KAESER KOMPRESSOREN

KAESER report

A Magazine for the Production Industry

2/23

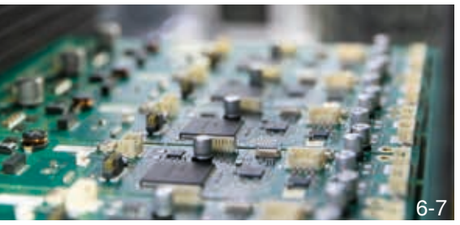
Heat recovery
Use energy twice

SIGMA PROFILE
More compressed air for less energy

Rotary screw blowers
30 percent more efficient

SECOTEC
Saving with thermal storage

Contents Issue 2/23



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Editorial

Technologies for a sustainable future

Egil Krokan
General Manager
KAESER KOMPRESSOREN AS

Excessive consumption of finite resources and climate change are significant challenges facing humanity, ones that we must address. However, it is not just about discipline; it's about deciding on and implementing technological solutions to effectively tackle crucial issues, such as energy efficiency, sustainability, resource conservation, replacing fossil fuels, energy conservation and climate change. This will pave the way for a bright and sustainable future.

Energy efficiency means achieving more with less: all devices, machines and industrial processes must be enhanced and optimised to deliver peak performance with the least possible energy consumption. This not only saves costs, but also significantly reduces CO_2 emissions and conserves finite resources. KAESER KOMPRESSOREN engineers all of its compressors, blowers, compressed air dryers and all other compressed air station components with a focus on continually improving energy efficiency. Moreover, the use of SAM 4.0 computer systems significantly enhances coordination and efficiency of the compressed air station as a whole.

Resource conservation is imperative, as all material resources are finite. Therefore, a conscious approach to these resources is essential, whether through frugal utilisation, recycling, reuse, or the substitution of renewable materials. KAESER KOMPRESSOREN systematically emphasises prudent material use and ensures that, wherever possible, all materials employed are recyclable.

Furthermore, fossil fuels such as coal, oil and natural gas are not only finite, but also one of the primary contributors to greenhouse gas emissions through their combustion. In contrast, renewable energy sources like solar, wind and water offer a clean and inexhaustible supply of energy. The transition to renewable energies is not only environmentally responsible and necessary, but also offers significant economic opportunities through continuous innovation and job creation. KAESER KOMPRESSOREN, alongside its own photovoltaic installations, gains 100% of its electricity from renewable energy sources (green energy).

Climate change is one of the greatest challenges of our time. Increased temperatures, rising sea levels and extreme weather events are direct consequences of our actions. The points mentioned above are not isolated issues, but interconnected components of a larger whole: the battle against climate change.

Humanity has a multitude of avenues and tools at its disposal to address these significant challenges. However, technology alone is not the answer. What is needed is a collective will, political commitment, as well as the courage and confidence to depart from established paths and venture into the unknown. Together, this will benefit everyone – and future generations to come.

Image: AdobeStock

A tale of hunters and gatherers

Beer from the Stone Age

Beer is one of today's most popular alcoholic beverages and has a long tradition dating back thousands of years – for example, we know the Sumerians were already drinking fermented grain juice over 6,000 years ago. In the southern region of Egypt, around 2,000 years ago, beer was consumed as medicine to protect against infections, and brewing was also a daily practice among the Gauls. However, the history of beer brewing goes back even further.

Beer is not only one of the most popular, but also one of the oldest alcoholic beverages. The ancient Egyptians were not the only ones who are known to have produced beer. In Central Europe, beer production has been documented as early as the 3rd millennium BC. Many ancient cultures, such as the Celts, Greeks and Romans, also consumed beer. Until now, scientists believed that the roots of beer production date back to the Neolithic period. The Neolithic period, also known as the Stone Age, is defined as the era in human history that marks the transition from hunter-gatherer to pastoral and agricultural societies. In the region known as the "Fertile Crescent" in the Middle East, this period is dated to around 9,500 BC. In central and northwestern Europe, the Neolithic period is commonly regarded as occurring between 5,800 and 4,000 BC. However, as recent research shows, the production of beer is likely to be even older. In 2018, archaeologists discovered evidence of an ancient alcohol production on site during excavations in the Raqefet Cave, located south of Haifa in Israel. The cave was inhabited by people of the Natufian culture, a semi-sedentary hunter-gatherer community considered a precursor to the first true farmers, during the Proto-Neolithic period, approximately 13,000 years ago. Millennia-old traces found in stone vessels indicate that beer was already being brewed there using wild grains and other plant ingredients.

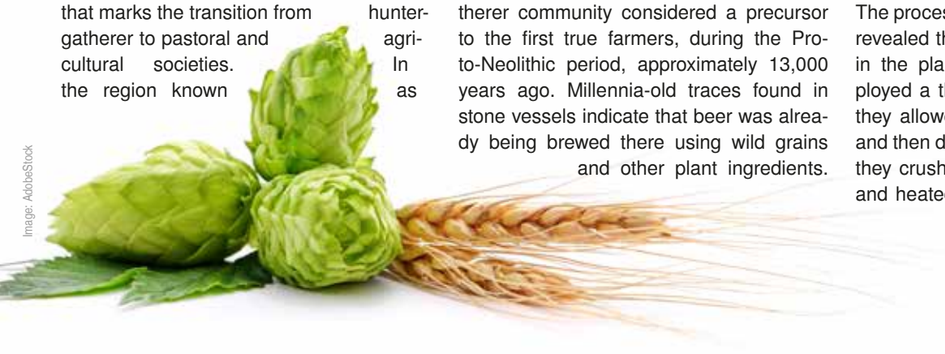

Image: AdobeStock

Archaeologists speculate that the Natufians produced their beer for ritual events and may have consumed the beverage while performing funeral rituals, for example. However, Stone Age beer bore scant resemblance to the products of modern breweries. Its consistency probably resembled a thin porridge rather than the beer we know today.

