburg	-	-
Kleve	-	-
Worms	-	-

	2017	2018
Generated waste per €m turnover [t/€m turnover]		
Group[1]	5.4	5.1
Bad Kreuznach	5.1	6.4
Dortmund	6.0	5.3
Hamburg	2.5	2.5
Kleve	7.9	6.9
Worms	9.4	7.5

[1] For the KHS Group the total consumption of all German plants is divided by the plants' turnover and converted into the relevant unit.

	2017	2018
CO_2 emissions per €m turnover [t/€m turnover]		
Group[1]	9.0	9.7
Bad Kreuznach	13.1	14.8
Dortmund	6.1	5.9
Hamburg	2.7	2.0
Kleve	4.8	5.8
Worms	16.0	17.4

	2017	2018
Total consumption per €m turnover [MWh/€m][7]		
Group[1]	65.7	68.5
Bad Kreuznach	94.4	104.8
Dortmund	53.3	51.2
Hamburg	27.6	23.9
Kleve	49.1	55.0
Worms	100.3	108.2

[1] For the KHS Group the total consumption of all German plants is divided by the plants' turnover and converted into the relevant unit.

[7] Total consumption = power consumption + heating requirement.

Site performance: Results, goals, and challenges

KHS consistently treads the path of sustainable production and processes. We were able to build significantly on some of the site results from the past reporting period, while others still have potential. One thing is certain: binding goals and guidelines are important.

Those who formulate clear goals can and must stand up to comparison. For this reason, it is particularly important for us as a company as a whole as well as for our individual locations, to set target figures for more sustainable production and processes to which we are committed. Not in all instances have we already achieved our goals or will we reach them soon as hoped for. We must take an honest look at the reasons and establish conditions under which we can better implement our projects. In other areas we were able to achieve very good results, on which we want to continually build. One thing is clear: when we create and achieve binding site goals, we form the cornerstones of strong entrepreneurial activity with a clear future orientation.

The reduction of CO_2 was our declared goal in the years 2016/2017 after beginning complete conversion of all German sites to green electricity in 2016. This measure alone has lastingly reduced yearly CO_2 emissions and saved a total of 22,620 metric tons of CO_2*. This is the absolute figure for all five locations in Germany. Nevertheless, we are aware that the status quo initially involves selective best-practice examples that illustrate our endeavors. Fact is, we are committed to significantly more CO_2 reduction - and still have to work to achieve that objective on a large scale.

Nevertheless, many of our large and small structural investments, projects, and targets bear witness to the priority that CO_2 reductions have for us. In addition to the directly measurable results, in countless cases we achieve indirect CO_2 savings - for example, by avoiding processes, using fewer materials, and achieving energy efficiency. Many examples can be found in our product overview in chapter Saving resources.

We have achieved a significant reduction in power consumption through measures such as the replacing old lighting with LED lights and by introducing a building management system at all locations. This saves us another 545,000 kWh per year.

* The calculation is based on the following figures from the Federal Environmental Agency:
2016: 523 g/kWh
2017: 486 g/kWh
2018: 474 g/kWh
Source: German Federal Environmental Agency

Ecology – Our targets for 2025

Energy consumption within the KHS Group	Status quo[1]	Goal for 2025[2]
Power consumption [kWh]	-12.64 %	-8.9 %
Heating requirement [kWh]	-3.54 %	-4.9 %
Water consumption [cubic meters]	-2.86 %	+1.1 %[3]

[1] As of 2018. Percentages are based on the base year 2012

[2] Percentages are based on the base year 2018

[3] Slight increase in absolute values due to the rising number of commissioned lines/machines. The aim continues to be to keep water consumption down to a minimum in individual cases.

KHS India as an international prime example

Our next important goal is to apply the corporate sustainability goals that we have successfully implemented for the KHS Group to our international locations as well. But even if this is still an open issue, we have already achieved a clear international performance. The example of India demonstrates how sound environmental protection can be established in other countries as well. This country has even become a pioneer in the use of renewable energy. Thanks to an extensive sustainability program, KHS India has excellent sustainability credentials in many aspects: from switching to "green" energy through waste prevention and recycling programs, automated power savings in conference rooms, LED lighting, up to and including the social aspects of sustainability in terms of employee support and workplace organization. In 2018, KHS India received the Times Network Strategy Award for its commitment, and was awarded gold by the Quality Circle Forum of India (QCFI) for its 5S method of workplace organization (an instrument to keep workplaces and their surroundings safe, clean, and tidy). The next big objective has already been formulated: by 2026, this site intends to become certified as a Green Factory Building by the Indian Green Building Council.

Detailed information on the sustainability commitment of KHS India can be found in the our customer magazine KHS competence.

Standardization is particularly important to us internationally: we work according to ISO standards and other key certifications at all of our sites. A detailed description can be found in chapter Site-based audits.

Handling structural investments sustainably

Continuous investments are essential prerequisites for the competitive and future viability of a company. For this reason, we consider structural investments to be extremely important and we pay particular attention to this aspect. Here, we present four projects as examples.

