

KAESER report

A Magazine for the Production Industry

Special issue IFAT 2022



KAESER

Pillaerator

HP 4000

KAESER goes Turbo

...with the new Pillaerator turbo blowers

Digitalisation and automation in the water management sector

More sustainable use of a vital resource

Compressed air for a cleaner future

Wastewater treatment with KAESER

HBS rotary screw blowers

A new benchmark in blower technology

Special Issue!
KAESER blower technology



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More sustainable use of a vital resource

World's Leading Trade Fair for Environmental Technologies and Water Management

Welcome to IFAT 2022

Water is more than an everyday raw material, rather it is an inherited resource that must be protected for us today and for generations to come. Sustainability is therefore key and plays an essential role when it comes to water management. This guiding principle applies both to drinking water supply and wastewater treatment. To learn more about what KAESER KOMPRESSOREN is doing to support this important undertaking, come and visit us at IFAT 2022 in Munich.

KAESER blowers for Water 4.0 combine exceptional efficiency with future-forward design and technology. The Coburg-based compressed air specialist will be showcasing a comprehensive range of solutions to meet the needs of low pressure applications at this year's IFAT. This not only includes high-efficiency rotary screw blowers now featuring synchronous reluctance motors, but also, for the first time, turbo blowers. The lineup is rounded out by the SIGMA AIR MANAGER 4.0 master controller, which is able to transform control of multiple blowers into user-friendly operation of a seamless and effective team.

Even more efficient, even more economical

CBS to HBS series rotary screw blowers (differential pressure up to 1100 mbar, flow rate 5 to 160 m³/min) are the perfect choice for wastewater treatment in municipal or industrial clarification plants, as they are up to 35 percent more efficient than comparable conventional rotary lobe blowers. KAESER rotary screw blowers truly come into their own in continuous operation, making them ideal for generation of aeration air in water treatment, for bioreactors, flotation and fluidisation. KAESER will also be presenting new highlights to the series, the FBS and GBS rotary screw blower ranges (differential pressure up to 1.1 bar, flow rate 18 to 105 m³/min).

The latest generation of variable-speed rotary screw blowers features synchronous reluctance motors, which enable frequency-converter-equipped systems

to operate with even greater efficiency. Suitable for flow rates from 50 to 275 m³/min and differential pressures of up to 1.3 bar, Pillaerator turbo blowers are the newest members of the KAESER family. They are characterised by their exceptional efficiency and intelligent design. The smart magnetic bearing is completely wear-free, is protected against power failure and actively controls the rotor position.

All systems go for Water 4.0

The new SIGMA AIR MANAGER 4.0 is a must-have in a professional blower station. As a master controller, it not only ensures that the individual blowers are utilised as effectively as possible, but that their simultaneous operation within a network also achieves optimum overall efficiency. This advanced master controller provides demand-oriented automation and comprehensive monitoring of blower stations.



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Six rotary blowers for trout farm

Fresh air, fresh fish



From rural fishpond to automated aqua farm: A modern operation in the Kashubia region, Poland.

In the eastern part of central Europe, systematic fish farming dates back to the Middle Ages at many of the monasteries in the region. Their nuns and monks made sure they had adequate supplies of the fish they were permitted to eat when they had to fast. True farming operations that plan and control fish reproduction have been around since the fifteenth century. Nowadays, industrial fish farming is a sophisticated mechanised arm of the food production industry.