Analysis of residues on mortars suggests that the beer was made from seven different plant varieties, including wheat or barley, oats, legumes, and bast fibres such as flax. The process of making Stone Age beer was revealed through analyses of starch grains in the plant remains. The Natufians employed a three-step brewing process: first, they allowed the grains to sprout in water and then dried them, resulting in malt. Next, they crushed the malted grains in mortars and heated them. Finally, the mixture was stored in containers and fermented, resulting in an alcoholic brew.

What does beer have to do with compressed air?

The "amber nectar" has evolved through the ages to become a popular beverage that is now enjoyed throughout the world. However, the entire brewing process is quite different today from how it was in ancient times. In modern automated beer production, much depends on the reliable supply of food-grade compressed air. It is used as a conveying medium, for aeration of the wort at the beginning of the fermentation process, and for bottling and the filling of kegs. Additionally, large volumes of control air are required for the operation of numerous valves and actuators. Needless to say, this air must meet the highest hygiene standards. KAESER's CSG series oil-free rotary screw compressors, for example, truly shine in this regard. These new models made their debut to a wide audience at this year's Hannover Messe trade fair.

Food safety in accordance with ISO 22000

KAESER places the utmost importance on providing safe products to customers in the food industry and on meeting their associated expectations. While KAESER products do not come into direct contact with food, they generate compressed air to the required quality for food processing applications. To ensure demonstrable compliance with these quality requirements, a food safety management system in accordance with ISO 22000 has been integrated into the existing management system at KAESER. This system applies to the development and production of CSG, DSG, and FSG series oil-free rotary screw compressors. Through the standardisation of internal processes, KAESER ensures safe, transparent and efficient operation across all functional areas. The added value for the customer lies in the assurance that both legal and regulatory requirements, as well as customer requirements and any associated changes, are consistently included and implemented.

Climate-neutral printing

Responsible use of resources is a key priority at KAESER KOMPRESSOREN. The KAESER Report, which is not only distributed in Germany but in more than 50 countries with KAESER locations or local partners, has been printed climate-neutrally for quite some time now. At the beginning of the year, however, the decision was made to go one step further: from now on, all printed material at KAESER will be printed without exception on a climate-neutral basis. The CO_2 emissions generated through printing are offset by supporting an international climate protection project.

Compressed air station with special requirements

At home in the digital world

ASMPT, a comprehensive software, hardware, and services provider in the semiconductor and electronics manufacturing sector, demonstrates what shaping a positive and sustainable future can look like these days. While the company enjoys healthy growth, it also continuously improves operational efficiency and resource management. With the new, advanced compressed air station at its Munich Obersendling site, ASMPT has taken a further step in the right direction.

Digital transformation has many facets. New technologies such as mobile connectivity, the Internet of Things, expert systems and real-time simulations shape the concept of Industrie 4.0, making products smarter, more flexible and resource-efficient. Above all, there is the desire for automation. In electronics manufacturing too, the focus is increasingly shifting towards Industrie 4.0 and the Integrated Smart Factory. In the near four decades it has been active, ASMPT has evolved from an equipment supplier to a provider of complete solutions for semiconductor and electronics manufacturing, thereby becoming synonymous with the Integrated Smart Factory. Today it supports countless customers from a variety of industries worldwide with a broad range of products and services. The company demonstrates its technological leadership with best-in-class hardware and software, such as SIPLACE mounting machines, DEK printers, inspection and material storage solutions, as well as WORKS, its proprietary intelligent shop floor management suite. ASMPT's Open Automation concept forms the basis for modular, flexible, manufacturer-independent – and therefore economically viable – automation in its customers' SMT manufacturing applications.

A site with history

The ASMPT site in Munich is located on a section of the former Siemens premises in Obersendling. The long history of the electronics giant Siemens can be felt everywhere here, in the buildings as well as in the highly advanced manufacturing processes. Our editorial team had the opportunity to view a production line during their visit to the Munich facility, where customer-tailored mounting machines for circuit boards are produced. Once the machine is fully assembled, it undergoes a test run to ensure that it meets all of the customer's requirements. Here we are talking about high-precision robotics, since the components being mounted on the assembly machines are minute. This is where compressed air comes into play, as it is used to generate the vacuum (Venturi principle) that picks up the tiny components from the carrier material and holds them in place for precise positioning. Additionally, compressed air is used to cut the carrier reels for these components. Up until 2002, the entire building, including the old compressed air station, was still owned by Siemens. The old station was located in the basement beneath the former company cafeteria and had to be relocated due to the renovation plans. During this process, the station was also slated for modernisation. It comprised three compressors of different sizes from various manufacturers and was not only oversized, but also inefficient and resource intensive.

The container housing the compressed air station has been completely lined with sound insulation mats to comply with sound emission limits.

> Reliability is key for the compressed air station.
>
> *(Thomas-Ernst Richter, Manager Technical Services)*

ASMPT has become a leading provider of complete solutions for semiconductor and electronics manufacturing.