1. Innopas SX tunnel pasteurizer lean manufacturing

Where:
Dortmund, Germany

When:
concluded in 2018, approved in July 2016

How much:
€918,000 total investment

What:
We invested in the Innopas SX tunnel pasteurizer to increase productivity in Dortmund. The goal in particular was through flow production to achieve shorter throughput times for customers. For this, we relied on fixed cycles, optimized material placement at the workplace, cycle-assisted pre-assembly and parallel assembly of components. This has made it possible to improve adherence to time schedules and achieve better working conditions, for example, by optimizing ergonomics at the assembly workstations for employees. This additionally avoided wasting materials and squandering staff resources by shortening non-value adding activities such as waiting, searching, and unpacking. Thanks to the exact production planning, ad-hoc measures leading to additional transport of materials and duplication of work are not necessary.
The investment in Lean Manufacturing Innopas SX is part of KHS' manufacturing strategy of "resource-efficient production of standardized products". It has already been implemented for many other products at various sites.

2. Mold production, India

Where:
Ahmedabad, India

When:
concluded in 2018, approved in April 2016

How much:
€1,574,000 total investment

What:
By establishing new blow molding production facilities including laboratory capacities, we have strengthened our PET competence in growth markets in India and Bangladesh. The aim was to increase customer proximity and local customer support to ensure on-time delivery and to achieve shorter throughput times. In addition, the logistics costs incurred in intercontinental transports can be reduced as well as the related CO_2 burden. Instead, we have strengthened our international know-how and our local manufacturing expertise. This investment has enabled the India site to continue its qualitative and quantitative growth.

3. KHS Kisters Academy Kleve

Where:
Kleve, Germany

When:
concluded in 2018, approved in January 2017

How much:
€2,531,000 total investment

What:
We have set up a customer and employee training center in Kleve in cooperation with the Kisters Academy. The site is located near the production area for our high performance packing systems and provides additional workshops and training opportunities for customers. The optimization of the education and training facilities in Kleve offers employees numerous opportunities - including utilization of the training options offered by the Kisters Foundation. It is our conviction that it is important to contribute to sustainability in terms of knowledge transfer and Personnel development by imparting high-quality knowledge.

4. Surface treatment subproject: pickling shop relocation

Where:
Bad Kreuznach, Germany

When:
concluded in 2019, approved in March 2015

How much:
€3,273,000 total investment, €1,922,000 of which for construction of new facilities

What:
The structural and site investment project "Lean manufacturing, relocation and expansion of the pickling shop" is presented in detail here.

Lean manufacturing: new pickling shop for production and process efficiency

Our Structural Investment project as an example. "Relocation of the pickling shop" in Bad Kreuznach clearly demonstrates how important sustainable and efficient production is for KHS.

The large-scale investment project "relocation of the pickling shop" carried out in Bad Kreuznach has come to a successful conclusion after more than four years of intensive work. The entire pickling plant has been relocated and adapted to meet future requirements initiated and supervised by Jürgen Boos, cross-divisional Industrial Engineering Project Engineer. The dip pickling and pickling paste processing facilities were divided into two different areas and connected by underground by pipelines so that they can be operated with only one wastewater neutralization system. The pipelines comply with the latest state of the art: they are double-walled and are equipped with automatic leakage monitoring. In addition, KHS has invested in a new gas scrubber to clean and filter the air in both areas. Dividing the project into two areas shortens the throughput time, which in turn has a positive impact on the carbon footprint.

Pickling
KHS treats stainless steel surfaces by dip pickling or applying a pickling paste. Both are wet processes that use nitric acid or hydrofluoric acid mixtures to maintain the corrosion resistance of the stainless steel. Only properly pickled surfaces are corrosion-resistant and comparable to the base metal since oxides or deposits resulting from welding, annealing, and rolling processes damage the passive layer and thus lead to corrosion.

Dip pickling
Dipping pickling is usually used on smaller components such as pipes and involves dipping the entire component in the pickling liquid. The pickling bath mixture has the consistency of water. Since small components have small surfaces, there is little carryover of the pickling medium during the pickling process.

Pickling paste
Pickling paste is used for very large components. The consistency is gel-like, which makes it possible to brush the paste on areas such as welding seams. The gel adheres to the applied area without running. There is also very little carryover due to the relatively small area to be pickled. The amount of hazardous substance mixture is reduced which and contributes toward protecting the environment.

Special floor covering, neutral wastewater

We have added on a new part of a building to accommodate the necessary equipment such as gas scrubbers, blowers, and buffer tanks for wastewater. After an extensive planning phase , we have equipped all treatment areas in accordance with the Water Resources Act with a special plastic floor covering comprised of PE boards all with welded joints and seams to prevent pickling residue from entering the ground. In order to ensure proper wastewater treatment, we have installed a new, two-stage (post) neutralization system.

In order to save energy and lower heating costs, new fast opening and closing shop doors were installed that can be operated remotely from industrial forklifts. The doors thus remain open only for a minimum amount of time when outdoor temperatures are low. Another power-saving measure is brightness-controlled LED lighting. The light output and thus the power consumption is automatically adjusted according to the amount of available daylight.