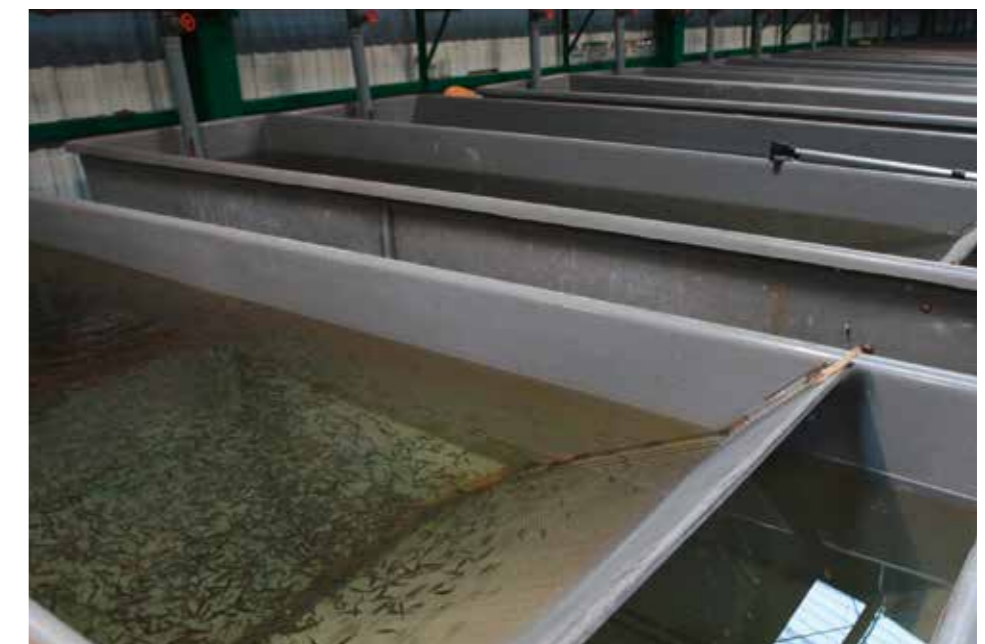
Over half of the fish farmed around the world today are salmonids, to which family trout also belongs. Traditionally, like the rest of Europe, trout farms in Poland are relatively small family enterprises. This ensures that product quality remains high during every stage of the process.

Mieczysław Pelka's rainbow trout farm is in the town of Skrzyszewo, situated in the northeast corner of Poland's Kashubian Lake District. This is where he prepares the fry. The larger fish are placed in ponds fed from the Okalica River and are located in another part of the operation. It normally takes approximately one-and-a-half years for a rainbow trout to go from a newly-hatched fry to a ready-to-harvest fish. To ensure that quality remains con-

sistent, Mieczysław Pelka buys purified fry that turn into healthy, disease-resistant fish. About 450,000 fish eggs are bred in incubators. When all the nutrition in the eggs has been consumed, the fry are transferred to pre-breeding ponds.

The important thing now is to feed the hatchlings, five to six times a day. Trout are

predators and need animal feed (fish meal). Water temperature also plays an important role. Wild trout thrive in cool, crystal-clear waters and therefore need the same thing when they are farmed. When the water temperature rises above 18° C, the fish do not develop as well and are more susceptible to disease. Says Pelka: "You can't fool



Young trout in the pre-breeding basin.



Nitrification ponds also need a lot of air from rotary blowers.

trout when it comes to food and their environment. They need exceptionally clean water and top quality food. They are true aristocrats of the fish world.”

When the young fish in the pre-breeding ponds weigh between ten and twelve grams, they are moved to the breeding ponds, where the water is about 1.5 metres deep. Two pools joined by chutes form a single unit that can accommodate approximately seven tonnes of fish. Air delivered by rotary blowers plays a key role in ensuring that the fish are raised in the best possible environment.

Six KAESER rotary blowers, four DB 166 OFC units and two DB 236 OFC

machines, run continuously in an adjacent building. They have three important jobs: The first is aeration. To saturate the water with oxygen, an air chamber with perforated rubber membranes that emits fine bubbles is installed in the water at a depth of two metres.

The KAESER blowers’ second task consists of supplying air to remove the fish waste from the water. Nitrites that are harmful to the fish are converted to safe nitrates in a nitrification chamber.

And finally, air from the blowers generates large air bubbles via diffusers installed at the bottom of the basin, four metres deep, which raise the water level by over ten cen-

timetres. The continuous raising and lowering of the water level results in the desired water circulation; the bubbles also add to the water’s oxygen concentration.

Two pre-owned KAESER rotary blowers had reliably delivered the necessary air for many years, so when it came to investment in new compressed air equipment for a planned expansion, the owners were already convinced of the right way to go – no discussion was necessary: They had to be KAESER blowers – after all, a trout farm’s success rests on a reliable, continuous supply of quality air.

When the fish weigh about 100 grams, they are pumped to a larger basin, and the breeding basins are filled with a fresh supply of young fish. The fish in any basin must all be close to the same size, otherwise the larger ones would eat the smaller ones.

Before further processing, the fish are placed in sparsely populated ponds fed by water from the Okalica River, so that they acquire a true freshwater trout flavour.



One of the key pillars of successful fish farming: a reliable oxygen supply from KAESER rotary blowers.

■ Author: Robert Ryt

A new benchmark in blower technology

HBS rotary screw blowers: peak performance over the entire control range

The HBS blower series combines KAESER’s many decades of expertise in the development of highly efficient rotary screw compressors with its experience in Industrie 4.0 technology. The new rotary screw blowers from KAESER, driven by a loss-free direct drive, are up to 35 percent more efficient than conventional rotary lobe blowers and also deliver significant energy advantages compared to many rotary screw blowers and turbo compressors available on the market.