Compressed air station with green fingers

Various options were discussed when selecting the new location for the compressed air station. Ultimately, housing it at ground level in a container near to the manufacturing area proved to be the most practical and cost-effective solution. However, there were several strict regulations imposed by the city of Munich that had to be taken into consideration, since ASMPT is situated in a mixed residential and industrial zone. These regulations primarily concern adherence to sound emission limits (maximum of 45 dB during the day, 39 dB at night). This was addressed by lining the entire container with sound insulation mats. Another requirement relates to the container roof: in accordance with Munich's green space ordinance, a certain portion of the roof must be maintained as green space and planted. Therefore, it has been adorned with assorted greenery and flowering plants, offering a pleasant sight to onlookers from surrounding buildings. Meanwhile, three KAESER rotary screw compressors (CSDX 165 SFC, CSDX 165 and CSD 85) carry out their work quietly and efficiently inside the container. Two energy-saving SECOTEC TF 340 refrigeration dryers are also installed to maintain a reliable pressure dew point of +3 °C. Together with various high-performance filters, they ensure that the compressed air in contact with sensitive electronic components meets purity class 1-4-1 in accordance with ISO 8573-1.

The advanced SIGMA AIR MANAGER 4.0 master controller provides demand-oriented compressed air management. Last but not least, a KAESER maintenance contract, including maintenance parts, guarantees maximum compressed air system reliability, availability, cost efficiency and value retention.

Generating energy from waste

Environmental protection begins with energy efficiency

Image: AdobeStock

The 70,000-litre storage volume is divided between eight compressed air receivers.

Hamelin, home to the Enertec Hameln GmbH waste incineration plant, is also associated with one of Germany's most famous legends: the tale of the Pied Piper of Hamelin, which has been translated into more than 30 languages. The true core of this late medieval story continues to be debated: was it based on the emigration of young citizens, did the plague play a role, or was it indeed a children's crusade? Whatever its origins, the magic remains, as does the aura of enchantment that has always surrounded Hamelin. This ancient legend makes Hamelin unique.

Today, this historic town in Lower Saxony is making headlines for its numerous environmental initiatives. Enertec Hameln GmbH, a subsidiary of Interargem GmbH, has seamlessly integrated its thermal waste treatment plant into the panoramic landscape of this eco-conscious town. The plant not only provides thermal recycling of delivered waste that is no longer materially recoverable, but also harnesses this waste for energy generation. Indeed, the so-called municipal waste is an important source of energy with an average energy content equivalent to that of brown coal. District heating is particularly climate-friendly; it preserves natural resources and provides a high level of supply security. Therefore, utilising energy from waste also makes a significant contribution to the energy revolution. In thermal waste treatment, one of Enertec's core competencies, the energy released during combustion is harnessed and converted into electricity and district heating through combined heat and power. From the current treatment capacity of 350,000 tonnes of waste per year, 118 MWh of electricity and 213 MWh of district heating are generated. The produced district heating is drawn off as energy for heating purposes or as process steam and is directed to consumers through Enertec's own district heating network, spanning approximately 64 kilometres. This currently ensures the supply for about 42,300 households with electricity and 14,200 households with district heating.

Optimised energy consumption

Environmental protection plays a key role at Enertec Hameln GmbH. Emission limits, in accordance with the 17th Federal Emission Control Ordinance, are not only safely adhered to but are significantly undershot thanks to highly efficient flue gas cleaning, in which compressed air also plays an important part. In the future, an ever-increasing proportion of the company's energy consumption is to be covered by renewable energy sources – upcoming projects, for example, include construction of a photovoltaic system and various wind turbines. Nonetheless, conscious, controlled energy usage is more crucial than ever. This was also the motivation behind renovation of the compressed air station approximately a year ago. "It goes without saying that it was important for us that the new station was of the highest quality. However, we not only had to take investment costs into consideration, but also the ongoing operating costs for maintenance, repairs and, above all, energy consumption. The concept proposed by KAESER was clearly the best," explains Dirk Cromwell, Head of Production. The concept includes a total of four rotary screw compressors (one DSD 202 and three DSD 240s), which, thanks to their IE4 drive motors and the energy-saving SIGMA PROFILE, deliver best possible energy efficiency in accordance with the very latest technology. Since the compressed air is required at two different levels of humidity, it is treated in two different air treatment systems. While a pressure dew point of +3 °C is sufficient for the so-called operating air, an exceptionally low pressure dew point of -40 °C is required for the so-called instrument air, which is used, for example, for the measurement instrumentation. Four energy-saving SECOTEC TG 780 refrigeration dryers reliably maintain the pressure dew point necessary for the operating air and truly stand out with their exceptionally energy-efficient refrigerant compressors, whilst a HYBRITEC DTI 418/752 ensures the -40 °C pressure dew point necessary for the instrument air. This combination dryer brings together the extremely low pressure dew points that desiccant dryers have to offer with the energy-saving performance of modern refrigeration dryers. The result is a level of flexibility that massively reduces energy consumption. Redundancy is provided by a DC 444 desiccant dryer. The SIGMA AIR MANAGER 4.0 master controller ensures optimal interaction of all components within the compressed air station to deliver demand-oriented compressed air management and optimised energy efficiency throughout the entire system.

The station has been in operation for approximately a year now and continues to meet Dirk Cromwell's expectations. "The new compressed air station operates as energy-efficiently as current technology allows. Should our needs grow in the future, the station can be easily expanded, since we have already taken the necessary steps to accommodate this possibility."

Two different compressed air treatment systems dry the compressed air for the respective requirements.

Dirk Cromwell, Head of Production, talking to Marcel Knicker (KAESER) regarding energy savings with the efficient hybrid dryer.

A total of four rotary screw compressors with IE4 drive motors and the energy-saving SIGMA PROFILE operate in the compressed air station.