With the “relocation of the pickling shop” project we underline our holistic expertise in conserving resources in the production process - and additionally apply all legal ecological standards and measures. In this way, we have created a sustainable, future-oriented production area.

More about the idea and project manager Jürgen Boos

„Go through life with your eyes open“

Even as a grease monkey working at his workbench, he combined the best tricks of the trade from his colleagues with his own to achieve highly efficient results. As a project manager for cross-divisional Industrial Engineering, he has recently been responsible for the sustainable large-scale project “relocation of the pickling shop” combining the best ideas of his team.

“You have to listen to employees that have ideas,” says Jürgen Boos. And adds full of conviction: “If the ideas are good, they should of course be pursued - and the name the source of idea clearly stated.” Exactly following this principle, he has recently successfully managed and implemented the large-scale “relocation of the pickling shop” project. Today’s cross-divisional Industrial Engineering project manager joined KHS twenty-one years ago and in his various positions and activities has always emphasized making a convincing “bigger whole” from many small steps. He began his career in a traditional way at the workbench: “Even back then, I was always looking to the left and to the right and adopted the best tricks of the trade from my colleagues,” he says. “Using these tricks combined with my own ideas, I was then able to assemble components very efficiently.” In this way, he quickly became a group supervisor and specialized in optimization processes. “It simply interested me from the beginning how to combine the best techniques and ideas in such a way to make something efficient,” says Boos. He has pursued this approach throughout his time working at KHS. It is also important to have a high level of commitment and to gain a well-founded overview. “My basic principle is to always go to where things are happening. Contact with colleagues is essential if you want to understand the relationships.”

Taking ideas seriously, gathering the advantages and drawbacks

This is how he has also successfully implemented the pickling shop relocation project in Bad Kreuznach. He spent well over three years in the planning phase and attached great importance to the opinions of his team members. For example, some colleagues came up with the idea of covering the floor of one section of the newly constructed picking shop with plastic floor covering. He collected the advantages and disadvantages, let the both the critics and the proponents have their say and then weighed the results. Ultimately it became clear that the best option was to actually use PE boards - and thus the idea was successfully implemented. "Every idea is basically good," says Boos out of conviction. "We of course want to get the job done in a joint effort and pull together. There's great deal of momentum when the relationship of trust is good and you can express new ideas, even if they aren't fully developed yet." It's sometimes challenging to sit in the what is referred to as a 'sandwich' position, he says: "I have to look both 'up' towards the people in charge of the site and 'down' towards my project colleagues and sometimes have to mediate between the two." Ultimately, however, he benefits from the great amount of trust he has from both sides.

Focus on sustainability aspects

Relocation of the pickling shop was basically completely driven based on analyses of the production facilities and independent of external requirements. "The facilities were simply no longer up-to-date," explains the project manager. The result is a highly efficient revision of the process, the shop, the materials - and always with the aspect of sustainability in mind. The new LED lamps, for example, are not only compelling because they are automatically controlled by daylight and therefore use less energy - but also because they cannot be corroded by the pickling gases and thus conserve on resources as well.

"When requesting quotes, we always asked about energy requirements because it is important to us to pay particular attention to the environmental friendliness aspect," says Boos. Personally, he has been become increasingly sensitized to the subject of sustainability for many years. Years ago, the 'Energy and the Environment' initiative established by KHS' Building Management gave him a thought-provoking impulse. "This campaign has really brought about a noticeable change in me," he says. "Since then, I've been watching for little things like switching off the lights in my office when I leave, or closing the door when the heat is on. I have internalized this attitude in the meantime and convey this attitude clearly to colleagues." It is also important to pay close attention to the sustainability principles of suppliers and to inquire about the resource efficiency of projects even during the offer phase.

Motivation through human relations

There are three aspects that continuously renew Jürgen Boos motivation for each project: social responsibility - which includes not only the important aspect of sustainability but also close contact with neighbors, for example - the added value for the company, and the enthusiasm and involvement of its colleagues. "Ultimately, it is always a matter of going through life with your eyes open. It is so very important to listen to the ideas of colleagues and then ask yourself how can these ideas be implemented most effectively in the interests of the company. I always try to bake a delicious 'cake' using the best ideas as 'ingredients'. I consider it my job to provide a future-oriented workplace!"

With this attitude, Boos lives up to exactly those principles that are important at KHS in terms of Personnel development and Employee loyalty. Teamwork at eye level, motivation, and appreciation are the cornerstones on which sustainable success is based - for both individual projects as well as for the entire company.

Certified sustainability: certifications and awards

The fact that our efforts to achieve sustainability are not just goodwill, but tested in daily practice is evidenced by numerous certifications and awards in the form of site-specific audits that KHS has received for its locations in Germany and abroad.