Optimal efficiency

These powerhouses feature exceptional control characteristics, quiet operation, an optimised footprint and low maintenance requirements. They also deliver consistently high efficiency across the entire control range – which makes them an attractive alternative to turbo compressors. A frequency converter is integrated for dynamic adjustment of the flow rate to actual demand. The frequency converter and motor are fine-tuned to deliver optimal overall IES2-class efficiency in compliance with the new EN 50598-2 standard.

Smart control

The integrated SIGMA CONTROL 2 controller ensures operational reliability and comprehensive communication through integration into process control systems operating within Industrie 4.0 environments. The SIGMA AIR MANAGER 4.0 master controller is recommended for blower stations comprising multiple machines, as it features control and regulation algorithms specially developed for the needs of low-pressure applications. The SIGMA CONTROL 2 brings additional cost savings by simplifying automation of the individual blowers, permitting them to be grouped as a single system for efficient and coordinated operation.

HBS rotary screw blowers define a new benchmark in blower technology for the 132 to 250 kW power range, with flow rates of 40 to 160 m³/min and differential pressures up to 1100 mbar. Introduced at this year’s IFAT trade fair in Munich as a new entry in the segment of powerhouse machines for wastewater treatment plants – an area otherwise dominated by turbo compressors – the HBS was an immediate sensation. The innovative HBS rotary screw blower sets new standards for exceptional control characteristics and energy efficiency.



Reprint from KAESER Report Issue 2/2013

Premiere at the Goldsteig cheese diary

Success story of KAESER screw blowers

A KAESER EBS series screw blower is making wastewater treatment considerably more efficient and effective at the Goldsteig dairy factory in Cham in the Upper Palatinate region of Germany.

Goldsteig Käserei Plattling eG and the local Cham dairy producers association underwent a merger in 1992 to form Goldsteig Käsereien Bayerwald GmbH – today Germany's most in-demand mozzarella producer and exporter to all of Europe. Another merger followed in 1998, this time with Ostbayerischen Milchwerken eG, and finally in 2000 Goldsteig merged with the local Straubing dairy producers

association. Today the product range encompasses cheeses such as mozzarella, Emmental, semi-hard cheese, Camembert and Limburger, as well as butter, ricotta and mascarpone. The fully automated facility for producing semi-hard and hard cheeses erected in Cham in 2006 meets the highest quality standards. The computer-managed high-bay warehouse ensures optimal storage and retrieval, and most

importantly – that the Goldsteig products are always fresh when delivered to customers.

Blowers for wastewater treatment

Whether as part of the production process or for cleaning purposes, a lot of water is involved in large-scale cheese making. At the Goldsteig cheese factory, wastewater is collected in large tanks and treated sufficiently to allow for disposal into the regular sewage system. As in most modern treatment plants, the process relies on special strains of bacteria which require a sufficient



From mozzarella to Emmental – cheese from the Upper Palatinate region.

supply of oxygen: both to perform their purification functions and to reproduce, which is essential for the process to be maintained continuously.

The submersible blowers previously used at Goldsteig were recently replaced by direct ventilation through a membrane installed on the tank floor. It was a good opportunity to deploy one of the new KAESER screw blowers capable of reliably delivering the required quantity at pressures of 1000 mbar, even with ten metres of water-column – with exemplary energy efficiency. The profile of the rotors in the airend is derived from the famous energy-saving "Sigma pro-

file" used in the rotors of KAESER's rotary screw compressors. Thanks to the inner seal, this means more air and more savings with impressive reliability and durability. The blowers are ultra-quiet and induce only minimal, barely measurable vibrations into the pipe system.

Another feature of the KAESER screw blowers primarily intended for the pressure range from 500 to 1000 mbar is their design as complete systems, delivered ready for use as "plug and play" units. This streamlines installation and reduces the associated cost and effort – in short, an all-round success.

The Golden Road (Goldener Steig)
The name Goldsteig harks back to the Golden Road, an important trade route that connected Bohemia to the Danube in the Middle Ages. It was used to transport salt to Bohemia, while grain was mainly transported in the other direction.

Author: Klaus Dieter Bätz



SIGMA
Rotary blower series EBS.



KAESER systems for water management

Water needs compressed air



Image: Fotofa.com

For potable water supply, wastewater treatment and infrastructure maintenance, compressed air at varying pressures and levels of purity is indispensable.