> We not only take investment costs into consideration but also the ongoing operational costs…KAESER was clearly the best choice.
>
> ***(Dirk Cromwell, Head of Production)***

KAESER and Laverana: Partners for over 30 years

Together for the environment

Since its inception, Laverana GmbH & Co. KG, known as the manufacturer of the natural cosmetics brand lavera, has placed great importance on the conscious use of precious resources and has been operating on a carbon-neutral basis since 2019. Unsurprisingly, controlled energy consumption remains a key focus at the company, which has a host of ideas, initiatives, and projects in place to support this endeavour, and the new KAESER compressed air station at Bantorf is also playing an integral role.

The demand for natural ingredients in cosmetics is higher today than ever before. However, the natural cosmetics brand lavera has pursued the vision of manufacturing exclusively natural cosmetics and making them accessible to all for over 35 years. With this concept in mind, Thomas Haase, still the managing partner today, founded his company “Laverana” and the “lavera” brand in 1987. From the outset, the company eschewed microplastics, mineral oil-based ingredients, silicone oils and chemical colourings. Therefore, with their high-quality natural cosmetic products, they have been fulfilling the beauty wishes of customers worldwide for over 35 years.

Natural cosmetics manufacturer Laverana has 250 products in its product portfolio.

Image: Laverana GmbH & Co KG

Image: Adobe Stock

Image: Laverana GmbH & Co KG

Image, top left: The SIGMA AIR MANAGER 4.0 master controller ensures that the entire compressed air station operates at peak efficiency.

Image, centre: A view inside the new ultra-modern compressor room.

Image, top right: The building complex at the new Laverana site in Barsinghausen-Bantorf.

Image, bottom left: Laverana uses over 300 organic plant-based ingredients, which it largely produces itself in the Hanover region.

With approximately 450 employees and distributing around 250 products in 40 countries, Laverana has grown to become one of Europe's leading natural cosmetics manufacturers. The company uses over 300 organic plant-based ingredients, which it largely produces itself in the Hanover region. With the exception of decorative cosmetics, the gel and cream formulations are biodegradable according to the OECD, and both the products and the company have been carbon-neutral since 2019. (CO_2 emissions are reduced, whilst unavoidable CO_2 emissions are offset by the purchase of emission reduction certificates). Laverana supports various climate protection projects and is committed to reforesting woodland and natural areas in Germany, Austria and France. In 2021, the company was awarded the European GREEN BRAND quality seal for the sixth time in a row for its ecologically sustainable corporate management. Moreover, the natural cosmetics manufacturer won the German Sustainability Award in 2023 for its pioneering work and commitment to sustainability. Given the immense importance of environmental and resource protection at Laverana, it is no surprise that the focus during planning of the new site in Barsinghausen-Bantorf (from 2019 to 2021) was on sustainable energy management for the new factory. Aiming to cover one hundred percent of its electricity needs in-house and exclusively from renewable energy sources, a large photovoltaic system with a peak output of 750 kWp was installed on the factory roof and integrated into the electricity grid this spring. Moreover, plans are afoot to acquire the Expo wind turbine, located just a few hundred metres away.

Cut from the same cloth

In terms of its unwavering commitment to sustainability, the natural cosmetics manufacturer aligns perfectly with KAESER, the Coburg-based compressed air systems provider. "We have enjoyed a close partnership with KAESER for over 30 years now. Although there are several compressor suppliers out there, the company founder, Thomas Haase, chose KAESER from the very beginning because the mid-sized company shares Laverana's commitment to sustainability and stands out due to its exceptional technical expertise and dedication to quality," says Karsten Neupert (TGA and Technical Control Centre). It was therefore clear that KAESER was the only choice as the supplier for the new Bantorf site's compressed air station. "For the new compressed air station, it was important to us for it to operate with maximum energy efficiency and reliability, and with minimal maintenance requirement," explains Karsten Neupert. Therefore, everything that cutting-edge compressed air engineering technology has to offer is installed in the new, ultra-modern compressor room. To achieve the strict purity class of 1-4-1 as per ISO 8573:2010, a sophisticated compressed air treatment system is in use, comprising three SECOTEC TF 280 energy-saving refrigeration dryers, various filters and an activated carbon adsorber. Generously dimensioned flow cross sections ensure uniform flow with an exceptionally low pressure loss of maximum 0.1 bar. In this way, the discharge pressure of upstream compressors and the energy costs for compressed air generation can be kept as low as possible. The total of six rotary screw compressors (three ASD 40 and three BSD 75) are all equipped with IE4 Premium Efficiency motors, which further enhance overall system energy efficiency. Moreover, the screw rotors' flow-optimised SIGMA PROFILE additionally contributes to improved specific package input power. KAESER's compressor controllers also score top marks when it comes to energy efficiency: the internal SIGMA CONTROL 2 allows compressor performance to be precisely adjusted according to actual compressed air demand, whilst the SIGMA AIR MANAGER 4.0 master controller monitors and controls the entire compressed air station. It enables efficient interaction between all of the compressors, coordinates compressed air production and demand, and balances compressor load hours to ensure that the entire compressed air station operates at peak efficiency at all times. The Bantorf site uses compressed air for pneumatic control of the systems and for handling of the products throughout the process across all 45 lines in the four filling halls. The necessary pressure level of 6.5 bar was determined as the result of numerous tests that aimed to identify the lowest pressure sufficient to comfortably meet the demand at the consumers. After all, the ironclad rule here is that every 1 bar drop in pressure results in at least a 6 percent energy saving. Last but not least, all six rotary screw compressors are ready-equipped with two pipes each for future heat recovery. The plan is indeed to utilise the compressors' exhaust heat, alongside the thermal energy from heat pumps, for building-heating purposes.