This topic is also becoming increasingly important to our key customers. The focus is more and more on subject areas such as supply chain, quality assurance, labor and human rights. With these audits, we pursue our goal of reducing emissions, improving working conditions and supplying reliable machinery. KHS undergoes the following audits on a regular basis:

Certifications

ISO 9001: Quality management

KHS has been ISO 9001 certified since 1995. This certifies compliance with the quality management standard, which is the most widespread standard nationally and internationally. The most recent certifications were received in 2017 for our sites in Dortmund, Bad Kreuznach, Worms, Hamburg, Kleve, Ahmedabad in India, Waukesha and Sarasota in the USA, Zinacantepec in Mexico and São Paolo in Brazil.

Inga Lindstaedt-Meister and Joachim Peinemann work together on global quality management.

BS OHSAS 18001: Occupational health and safety management

The minimum requirements for best practices in occupational health and safety management have been certified by the BS OHSAS 18001 (Occupational Health and Safety Assessment Series) since 2011. Among other things, this helps to identify risks in advance and implement effective measures to protect employees and to improve prevention of failures and disruptions during operation. BS OHSAS 18001 is widely implemented in more than eighty countries, making it one of the best-known occupational health and safety management standards in the world. The certificate was last awarded to our sites in Dortmund, Bad Kreuznach, Worms, Hamburg and Kleve in 2017. In 2019, we intend to achieve certification according to the new ISO standard 45001 as a replacement for OHSAS 18001.

SEDEX: Transparency and safety according to SMETA

Since 2013, TÜV-Rheinland Cert GmbH has carried out audits in accordance with the increasingly significant SEDEX (SMETA4Pillar audit). The issue of ethical and social sustainability has been become increasingly important to many of our key customers in recent years and they also require the SEDEX certificate from their business partners. The related SEDEX (Supplier Ethical Data Exchange) online platform allows its members to provide customers and business partners with detailed information on social and ethical processes to increase transparency and safety throughout the supply chain. Subject areas such as working conditions, occupational safety and hygiene and environmental management are evaluated according to the SMETA (Sedex Members' Ethical Trade Audit) audit procedure. The most recent certifications were awarded in 2019 to all of our sites in Germany and in 2016 to all of our locations abroad with the exception of Suzhou in China.

ISO 50001: Energy management

Optimizing and defining energy savings as management goals are two of the prerequisites for successful certification in accordance with ISO 50001. This worldwide standard defines requirements for an energy management system. KHS has been receiving this certificate since 2014. Most recently, all of our sites in Germany received the certificate in 2017; our site in Ahmedabad, India in 2016.

ISO 14001: Environment

The ISO 14001 standard is the globally accepted and applied standard for environmental management systems and regulates the planning, execution, control and improvement of these systems. KHS has been receiving this certificate since 2014. The most recent certificates were issued in 2017 to all sites in Germany as well as our location in Ahmedabad, India.

Awards / ratings

EcoVadis: Silver medal for CSR

KHS has been receiving annual awards from EcoVadis since 2015 and again worldwide in 2018 with a silver medal for all sites. This independent rating tool assesses Corporate Social Responsibility (CSR) in the fields of environment, labor law and human rights, ethics and sustainable procurement.

ÖKOPROFIT

We have been receiving this certificate since 2011. The modular consulting and qualification program ÖKOPROFIT stands for "Ökologisches Projekt für Integrierte Umwelt-Technik" [Ecological Project for Integrated Environmental Technology] and is a cooperation project between communities and local businesses. The aim of this program is to reduce operating costs while sustainably conserving on natural resources such as water and power. The last certificates were presented to the Hamburg site in 2014, Bad Kreuznach in 2013 and Dortmund in 2012.

Green power throughout Germany

KHS has been sourcing electricity from renewable sources in Germany since 2016. We received the green power certificate for all our domestic sites again in 2018.

Self-regulation in the interest of sustainability

In addition to external audits, KHS also conducts in-house audits at its sites in Germany in the areas of quality, occupational safety, environmental protection and energy management. They additionally support our efforts to transparently introduce our production process steps to our customers.

Economic responsibility

On track to reaching our goal

Meeting economic responsibility

Our core competence as a system provider lies in the holistic consulting, design and development of economical filling and packaging systems where the packaging plays a key role in the interaction of all components.

In the area of plastic containers and secondary packaging, we offer numerous approaches for achieving concrete material savings and even avoiding packaging all together. They have a direct impact on the entire production process with regard to long-term reduction of CO_2 emissions.

This chapter provides information on how KHS has pushed for resource conservation in the development of new products and further development of existing products in 2017 and 2018, exemplifies significant milestones from the reporting period and takes a look behind the scenes with a personal "home story" that tells the story of our film-free Nature MultiPack™ system. With the subject areas transport and logistics as well as research and development, we will also be demonstrating how these topics contribute towards additional emission savings through the interaction of our systems.

Our primary goal at all levels: resource conservation

Whether in the design, production, transport or commissioning of our filling and packaging solutions, no matter what requirements you place on us as an expert in container and packaging solutions: for us, as one of the leading developers of innovative solutions in our branch of industry, resource conservation is an important goal in every (further) development.