At the world's leading trade fair for water treatment and wastewater processing, KAESER KOMPRESSOREN showcased how compressed air can be produced reliably, as needed and with exceptional energy efficiency for water and wastewater treatment plants.

For potable water treatment...

...thanks to their uncompromising reliability, KAESER rotary blowers are the blower of choice in many locations for flushing sand filter systems and membrane filters. Kaeser rotary screw compressors are used, for example, for removal of undesired (lime) particles from incoming water. Water saturated with air bubbles is injected into the water being treated within flotation pools. The bubbles attach to the lime particles and transport them to the surface where they are filtered out and reused in processes such as cement manufacturing. Of course, the rotary screw compressors used to produce the ventilation feature food-safe fluid as coolant and rotor lubricant. Downstream compressed air oil filters complete the compressed air treatment process.

Blown air – the “elixir of life” for wastewater treatment plants

Wastewater treatment plants imitate biological cleaning processes that occur automatically in natural bodies of water. Blower ventilation increases the oxygen content, which accelerates the process. The success of this biological process depends on its continuity: microorganisms are only effective if they remain continuously viable. Every interruption leads to a breakdown in the treatment chain, requiring laborious reestablishment of the bacterial cultures. Absolute reliability is therefore the most important requirement for the blowers used in this area. And users are increasingly deciding in favour of rotary blowers from KAESER KOMPRESSOREN since, in short: “Nothing runs with as few problems as the KAESER blowers – if only all our systems were that reliable!”

Mobile compressed air for sewer rehabilitation

Defective sewer pipes in buildings are now being made watertight again thanks to

modern compressed air technology – without the need for major excavation. A compressed air-powered grinding robot works underground to clean out the damaged sewer pipe and remove any invading tree roots. The compressed air required to “blow in” the PVC inline repair hose can be easily produced by the KAESER M 13 MOBILAIR portable compressor, which can be easily transported in a truck.

Author: Klaus Dieter Bätz



Reprint from KAESER Report Issue 1/2014

Upgrade for a wastewater treatment plant:
La Calera, Colombia

On the shores of the sacred lake

After just a few months of system operation, KAESER Colombia Ltda was informed that the client was enjoying energy savings of approximately 80 %.

The small mountain town of La Calera, Colombia, is situated 9 km to the north-east of Bogotá at an altitude of 2700 meters. It is a dream destination for outdoor enthusiasts, far removed from mass tourism.

Its origins date back to the Spanish colonial era, when, in 1772, Pedro de Tovar y Buendía founded a hacienda near the neighbouring limestone mines. That hacienda now houses the administration offices of the town that gradually took shape around it, including the pretty Nuestra Señora La Virgen del Rosario chapel. Every year it attracts visitors who come to enjoy riding, hiking, climbing and the many other outdoor activities available in the vi-

cinity. Cosy taverns, lively bars, restaurants and guesthouses offer passing travellers and day-trippers enticing options for rest and refreshment. La Calera is an ideal spot to recover from the stresses of everyday life stress amid beautiful natural scenery.

The legend of El Dorado

The area also has a history, continuing to the present day, as a magnet for adventurers and archaeologists – both amateur

and professional: in pre-colonial times, the region was populated by the Chibcha people, who are believed to have originated the myth of the legendary El Dorado (“The Golden Man”).

According to the story, the Muisca, a Chibcha tribe, had an initiation rite for their rulers in which the new king taken to Lake Guatavitá, a small lake in the mountains near Bogotá, to worship the sun god. He was covered with gold dust and then rowed

with his followers on a raft laden with emeralds and gold to the middle of the lake. There he immersed himself in the water, causing the gold to sink to the bottom. Other valuables, including gold and emeralds, were dropped into the lake by the king’s companions. These treasures are said to be still submerged on the bed of the lake and were the likely cause of the gold rush by the European conquistadors who, according to legend, arrived in several waves in search

of the riches of the earlier inhabitants. Possible proof of the existence of the ritual is seen in the legendary “Muisca raft”, which was discovered in a cave to the south-west of Bogotá in 1969. It probably dates from the period between 600 and 1600 AD and is displayed today in the Museo del Oro in Bogotá.

Popular destination for adventurers and nature lovers

There are consequently many reasons for tourists to visit La Calera and spend a holiday there. But until recently there was one problem: The big blowers in the plant treating the sewage of the town of 30,000 and returning the purified water to the Teusaquillo River could be heard far and wide – and also spread a powerful odour throughout the surrounding area.