Image: Laverana GmbH & Co KG

> Resource-conscious compressed air generation is very important to us.
>
> ***(Karsten Neupert, Control Centre Management)***

The new compressed air station at Sandvik Coromant enables energy savings in the five figure range.

Image: KAESER COMPRESSORS

The control unit SIGMA CONTROL 2 is the integrated intelligence.

Living up to your promises

Part of global industrial engineering group Sandvik, Sandvik Coromant specializes in manufacturing metal cutting tools for machining applications with exceptionally precise tolerances. Established in 1942 in Sandviken, Sweden, they support over 100.000 customers worldwide with a passion for mechanical engineering, a desire to push the boundaries of accepted technology, emphasizing close collaboration, and a continuing thirst for knowledge.

Energy saving and better monitoring

Sandvik Coromant holds over 1700 global patents and files an additional 150 each year. Their commitment to providing customized machining solutions and digitalization has solidified their reputation for performance, long-lasting products, and faster production times. But that's not the only way they live up to their promises!

Sandvik Coromant is also deeply committed to sustainability and the environment. By supporting global initiatives like the Paris Climate Accords and implementing their own programs such as Making the Shift, they measure and continually reduce their environmental impact, seeking always to "do no harm to people."

Sandvik Coromant's spirit of collaboration is not only critical to their customer approach, but to its internal processes as well. In the last ten years, they've steadily grown their operations in South Carolina. When deciding to expand the Westminster facility, Coromant spent months bringing in prospective partners and vetting them. Authorized KAESER distributor Elevated Industrial Solutions, did their due diligence up front and it showed! They approached the project the way Coromant approaches its customers: with collaboration, lots of listening, and plenty of learning from each other. Coromant was clearly a knowledgeable customer and had high expectations especially since their Mebane, North Carolina facility already had two KAESER units. However, the expectations ran both ways as Jason Acker, the South Carolina General Manager for Elevated, wanted a customer who would consider their recommendations.

The existing system in Westminster was aging and decentralized, and it had problems maintaining a consistent pressure – especially with increasing demand. There were also air quality issues with the air knives and blasting equipment impacting both product quality and equipment maintenance.

Energy consumption was an issue as previous air studies indicated the air system was a top energy user. With bold sustainability targets and a desire to measure and track their savings, Coromant needed a partner to evaluate their needs, build the system, and collaborate in maintaining reliability, performance, and efficiency. "They needed someone who could support them from start to finish", said Acker. "We began with a comprehensive air study using KAESER's Air Demand Analysis to determine how to best meet their current needs and provide a solid foundation for their future."

Exceeded expectations

The study estimated $80,000 in annual energy savings and proposed a new primary system including four DSD 175 rotary screw compressors, three TG 980 Secotec dryers, a SIGMA AIR MANAGER (SAM) 4.0, increased storage, and a new SmartPipe distribution system. Plus, Coromant needed a smaller secondary system for extra machining consisting of two SK 20 rotary screw compressors and a SAM.

"We weren't just buying a bunch of horsepower," commented Lee Westmoreland, Coromant's Maintenance Engineer. "For this project, we wanted thoughtful, system engineering." Coromant also needed to integrate the compressed air system into their Building Management System (BMS) and fortunately, KAESER's SAM with its mod bus capabilities was the perfect solution. It pulls operational data from the compressed air system and maintains a stable operating pressure, ensuring maximum compressed air efficiency and balanced service hours.

Coromant chose BACnet protocol to pull data from each SAM 4.0 and because they were running on a legacy control network, KAESER implemented a BACnet router to establish communication between the KAESER equipment and the BMS. In addition to the compressor alarms and messages, and operational data (run, load, off status), Coromant needed the dryers' operating conditions which also pull from the SAM 4.0. This was no problem for KAESER's system engineering team. "The total installation was turnkey and took roughly 7-8 months," said Acker noting the outstanding work of the South Carolina Elevated installation crew headed by project Manager Jimmy Willis and their commitment to completing a project of this scale during the COVID pandemic. "We also really enjoyed working with the team at Coromant and it's impressive to see how they are tracking their improvements." For their part, Coromant estimates their actual energy savings are closer to $90,000 a year. "And this is a manageable system that can be scaled up as we look ahead over the next ten years," added Westmoreland.

While Sandvik Coromant had the pressure they needed before, it's more refined and controlled now. And with SAM's reporting capabilities, they are able to see it and track it. In fact, with this data, they are decreasing pressure in stages for more cost savings and for delivering on their promise to reduce environmental impact on humans everywhere!

> For this project we wanted thoughtful, system engineering.
>
> ***(Lee Westmoreland, Maintenance Engineer)***

Sandvik Coromant is the world market leader for tools and machining solutions.

Image: Sandvik Coromant

New blower station at Herdorf wastewater treatment plant

Enhanced operational efficiency

Located in a beautiful setting between the Siegerland and Westerwald regions of Germany, lies the small town of Herdorf. Historically, the area has been one of the most important iron ore mining regions in Europe. For centuries, the town thrived on iron ore and basalt mining, and this heritage has left a lasting impact on the town and its people. In recent years, Herdorf has made itself future-ready by expanding its commercial areas and offering numerous attractive opportunities for businesses and residents.

Image: AdobeStock

Historically, the region is considered one of the most significant iron ore mining areas in Europe.

The degree of wastewater contamination is highly variable due to various factors.