Our core competence involves developing product and service solutions for our customers that innovatively combine quality requirements, individual customer requirements and sustainability goals. At the same time, the various aspects of a high-performance offer are mutually dependent: packaging, machine and service products are mutually influencing; their further development leads to the next development steps. This means that we are able to offer conversions and upgrades for a great number of existing machines in the short-term so that they can be upgraded technically, economically and ecologically. This way, we provide our customers support so that in the long term they can work with a reliable and cutting-edge filling and packaging systems. Our sales and service locations in more than fifty countries around the world support this claim, ensuring that the creation of value over the life cycle of the system continues as expected - or even increases - while minimizing the consumption of resources and maximizing system efficiency.

One of the most important goals in the development of innovative filling and packaging systems is the long-term reduction of CO_2 consumption from two different standpoints: in the manufacturing processes of our customers as well as all aspects of the packaging they choose for their product range. To achieve this goal, numerous aspects have to be taken into account which KHS has actively addressed in recent years. This has resulted in the launch of a large number of innovative new and further developments to the market in 2017 and 2018 presented below.

Pet Bottles

5-gram lightweight presented to the market

Our expertise in lightweight containers is defined by sophisticated technology and not only ensures that our customers save considerable costs, but sustainably improve their ecobalance. This was how the concept of weight optimization of the 100 bottle factor came into being, for example. We presented this concept at 2017 drinktec. Based on this concept, we have further reduced the weight of a 0.5-liter PET bottle for still water to only 5 grams (without the cap). We saved 2.2 grams of weight versus the 7.2 grams of the 0.5-liter PET bottle generally available on the market. The CO_2 equivalent alone is approximately 30% higher than the other bottle type.

rPET bottle made of 100% recycled PET

For our customer share, we developed the first 0.5-liter and 1.0-liter bottles made entirely of recycled PET, which, introduced in September 2018, saves a CO_2 equivalent of about 40% versus comparable bottles made of virgin PET. Using 100% recycled materials for PET bottles is a real innovation. share is the first German company to launch a bottle to the market made of 100% rPET and thereby sets a good example by paving the way to a complete packaging cycle. Henkel also followed up in 2018 and now produces all its PET bottles from recycled PET.

FreshSafe-PET®: International breakthrough of the barrier solution

Take the best properties of PET and glass and combine them into one of the most sustainable product developments in the industry: FreshSafe-PET®. An ultra-thin protective layer of silicon oxide (SiOx) - chemically pure glass - applied to the inner walls of the PET container forms an effective barrier to protect and ensure the shelf life of the product. The lighter weight versus the glass bottle offers a much improved carbon footprint and extends the product shelf life by up to ten times thereby avoiding environmentally harmful food waste.

A really unique selling point is that FreshSafe PET® bottles are 100% recyclable. This feature is in keeping with the spirit of the times when society is raising the question of how plastic waste can be avoided in favor of a sustainable circular economy. FreshSafe-PET® solves this dilemma in an intelligent way: it completely replaces the otherwise necessary additives needed to achieve such high product protection.

Block system for efficient production

In 2017, we made a major contribution to greater energy efficiency in production by offering options for combining our customers' machinery to form a blocked system. The InnoPET TriBlock and InnoPET FreshSafe TriBlock block systems have been successfully introduced to the market.

The InnoPET Blomax Series V stretch blow molding system uses up to 40% less energy

In 2018, we significantly enhanced our successful high-performance stretch blow molder. Depending on heater version our customers choose, the Series V InnoPET Blomax is able to reduce the energy consumption by up to 40%. This also results in a corresponding reduction in CO_2 emissions depending on the energy mix used.

Retrofitting the stretch blow molder heater to state of the art

We have been offering our customers a service for upgrading their heaters to the state of the art of the new InnoPET Blomax Series V stretch blow molder since 2018 to enable them to heat preforms in accordance with current standards. Depending on the heater version and on the energy mix used, energy savings of up to 40% are possible in addition to lower CO_2 emissions.

Cans

Innofill Can C for smaller breweries

In 2017, we customized our can filler to the requirements of small and medium-sized breweries. A positive side effect: with the Innofill Can C we were able to reduce CO_2 emissions by up to 30% - with the same oxygen pickup - compared to the competition.

Innopas SX: Thermal energy-saving pasteurizer

We launched the new Pasteur Innopas SX to the market in 2017. It is hallmarked by its ability to offer significant heat savings while delivering process optimization that results in improved overall product quality.

Innopack TLM block system reduces energy consumption

With the Innopack TLM block system, we included a very flexible packaging system in our product portfolio in 2017, which can process a wide variety of different types of secondary packaging. By eliminating the need for the shrink tunnel of the SP packer, this system conserves resources and decreases the energy consumption by about 70% in addition to generating less CO_2 depending on the energy mix used.

Film-free Nature MultiPack™ convinces Carlsberg

One of the most sustainable innovations in secondary packaging is based on our principle of "thinking outside the box": creative and unusual ideas and approaches have a permanent place at KHS. This is how the new Nature MultiPack™ came into being. It is a pack that holds PET bottles or cans together solely by dots of adhesive and requires no film wrapper of any kind.