Nature has also made a comeback since the switchover.

Visitors to the plant had to wear ear protection and a face mask or keep a safe distance.

Necessary expansion

The ESPUCAL ESP city works department asked KAESER for a proposal to expand and optimise the existing wastewater treatment plant. Among the findings of the KAESER experts who surveyed the site:

the airflow provided by the three blowers was not meeting the design specifications. When KAESER explained the benefits of rotary screw blowers, and in particular the possibility of generating more compressed air with less energy, the municipal officials in the La Calera – Cundinamarca district, which is responsible for the plant, opted for three EBS 380 M STC blowers with a total power rating of 111 kW.

Expectations exceeded

The first success was seen within just three days, when the indicated oxygen level in the plant rose to 1.3 ppm – a big improvement over the usual 0.3 ppm. The foul odour gradually faded and soon vanished entirely, while the oxygen concentration rose to around 2 ppm. From that time onward, the plant operators saw a steady increase in positive feedback: “What did you do to

the wastewater plant? Did you relocate it? Have you closed it?” Before long, the positive effects of the upgrades were evident to all inhabitants of La Calera. Today tourist buses are again stopping outside the plant. Even nature has been appreciative – as seen in the reappearance of hummingbirds in the area. The plant operators were initially expecting savings of 28%, but after just a few months of plant operations, KAESER

Colombia Ltda was informed that the new system was actually achieving energy savings of approximately 80%.



Image: By Andrew Bertram (Wor066) [CC BY-SA 1.0] (<https://creativecommons.org/licenses/by-sa/1.0/>), via Wikimedia Commons



The system after the optimisation project.



La Calera wastewater treatment plant.

Author: Petra Gaudiello

All images: Kaeser Compressores Colombia

Reprint from KAESER Report Issue 2/2018

Quiet and efficient: Turbo blowers from KAESER

Lake Constance: Scenic holiday destination and vital water source

Located on the northern fringe of the Alps where Germany, Austria and Switzerland meet, Lake Constance is Central Europe's third largest lake by surface area, after Lakes Balaton and Geneva respectively. Due to its mild climate and delightful countryside, this scenic lake is not only a renowned holiday destination and local recreational area, but also serves as a key source of drinking water. With a water volume of some 48.5 km³, Lake Constance provides around 180 million cubic metres of drinking water per year to approximately 4.5 million people in the region. The Langwiese water treatment plant, situated within the lake's drainage basin, uses the very latest technology to meet the required stringent water quality standards.



Investment in new turbo blowers achieved three goals in one: energy efficiency, noise reduction and cost efficiency.

The Langwiese wastewater collection and treatment plant is the largest of its kind in the northern catchment area of Lake Constance.

The Langwiese wastewater collection and treatment plant, designed to meet the needs of 184,000 inhabitants, is the largest treatment plant in the northern catchment area of Lake Constance, serving the municipalities of Ravensburg, Weingarten, Baienfurt and Berg. Since 2013, in addition to the usual three purification stages – me-

chanical, biological and chemical – the facility has also employed a so-called “fourth purification stage”, whereby powdered activated carbon is used to eliminate any re-

maining trace elements and micro-pollutants (residue from detergents or medications, for example) from the water. This adsorption treatment procedure ensures

that the treated water flowing back into Lake Constance via the Schussen River meets the very highest water quality standards. It predominantly takes place

after the biological stage and before the filtration process, using a single-line adsorption stage consisting of a contact reactor with a 3-tier cascade, followed by a circular

sedimentation tank. Next, in order to boost the adsorption process, the partially laden activated carbon is redirected back through the biological stage. Expansion of the ad-



Compressed air is used to supply oxygen for the microorganisms active in the clarification tanks.



The new LP8000 Pillaerator turbo blower from KAESER.

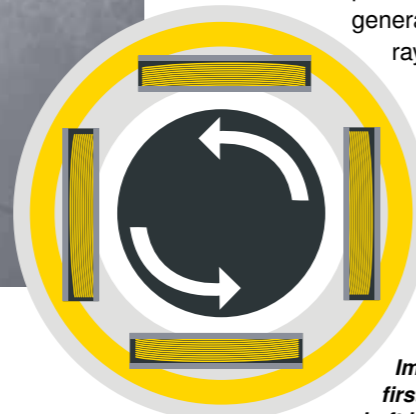


Image left: From the first rotation, the drive shaft is suspended in a frictionless controlled magnetic field, which is generated by a circular array of permanent magnets and electromagnets.

non-wearing and maintenance-free – all of which make Pillaerator turbo blowers from KAESER the perfect choice to meet a wide range of blower air needs.