The history of Herdorf dates back to pre-Christian times, specifically to the Celtic era. Archaeologists in the 1960s discovered several Celtic smelting sites in various locations within the city area. The exact dating of these sites is still a subject of debate among experts, but slag and ceramic finds are attributed by some specialists to the 6th – 5th centuries BC. After more than 2,000 years, this mining tradition came to an end in 1965 with the closure of the Siegerland region's mines. Today, aside from a few sealed mine entrances and slag heaps in the forests, there is not much visible evidence of this mining heritage. In recent years, Herdorf has expanded its commercial areas, providing opportunities for both start-ups and existing businesses to relocate or expand. The local wastewater treatment plant has also made itself future-ready with a modern, highly efficient blower station for the aeration tank, among other upgrades. The Hellertal Wastewater Association has operated the wastewater treatment plant in Herdorf since 1965. The facility currently has a capacity of 49,000 population equivalents, while the current load is approximately 32,000 population equivalents. Wastewater from the catchment area is conveyed to the treatment plant through a main collector and five pumping stations. The wastewater undergoes mechanical, chemical and full biological treatment at the plant. Under dry weather conditions, the plant receives around 450 m³ per hour, while during rainy weather, this value can increase to approximately 1,300 m³ per hour.

A bird's eye view of the wastewater treatment plant in Herdorf.

Efficiency and controllability

"The degree of wastewater contamination is highly variable due to various factors. This is partly down to significant variations in precipitation within the catchment area, such as the so-called flush effect, whereby the sewer lines are flushed out after prolonged spells of dry weather," explains Peter Kloidt, Technical Manager at the wastewater treatment plant. "Consequently, the air demand in the aeration tank is also highly variable, which poses specific requirements for the new blower station, necessitating much better controllability than the outdated system from the 1990s." After more than 30 years, the machine technology – comprising four older rotary lobe blowers, each with a motor power of 110 kW, and only one blower offering variable output via a frequency converter – had become outdated and inefficient. Today, in the era of the energy revolution, maximised operational efficiency is more important than ever before. "When planning the new station, the initial question was to determine which technology could best deliver the air required for aeration in the tank. We also wanted to achieve excellent controllability and significantly enhance operational efficiency with the new station," summarises Peter Kloidt, outlining the initial situation. Following detailed calculations during the project development and tendering process, it was determined that modern, high-efficiency rotary screw blowers were best suited to meet the plant's specific requirements.

> Our goal was to deliver the optimal amount of air into the water with as little power consumption as possible.
>
> ***(Peter Kloidt, Technical Manager)***

In 2021, three new frequency-controlled KAESER EBS 410 L SFC rotary screw blowers, each with a motor power of 45 kW, were installed. The highly efficient synchronous reluctance motor achieves visible improvements in efficiency compared to conventional motors, especially in the partial load range. Therefore, together with the energy-efficient SIGMA PROFILE, the rotary screw blowers are able to provide exceptional delivery performance with minimal power consumption. The moderate maximum speed, closely spaced rotary screw profile, and the near-constant specific package input power characteristics throughout the wide control range result in significant energy savings at every operating point. The Siemens frequency converter features a control algorithm specifically tailored to the motor, allowing for variable flow rate adjustment by regulating the blower's speed to match the process requirements. With its perfectly harmonised combination of frequency converter and synchronous reluctance motor, KAESER achieves best possible system efficiency, IES2, in accordance with IEC 61800-9-2. So, did the modern rotary screw blowers succeed in significantly enhancing operational efficiency? Based on long-term measurements conducted over several weeks, the old blowers operated at an average power of 86 kW, whereas the new blowers, under the same operating conditions, require only 44 – 57 kW. This corresponds to an annual saving of approximately 300,000 kWh.

In KAESER we trust

The future of transportation

Image: Clarios Germany Holding GmbH

Clarios' European headquarters – an important production plant employing 1,300 people – are located in Hanover-Stöcken.

Clarios supplies one out of every three cars worldwide with low-voltage batteries. As the global leader in energy storage, it designs the most advanced battery technologies for almost all types of vehicle. Its mission is to develop the knowledge today to enable the energy storage of the future. With its expertise, it is currently at the forefront of the market for smart energy storage solutions.

Image: Clarios Germany Holding GmbH

The global leader in energy storage designs the most advanced battery technologies for almost all types of vehicle.

Headquartered in Wisconsin, USA, Clarios employs approximately 16,000 people at 56 locations worldwide, whilst its European head office – and an important production plant employing 1,300 people – is located in the German borough of Hanover-Stöcken. Here, Clarios manufactures starter batteries for cars and commercial vehicles, including traditional lead-acid batteries, modern start-stop batteries, and low-voltage lithium-ion batteries for renowned automotive manufacturers and the aftermarket under the VARTA brand. The development curve of the Hanover site, situated on the banks of the River Leine, has been steadily on the rise for decades. To meet growing demand, extensive investments were made for the plant's transformation, including construction and expansion measures, to enlarge and gradually extend the existing 13 production halls. The demand for compressed air also grew in sync with development of the facility. Compressed air at the Hanover site fulfils multiple key tasks. It is used for pneumatic control of all equipment and machinery, and plays an important role in leak testing for the finished batteries. One especially crucial application is the transportation of lead oxide, which is performed in a closed system for safety reasons. Therefore, with the site's significant expansion and construction measures, the demand for compressed air increased accordingly. In turn, this necessitated corresponding expansion of the compressed air station.

Trust is essential

Stefan Hackstein, Coordinator of Facility Management at Clarios EMEA Hannover, expresses great satisfaction with the two large FSG 350 rotary screw compressors from KAESER, which were acquired during a previous development phase in 2011 to expand the compressed air station that formerly comprised only three turbo compressors. "These machines have always run smoothly, which helped to establish our trust in KAESER. During last year's expansion, the goal was not only to adapt the compressed air supply to meet growing demand, but also to ensure sufficient redundancy. Another key objective was to ensure that the entire compressed air station operates as efficiently as possible. Therefore, we not only focused on selecting the most efficient compressors and components, but also planned to incorporate a plant-wide control system that could integrate the existing third-party compressors," explains Stefan Hackstein.