In 2018, we acquired a key customer in the beverage can sector - Danish brewer Carlsberg. Since Calsberg also publicly advertises its firm belief in the merits of resource-saving innovations, Nature MultiPackTM is enjoying considerable popularity and is increasing its degree of familiarity enormously. Compared to ordinary six packs and film-wrapped packs, this innovation with adhesive dots saves up to 79% on CO_2 emissions.

Glass

Innofill Glass DPG ECO reduces CO_2 and energy consumption

In 2018, we further developed our proven filling process. As a result, we can now offer our customers significant CO_2 savings of up to 50% in the filling process - coupled with maximum technological quality - with the Innofill Glass DPG ECO. In addition, we have achieved additional 20% savings in electrical power required for vacuum generation.

Innopas SX: Thermal energy-saving pasteurizer

We launched the new Pasteur Innopas SX to the market in 2017. It is hallmarked by its ability to offer significant heat savings while delivering process optimization that results in improved overall product quality.

Compact and efficient: Innoket Roland 40

Great success in a small format: A compact version of our Innoket Roland labeling system for small and medium-sized breweries has also been available since 2017. A resource and energy-conserving as well as space-saving system for customers.

Innopack TLM block system reduces energy consumption

With the Innopack TLM block system, we included a very flexible packaging system in our product portfolio in 2017, which can process a wide variety of different types of secondary packaging. By eliminating the need for the shrink tunnel of the SP packer, this system conserves resources and decreases the energy consumption by about 70% in addition to generating less CO_2 depending on the energy mix used.

Service for optimized glass bottle filling

Our glass bottle filling systems can be optimized significantly with the ECO vacuum pump and the camera-controlled OPTICAM inspection system. The ECO vacuum pump uses less water and decreases water consumption by up to 95%. Thanks to these savings and the lower costs of supplying raw water, for example, or the subsequent water treatment process, we also indirectly achieve a reduction in CO_2 emissions. The OPTICAM camera system ensures significantly lower product losses and thus also indirectly for more resource and CO_2 efficiency.

Keg

Innokeg Transversal: many options within a small footprint

In 2017, we successfully introduced our extendable keg system for all types of treatment in the washing and racking processes. By using the new IE4 generation of electric motors in the conveyors we have reduced the power consumption even further. In addition, the machine uses water twice by utilizing the rinse water as mixed water for pre-washing and thus saves on valuable resources.

Media valves for less maintenance

Valves for controlling cleaning media for keg treatment that have been available to our customers since 2018, reduce maintenance costs significantly and thereby increase the system availability.

Upgrade for product-specific filling

With our software-controlled, product-specific Direct Flow Control (DFC) filling system, our service offers customers precise and gentle racking to meet every requirement. This upgrade system, which has been successfully implemented for decades, uses up to 40% less CO_2 by reducing the pressurization pressure prior to the racking process.

„One evening while watching television I suddenly came up with the idea of adhesive dots“

He has changed the secondary packaging market by experimenting himself: Christopher Stuhlmann successfully dealt with the question of how containers can be packed differently than in plastic film. The resulting Nature MultiPack (NMP) is one of the most sustainable solutions ever for packs.

Something special must be happening if you spontaneously to go to the nearest hardware store to buy various adhesives then get a hold some different types of container (cans, PET bottles) and finally fiddle around with them at home trying to stick them together intelligently some way or another. And this is exactly what happened when Christopher Stuhlmann, then head of KHS' Packaging Technology Product Center came up with the idea for trend-setting, environmentally friendly packaging in the summer of 2011.

This was preceded by a visit to interpack, where he and his colleagues watched the competition as they made a media-attractive presentation of a new packaging tape designed to reduce packaging materials significantly. "My boss just asked: 'What's our answer to that?", said the 51-year-old mechanical engineer. And from that point on, evidently began to give it some serious thought - consciously, for example, while talking with customers and partners and sometimes unconsciously as during that eventful evening at home.

He had just made himself comfortable in front of the television after arriving home from work when "The idea with the glue dots suddenly occurred to me," says Christopher Stuhlmann. How about connecting containers together for the beverage, food and non-food industries with adhesive so that they stick together without any additional materials but can be easily pulled apart again without effort?

Convincing short video from the living room

"At the time I was actually inspired by a conversation I had with Mr Göring, a manager of one of our good customers, who jokingly said that the best way would be to invent a kind of 'air hook' to connect the bottles," recalls Christopher Stuhlmann. This word eventually gave him the idea of small dabs of glue using almost as little material as air. "I then went to the hardware store and got all the adhesive I could find," says the current director of the Line Product Division - from the adhesive tape to superglue to a hot glue gun. He sat in the living room with these glues and experimented sticking the various container types and sizes (PET bottles, cans, etc.) together in the best way possible. "But it must be possible to easily separate the bottles again. That worked best with adhesive strips," he recalls. He recorded an "internal marketing video" as he called it in which he presented his idea and the results of his experiments and then showed the video to the technical director. He was enthusiastic and immediately spoke in favor of putting the idea into practice. "The bottles fell apart again one day after the living room experiment," says Christopher Stuhlmann and laughs. "But they stuck together long enough for the video." That was enough to meet their purpose.