Author: Petra Gaudiello

clarification tanks, require ambient air in order to ensure a healthy growth environment for the microorganisms active there. Before the plant was modernised, this air was provided by five ageing rotary lobe blowers, each one originally supplied by a different manufacturer. Owing to their age, these machines were not only far from energy efficient, but they also incurred high regular maintenance and repair costs. Furthermore, they happened to be located directly beneath the staff room and their noise could clearly be heard. The reasons for modernisation of the blower station were consequently threefold: to improve energy efficiency, to reduce noise levels and to minimise costs. In late 2017 / early 2018, these targets were met in full with the installation of four 150 kW LP8000 Pillaerator magnetic-bearing turbo blowers for flow rates up to 8000 m³/h. High-efficiency Pillaerator turbo blowers from KAESER are renowned for their quiet operation, exceptional cost efficiency and low-maintenance design. The vertically configured drive shaft is connected to the impeller and is suspended in a magnetic field generated by a circular array of permanent magnets and electro-

magnets. Thanks to its dynamic magnetic bearings, the drive motor is oil-free, vibration-free, frictionless,

sorption stage into a full-flow treatment phase was one of the Langwiese plant's pilot projects back in 2013. Today, it is one of the biggest of its kind in Germany.

Full power

For their water purification and sludge treatment procedures, wastewater treatment plants consume a considerable amount of energy, in the form of both electricity and heat. The obvious solution to this problem is to use waste material extracted from the water during the purification process for the purposes of energy recovery. In practice, this involves harnessing gases released during the sludge digestion process and using them to generate electricity – generators at the facility's 3 thermal power plants convert the energy released by burning these gases into electricity and usable heat

energy. This allows the Langwiese treatment plant to be fully self-sufficient in terms of its energy needs. This is not to say, however, that the subjects of energy consumption and energy efficiency have been rendered completely irrelevant.

Even recycled resources have limits to their availability and hence, at times when not enough waste gas can be harnessed to produce the amount of electricity required by the plant, further supplies must be sought via the local energy supplier. (In fact, this works both ways: at times when the treatment plant is recovering more energy than it requires, it becomes a supplier to the local network!)

Turbo blowers hold the key

The biological purification stages of the treatment process, which take place in the

SIGMA AIR MANAGER® 4.0



- **Availability:** Health statuses, maintenance hours counters, administration – everything at a glance
- **Monitoring:** Live values, status, runtime data, KPIs. Documentation and overview of individual data perspectives
- **Energy & costs:** Period comparison, table, reporting. Easy energy management for optimised cost control

- **Networking:** Control technology, KAESER Connect, KAESER Plant Control Center. Individual connection for every standard
- **Efficiency:** Unique, simulation-based optimisation process. Compressed air generation with minimal energy consumption



KAESER KOMPRESSOREN – More compressed air for less energy



State-of-the-art rotary screw blowers for the wastewater treatment plant at Neustadt an der Weinstraße

From wine into water...

For wastewater management companies located in Germany's winelands, the beginning of the winemaking season in the autumn marks their busiest time of the year by far. The introduction of lees, grape pomace, yeast and yeast residue, amongst other leftovers from the wine industry, into the sewerage system represents a considerable challenge for local treatment facilities. Not so, however, for the wastewater treatment plant at Lachen-Speyerdorf, which recently benefited from the installation of an ultra-modern blower station – courtesy of KAESER KOMPRESSOREN.

The wastewater treatment plant at Neustadt an der Weinstraße is owned and managed by the town's in-house waste disposal operation (Eigenbetrieb Stadtentsorgung Neustadt an der Weinstraße, or ESN). Located in the district of Lachen-Speyerdorf, the facility was designed to provide water treatment services for 85,000 residents and handles around 4.25 million cubic metres of wastewater per year; it serves every district in town, including the town centre.

By the parameters under which it is monitored, the average cleaning performance stands at over 90%.

Staying ahead of the curve

Commissioning of the Lachen-Speyerdorf treatment plant originally took place in two distinct stages. Mechanical pretreatment was available from inauguration in 1975, whilst biological treatment in the form of an

activated sludge procedure followed a few years later, in 1978.