To ensure that the increasing demand for compressed air was sufficiently met and to be prepared for future growth, the existing compressed air station was augmented last year with two oil-free, frequency-controlled FSG 520-2 rotary screw compressors from KAESER. Additionally, there is one KAESER DSD 328 and a DSDX 302 SFC frequency-controlled rotary screw compressor installed in separate locations, directly at the point of use. Thanks to the SIGMA AIR MANAGER 4.0 master controller, comprehensive monitoring and efficient energy management are possible, resulting in maximum energy efficiency for the entire compressed air station. Compressed air treatment plays an especially important role, since no clumping of the lead oxide due to moisture can be allowed during transportation. Therefore Stefan Hackstein wanted plenty of redundancy, as well as the best possible demand cover, even in the event of maintenance or repairs. Calculations showed that the most cost-effective and dependable solution was to distribute the required capacity, which was previously provided by two large-sized dryers, amongst a total of six smaller, energy-saving SECOTEC TF 340 refrigeration dryers. These models impress with their exceptionally low life-cycle costs, which are achieved thanks to a low-maintenance system design, the selection of more energy-efficient components and, above all, their energy-saving control. In addition, the company purchased two larger SECOTEC TF 650 refrigeration dryers, which are not only capable of covering the increasing demand with capacity to spare, but also allow room for future expansion. Stefan Hackstein declares himself highly satisfied with the current air station: "We are now well prepared for future expansion of our facility".

Compressed air fulfils a number of important functions at the Hanover facility, including transportation of the lead oxide.

> The KAESER systems run smoothly and we are very satisfied with them.
>
> ***(Stefan Hackstein, Coordinator of Facility Management at Clarios EMEA Hannover)***

A passion for innovative packaging

Quality compressed air for quality products

With a passion for design and innovation, family-run packaging specialist GAPLAST from Upper Bavaria has been developing and producing intelligent plastic packaging and applications for the medical, pharmaceuticals and cosmetics industries for over 30 years. The GAPLAST trademark represents the ultimate added value for consumers; its high-quality Made in Germany products are sustainable in numerous different ways. As a renowned “solution finder”, the company is a dependable partner for a host of international customers.

> We have always had a good experience with KAESER.
>
> ***(Stefan Krinner, Facilities Engineering Manager)***

The new compressed air station from KAESER has been operating at GAPLAST since March 2022.

GAPLAST is the developer of AirlessMotion technology.

Saulgrub/Altenau in the municipality of Oberammergau – a honeypot location popular with holidaymakers – is home to GAPLAST. This family business, which has been owner-managed for more than three decades since senior partner Roland Kneer engineered a management buyout, develops and produces intelligent and sustainable bottles, closures and applications from plastic at two sites in Upper Bavaria. Pharmaceuticals, medical technology and cosmetics are the three product areas in which the packaging company mainly specialises. Its customers include pharmacological companies and brand manufacturers of cosmetics and dietary supplements that place high demand on primary packaging in terms of quality, purity and barrier properties. GAPLAST’s innovative strength is one of its greatest advantages, as evidenced by the more than 100 registered patents owned by the firm, as well as a further 32 in the development phase. Since 2022, the majority of production takes place at the company’s new premises in Peiting: a state-of-the-art building complex consisting of two production halls with an area of around 5,100 square metres, including space for a social area and building management systems.

What is AirlessMotion?

Developed in-house, GAPLAST’s AirlessMotion technology consists of a multi-layered container that has been refined into a hybrid packaging consisting of a rigid outer layer and an integrated, flexible and contracting inner bag. An airless pump can completely empty this bag over a prolonged period of use, even with long gaps between each usage, without allowing contaminated air to penetrate. In 2021, the packaging specialist’s AirlessMotion® PCR (Post Consumer Recycling) bottle won the German Packaging Award in the sustainability category. Sustainability is an important concept for the company, including during the product development phase. Here, the recyclability of the product is taken into account, materials are selected from renewable raw materials and secondary raw materials from post-consumer recycling are also used wherever possible. Since 2021, green energy from hydropower has been in operation at both of the company’s facilities. Photovoltaic systems are installed on the roof of the production building, which since last year have been used to power both production processes and electric vehicles. The business has targeted achieving CO_2-neutrality by 2030. The themes of sustainability, energy efficiency and dependability were also important factors in KAESER’s favour when GAPLAST began searching for suitable suppliers for its planned compressed air station at the new building in Peiting. “We had already had a good experience with KAESER at our Altenau facility,” remembers Facilities Engineering Manager Stefan Krinner. “The system there is quite old, but after 120,000 operating hours it still runs without any problems. We were also already operating KAESER compressors in Hall 2 and were very satisfied with them.” Virtually every production area at the Peiting factory relies on compressed air. The required pressure is 7 bar, the flow rate 45 m³/min. As so often, compressed air provides an indispensable source of energy for a variety of control and regulating processes; it also plays an important role in extrusion blow moulding, which makes use of the previously mentioned AirlessMotion technology. The necessary air quality was another argument in favour of KAESER, which in order to meet the required product quality had to meet the stringent demands of Purity Class 1-4-1 in accordance with ISO 8573-1:2010. This is achieved by means of very sophisticated compressed air treatment in the form of highly energy-efficient SECOTEC TG 520 dryers, several type ACT 386 activated carbon adsorbers and a variety of high-efficiency KAESER Filter products. Two separate compressed air stations are operated at Peiting. The first consists of four rotary screw compressors: an ASD 37, a frequency-controlled BSD 75 SFC and two BSD 72s. The second station comprises a frequency-controlled BSD 75 SFC and two CSDX 165 rotary screw compressors. A SIGMA AIR MANAGER 4.0 master controller ensures perfect interplay and dependable operation of all components, as well as the most favourable load balancing. The result is unprecedented energy efficiency and therefore significant cost savings. Thanks to its hi-tech processes, the packaging specialist enjoys considerable success and is anticipating that further expansion of the production area will be required in the future. Adapting the compressed air station to new challenges will be no problem at all.