Ten times lighter, vegan and environmentally friendly without plastic

In the following test phase, KHS cooperated with three different adhesive suppliers and experimented with 4,000 different adhesive mixtures until the results were really satisfactory. It took six years to develop the adhesive used today - and it is still not finished. Although the mixtures for PET and cans have been found for the most part, each of the other types of surface have to be re-tested.

NMP reduces the packaging material significantly by up to 90% and thus requires considerably less energy than film-wrapped containers. The carbon footprint is up to 70% smaller. The material savings of the groundbreaking innovation are also remarkable: while the traditional plastic film wrap weighs about 17 to 20 grams per PET six-pack, the Nature MultiPack™ requires only 1.5 to 2 grams of glue. Added to this is the environmental protection aspect: unlike film, the vegan adhesive does not break down into microplastics.

KHS has acquired Evian (Danone Group) as a key customer for NMP for PET bottles who is developing the product further jointly with KHS. Carlsberg followed with cans in 2018 - giving KHS considerable attention in the media. Here, too, KHS relies on partnership-based cooperation: after a complete rollout, Carlsberg will be saving 60 million plastic bags a year by using NMP. As a result, consumers will become more familiar with this film-free system. "And ultimately it's the consumer who decides whether an innovation like this can be widely implemented and if something can be done for the environment," says Christopher Stuhlmann. He would have never dreamed what development his former living room experiments would bring about. And looking ahead to the future, there are yet many possibilities such as application of this system to other materials like glass, cardboard composite packaging and metal containers. "It's really something special to have participated in an innovation like this right from the start," he summarizes. And that is saying it rather modestly - after all, this innovation would not even have come about without his brainwave while watching television.

Awarded: NMP walks off with awards

The sustainable innovation has received numerous awards including the German Design Award 2016 for outstanding communication design and sustainable packaging solutions, the Green Packaging Award 2018 and the World Star for Packaging 2018. In 2019, NMP was also awarded gold as a "polite packaging".

Transport and logistics

As a rule, our machines are large-size heavy goods that are transported once after manufacture to their destination to fulfill their task for as many years as possible without being moved again.

That is, they are long-lasting products that are ideally transported only once. A sustainable approach to this transport is particularly important to us. We are aware of the responsibility associated with the delivery of large and heavy goods. Ultimately, bundling and coordinating deliveries are a key lever for reducing CO_2 emissions and the overall footprint of a machine. The subject of time and resource management in this area is noticeably more important for our customers and us than in previous years. The three most important aspects that we can use to influence the carbon footprint are procurement, distribution and disposal logistics. We additionally have an influence on order picking and packaging, each of which are aided by digitization measures such as platform and cloud solutions that, for example, offer coordinated deliveries and prevent uncontrolled several individual deliveries of the raw materials we require.

The significance of time schedules for the carbon footprint

From a sustainability point of view, we consider the entire control and planning of the material flow of goods within our company - from the supplier to on-time delivery of the finished machinery to the agreed location. Our basic principle is to individually plan, coordinate and carry out each individual transport order while taking into account in-house requirements, the respective wishes and requirements of our customers, the agreed terms of delivery and the modes of transport used. All in all, it can be stated that our customers are increasingly ordering machines just in time in order to avoid storage costs and possible warehousing damage at the point of destination.

For KHS, this means taking care of coordination and delivery planning well in advance. Exact adherence to time schedules is therefore of particular importance - because if the machine is finished, dismantled and readied for packaging later than agreed, this will have direct consequences on the logistical processes of transport. For example, this may mean that we will have to choose a disadvantageous mode of transport (such as unplanned air freight), carry out undesirable partial deliveries, make special or empty trips or not be able to optimally utilize loading capacities. Realistic time scheduling can avoid these increased burdens on the environment. We thus work out the planned transport routes in detail to prevent any delays and to find the ideal shipping company.

KHS uses „multimodal transport“

The choice of resource-conserving means of transport is crucial for achieving a better carbon footprint. For this reason, relocating freight from road to rail transport would be a welcome alternative but infrastructure is still lacking. We have therefore switched years ago from shipping our heavy goods on roads to riverways. Heavy goods are loaded in the inland ports such as Mannheim and Dortmund and transported to major overseas ports.

Ralf Naujoks, head of distribution logistics at KHS, is involved in transport operations of this kind in what is called combined or multimodal transport, where the initial delivery (or follow-up delivery) is transported by truck and the main delivery is transported by inland waterway vessels. If necessary, he also gets in touch with authorities in the heavy goods transport approval process. He and the representative of the shipping company attended a meeting that was recently held with a member of the regional authorities involved. The reason for this was the opening of a transshipment facility on a waterway on behalf of KHS about which the authority had questions regarding the upcoming run-up to the transshipment terminal.

“I actively support these transport routes because I am convinced of their ecobalance and efficiency. I want to contribute to improving the carbon footprint over the life cycle of our machinery and equipment through my area of responsibility,” says Naujoks, explaining his commitment.