In principle, the biological treatment stages of a water purification plant function the same way as does the organic self-cleaning process undergone by waters in nature, albeit in a technically optimised and considerably less time-consuming fashion. Biological purification takes place after the mechanical pretreatment phase, using billions of microorganisms to convert dissolved matter in the wastewater (organic carbon, nitrogen and phosphorus compounds) into settleable solids – i.e. a biomass – by means of their metabolic activity. The biological purification stage can be divided roughly into two separate processes: nitrification and denitrification. Nitrification is the biological oxidation of ammonia to nitrate, via the intermediate stage of conversion to nitrite. This transformation is

undertaken by aerobic bacteria. Subsequently, denitrification takes place by means of introducing anaerobic microorganisms, which serve to reduce the nitrate to elementary nitrogen. Matter contained within the untreated wastewater provides a source of nourishment for the bacteria in the activated sludge, thereby ensuring a constant regrowth. Their only other requirement is, of course, a supply of oxygen. There are various ways of achieving this.

Back in 1994, a pure oxygen aeration system was installed for the biological purification stage – a decision taken

on the basis of the prevailing circumstances at the time. This, however, proved to be an expensive solution in the long run,

on account of the need to procure regular supplies of pure oxygen. Therefore, one of the aims of the recent modernisation of



The refurbished aeration tanks.



An aerial view of the facility at Lachen-Speyerdorf.



The blower station at the Lachen-Speyerdorf wastewater treatment plant, with its high-efficiency rotary screw blowers from KAESER KOMPRESSOREN.

the facility was to find a more cost-effective solution for the aeration processes, which would ultimately mean replacing the blower station.

A new brief

2015 saw the implementation of a comprehensive, multi-stage renovation and rehabilitation project at Lachen-Speyerdorf. The aim was to optimise the existing systems and equipment, from refurbishing the concrete in the tanks to renewing the lines and updating the electrical systems and software. Not only this, but the project set out to achieve clear cost savings and efficiency gains, whilst maintaining the facility's impressively high cleaning performance of around 96%.

Our new rotary screw blowers deliver clear cost savings with superior efficiency.

Increasing energy efficiency levels whilst simultaneously reducing costs happens to be KAESER's core competency. It transpired that, having installed a KAESER blower for supplying oxygen to one of the nitrification tanks back in 2003, the operators at Lachen-Speyerdorf were already familiar with the reliability and performance of the products and services on offer from the Coburg-based systems manufacturer. Another factor that stood out in their favour was the availability of a full, 10-year service contract.

Turbo blowers or rotary screw blowers?

When considering which of KAESER's energy-efficient blower models would be best suited for converting the tanks from

pure oxygen aeration to compressed air aeration, there were two choices in the running; turbo blowers and rotary screw blowers would both be equally adept at fulfilling the plant's requirements. In terms of energy consumption, there was not much in it either. In the end, the decision came down in favour of rotary screw blowers on account of their superior controllability, which comes into play from being able to

split the individual units and apply differing flow rates. Hence, since the autumn of 2019, the supply of air for the two 4m-deep aeration tanks has been provided by a type DBS 220 L SFC 30 kW (max. pressure differential 650 mbar, max. flow rate 23 m³/min) and two type EBS 380 L SFC 37 kW (max. pressure differential 650 mbar, max. flow rate 38 m³/min) rotary screw blowers, each one equipped with a frequency converter.

In addition to these units, further new machines would be required for the purposes of rehabilitating a 5.5m-deep nitrification tank, the aeration system for which had at some point previously been converted from coarse-bubble disc diffusers to fine-pore membrane plate diffusers. Here again, cost

savings and reliability of supply were the guiding principles and this time the solution was a DBS 220 M SFC 30 kW (max. pressure differential 1100 mbar, max. flow rate 22 m³/min) and two type EBS 380 M SFC 45 kW (max. pressure differential 1100 mbar, max. flow rate 37 m³/min) machines, also each with frequency converter. One of the two larger units is sufficient to cover the necessary redundancy to ensure that

the compressed air supply can still be covered in full when it comes to maintenance or repair work, or in cases of fluctuating air demand (such as occur during the grape harvest). This new, state-of-the-art blower station easily fulfils all the technical prerequisites necessary to guarantee peace of mind for the operators at the Lachen-Speyerdorf treatment plant – even at the height of the winemaking season!