All images: GAPLAST GmbH

Image above: The entrance to the company’s new premises in Peiting.
Image left: The SIGMA AIR MANAGER 4.0 ensures maximum energy efficiency for the whole compressed air system.

Eco-friendly operation on the high seas

Cruising the waves in style

MEYER WERFT counts amongst the largest and most modern shipyards on the planet. Over decades, the company has been building cruise ships for international shipping lines in its colossal production halls and covered building docks. In Papenburg, Germany, it recently launched the luxury liner SILVER NOVA, owned by Silversea Cruises. With an innovative hybrid drive engine, this remarkable vessel completely eclipses the technologies used previously and is set to usher in a new era of sustainable sea cruising.

Image: MEYER WERFT GmbH & Co. KG

The hybrid drive concept used in the SILVER NOVA completely eclipses previous technologies.

With consummate expertise and bold, innovative solutions gained from over 225 years of shipbuilding, MEYER WERFT designs and constructs cruise ships, riverboats and ferries, tailor-made to customer specifications. The origins of this family-run business stretch back to the year 1795, when Willm Rolf Meyer founded a shipyard in the town of Papenburg. In accordance with the age, its first vessels were wooden sailing ships – by the time of his death in 1841, Willm Rolf Meyer had built over 60 of these. His son took over management of the company in difficult circumstances; many of the shipyards in Papenburg threw in the towel at this time, having failed to manage the transition from wooden to iron shipbuilding. Moreover, the upriver location of the town made it difficult to increase the tonnage of the ships they were producing. MEYER WERFT, however, successfully managed the transition and today the MEYER Group includes the NEPTUN WERFT and MEYER TURKU shipyards in Rostock and Finland respectively. In 1986, under the management of Bernard Meyer, the company built its first cruise ship, the Homeric. Since then, the Papenburg shipyard has specialised in the construction of ever-larger and more state-of-the-art luxury liners. In 2018 it launched a world-first – a cruise ship equipped with a low-emissions drive engine powered by liquefied natural gas (LNG). Today, MEYER WERFT are renowned as a technological leader in the cruise ship industry.

Innovation in the cruise ship industry

The SILVER NOVA, the new flagship of deluxe shipping line Silversea Cruises, represents a revolutionary innovation in the field of cruise ships. The luxury liner built at MEYER WERFT's Papenburg facility is the first ship to use hybrid technology. Its new drive concept includes emissions-free local operation at port, by means of fuel cells and batteries. The SILVER NOVA's primary fuel source is LNG; its new hybrid technology allows the vessel to reduce emissions by 40% in comparison to its predecessors. Overall, its groundbreaking hydrodynamic design and onboard innovations diminish the ship's impact on the environment to an unprecedented level.

Why is compressed air required on board?

The compressed air applications aboard are many and various. In the first instance are the nitrogen generators: ships operating with LNG must render their fuel tanks and fuel lines inert with nitrogen in order to prevent the formation of explosive gas mixtures. A second important use for compressed air is as "work air" for various onboard applications, ranging from pneumatic tools to the laundry and the exhaust gas after-treatment system, which uses catalytic converter technology (SCR – Selective Catalytic Reduction) from the automotive industry to introduce urea into the exhaust gas and thereby convert the nitrogen oxides into harmless substances such as nitrogen and water. All of this means that, at around 300 – 400 m³/h, the compressed air demand on the cruise ship is enormous and must be available for 13 – 15 full load hours per day. Not only must the compressed air station cover this requirement, it must also provide 100% redundancy for safety reasons. Following a detailed and comprehensive analysis, the solution delivered by KAESER comprised a total of four Marine rotary screw compressors of identical model series plus the appropriate compressed air treatment systems. The indirect compressed air supply for the nitrogen generators is provided by two water-cooled Marine rotary screw compressors of type BSD 75-14. For work and instrument air, as well as the exhaust gas after-treatment system, two water-cooled BSD 75-10 rotary screw compressors ensure the required supply. For dependable compressed air treatment, two SECOTEC TE 102 energy-saving refrigeration dryers and an array of filters are installed. This KAESER solution has succeeded in improving the energy consumption of the compressed air supply by 13% over the original installation. What is more, using Marine compressors from the same series for the entire onboard compressed air requirement provides advantages when it comes to maintenance and servicing. After transferring via the River Ems, the SILVER NOVA is expected to be delivered to the shipping line at Bremerhaven, whence it will commence its maiden voyage to Venice. En route, up to 728 guests will experience the tailored service for which Silversea is renowned, as well as the innovate design, exquisite restaurants and spacious luxury suites attended by a personal butler.

Compressed air on the luxury cruise liner is provided by four identical BSD 75 Marine rotary screw compressors.

Image: MEYER WERFT GmbH & Co. KG

Four KAESER rotary screw compressors ensure dependable coverage of the complete compressed air requirement on board the luxury cruise liner SILVER NOVA.

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