During the meeting, the responsible official of the regional authorities told the participants that the KHS’ attitude on the issue of ‘relocating shipments to water and rail’ was exemplary in comparison to many other shippers. In this branch of industry, goods are frequently transported the entire distance from the starting point to the destination only on roadways. The existing legal provisions on the priority of combined or multimodal transport in the heavy goods transport area would of course also benefit climate protection. The specifications were issued in particular for the protection of the infrastructure and have already been complied with by our company, said the pleased agency employee. He hopes that the other shippers can be persuaded to do likewise in the future and also explained that the current version of the “Inland Waterway Transport Master Plan” is intended, among other things, as a measure to strengthen the legislation for primary use of inland waterways (and rail).

Ralf Naujoks is head of Distribution Logistics at KHS

Research and development

KHS' international success has always been preceded by intensive research and development work. Without proper basic groundwork, there is no further development and without further development, there is no increase in sustainability.

With our research and development projects, we want to create added value for our customers:

- minimization of energy, supplies and operating materials
- reduction of packaging materials
- increased product quality

All attributes that aid our customers in running efficient production operations and that directly ensure sustainability.

In order to continuously increase efficiency, we develop completely new machine concepts or consistently further develop tried and test systems already on the market. At the same time, we take dynamic customer and market requirements into account (what is known as "market pull") as well as the potential of new technologies (what is known as "technology push").

In addition to customer requirements, the requirements of the various departments involved in the process of providing goods and rendering services must always be taken into consideration in the development of new products. The focus here is on sustainable solutions not only for our customers but for us as well. By reducing operating costs by using fewer resources, we directly promote sustainability efforts just as we do with optimized KHS in-house processes within the scope of standardized projects, for example.

Science and practice hand in hand

Together with renowned universities and well-known industrial partners, KHS utilizes research funding projects as an established platform to investigate new technological approaches and issues with regard to benefits for future products. An important focus of consortium projects is always a common understanding of the project goals and the expected results. The collaboration in a consortium enables the use of distributed know-how and promotes a learning process for all involved. Recent projects include for example

- DnSPro – sensor-based subsystems with decentralized cooperation for Industry 4.0 production systems: The ever-present topic of Industry 4.0 has been implemented quite specifically here on a small scale in an application example of bottle filling. Two practice-related patent applications have already been submitted. The project was funded by the Federal Ministry of Education and Research (BMBF)

- CyProAssist: The focus here is first and foremost on the interaction between man and machine. Digitization creates new functionalities and added value, which successively change machines and systems and simplify process monitoring and machine diagnostics for example. In this case, we examine the question of what the relevant added value is for our customers and which business model will result for us. Our goal is to use artificial intelligence to develop self-learning and self-optimizing machines for highly efficient operation that do not make people redundant but support them to the greatest possible extent. The project is funded by the Federal Ministry of Education and Research (BMBF).

- DC-Industrie - an intelligent open direct current network in the industry for highly efficient system solutions with electric drives: Jointly with well-known industrial partners, we look into system configurations with smart, open DC networks. The aim is to redesign the supply of power to industrial systems using a smart, open DC network and to digitize the industrial energy supply structure. The project is funded by the Federal Ministry for Economic Affairs and Energy (BMWi).

- EnAP – user-oriented application of energy-efficient drive technology in production: The focus here is on optimizing drive systems. In cooperation with companies and institutes, energy saving concepts and system optimization procedures are developed that can be used in pneumatic and electric handling systems. The project is funded by the Federal Ministry for Economic Affairs and Energy (BMWi).

In summary, it can be noted that all of KHS' current funding projects are in the relevant fields of research and provide direct, tangible results that are incorporated into the development of new machines in the future. Another benefit lies in the further training of our employees and colleagues who can often directly implement new impulses and ideas in the interest of continuous improvement (CIP).

Making our mark as a turnkey supplier

It goes without saying that KHS' core competency in providing our customers with comprehensive advice on complete systems is more in demand today than ever before. In light of the increasing variety of beverage - such as craft beers and craft drinks - and packaging variants, an ever increasing flexible usability of lines is required in many cases both in daily operation and in medium-term adaptability. In the future, systems should be capable of processing additional formats for example or be expandable to include new technologies such as those in the field of packaging. We pursue the concept of modular design of system solutions in order to offer our customers customized and at the same time economically attractive solutions.

Starting with consulting during the line layout phase to system operation, we consistently focus on sustainability together with our customers. We create added value jointly with customers by using energy, media and consumables efficiently and optimizing packaging design. We set a good example ourselves: for example, KHS has been using hydroelectrically generated power exclusively at all of its sites in Germany since 2016 and have thus reduced CO_2 emissions by approx. 9,000 tons this year.

» For me, sustainability at KHS means that we are improving the quality of people's life or even making it possible in the first place by enabling beverages to be produced, processed and packaged hygienically. At the same time, we all work every day to reduce the use of necessary resources. «

Dr.-Ing. Matthias Schopp
Head of cross-divisional Engineering Systems
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