Author: Petra Gaudiello

Reprint from KAESER Report Issue 2/2020

New Rotary Screw Blower EBS 410

Maximum efficiency, minimal space requirement

Flow rate 10 to 41 m³/min, Pressure differential up to 1.1 bar



- **Slip-free synchronous reluctance motor**
Combines the advantages of high-efficiency permanent magnet motors with those of robust, maintenance-friendly asynchronous motors
- **Ready-to-run and powerful**
Complete with controller and frequency converter, or star-delta starter
- **Minimal space requirement**
Side-by-side installation possible, compact footprint of only 2.2 m² (Version C)

- **Maximum efficiency**
Up to 35 percent more efficient than conventional rotary lobe blowers thanks to the Sigma rotor profile and efficient IES2 / IE 4 drives
- **SIGMA PROFILE**
Proven KAESER rotary screw compressor technology now also available for the low pressure range

KAESER KOMPRESSOREN – More compressed air for less energy

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Top-quality golfing with KAESER rotary lobe blowers

All-in for a hole-in-one

Set amongst the picturesque green hills of Beecroft in the Australian state of New South Wales, the Pennant Hills Golf Club is the fourth oldest golf club in the area. Founded in 1923, it still occupies its original location in the Hills Shire district to the northwest of Sydney. Over recent years, a lengthy period of drought caused by persistently high temperatures and strong winds across the whole of southern Australia has turned the upkeep of its green areas into one of the greatest challenges facing the club today.

Mention the words “golf course” and most people immediately bring to mind images of endless, lush green grass stretching far away into the distance. Even in Australia, where large parts of the country has experienced severe and long term drought, a luxurious growth of grass is an essen-

tial prerequisite for any golf club. To keep its expansive turf areas well-groomed and healthy, the Pennant Hills Golf Club (PHGC) needs to provide them with a constant supply of high quality irrigation water. However, with the municipal water supply also under pressure from growth and drought in the re-

gion, the time had clearly come for the club to start looking at new solutions for an independent supply of its own.

Groundbreaking sewer mining project

Having taken the time to search for the right consultants, PHGC approached Permeate Partners – a consultancy specialising in the analysis, procurement, operation and maintenance of water and wastewater in-

frastructure. Known for meeting the challenge of increasing water scarcity head-on with innovative solutions, “recycling” is the watchword for these water industry experts. According to their calculations, the most cost-effective solution for irrigating the green areas of the golf club was to recycle

wastewater sourced from the nearby sewers, using a technique called sewer mining. State-of-the-art technology would then be brought to bear, so as to ensure that the wastewater is sufficiently treated to meet the necessary quality levels. This is where the rotary lobe blowers from KAESER



Rich in tradition, the Pennant Hills Golf Club was founded in the 1920s.



Four COMPACT-series rotary lobe blowers from KAESER are used to deliver process air for the membrane bioreactor.

The well-tended greens are the flagship feature of the Pennant Hills Golf Club.



The water recycling plant supplies the club with its own source of irrigation water.



The innovative solution from Permeate Partners was to use treated wastewater for the purposes of irrigation.



Our Compact rotary lobe blowers have proven their reliability – still running perfectly after over 12 years of operation.

The Pennant Hills Water Reclamation Plant commenced operation over 12 years ago and is capable of producing up to 650,000 litres of high-quality recycled water per day, which is used to irrigate the golf course.

come into play; blowers are a key component of any wastewater treatment facility and the water recycling plant at PHGC is no exception. Fortunately, the premises at Pennant Hills included a patch of unused land situated just 100m from the sewer in question, which would prove the perfect location to construct the new recycled water plant.

Low-pressure process air

At the heart of the wastewater treatment process lies a membrane bioreactor. In this system, the treated water from the biological

reactor is drawn through the surface of a membrane, which serves to remove any remaining solids and pathogens. When the suspended solids are rejected from the membrane surface, they are returned to the start of the biological reactor. The water which passes through the membrane can then be reused following further disinfection via UV and chlorine.

For this procedure to be effective, a dependable source of low-pressure process air is needed. Two compact, type BB 88 C rotary lobe blowers (15 kW, max. usable

flow rate 8.2 m³/min) from KAESER provide the biological reactors with oxygen aeration for the microorganisms active within. Two further KAESER rotary lobe blowers – this time 7.5 kW BB 88 C (max. usable flow rate 4.7 m³/min) – serve to aerate the membranes, which prevents any suspended solids from sticking to their outer surfaces.

Rotary lobe blowers from KAESER's BB-series are compact complete machines featuring OMEGA Profile rotors. Delivered ready for connection, including a full set of sensors, star-delta starter (or frequency

converter) and complete CE and EMC-certification, they considerably reduce both the workload and expenditure associated with planning, assembly, certification, documentation and commissioning. As with all KAESER products, they are designed for maximum levels of efficiency, reliability and durability and, thanks to minimal maintenance and service requirements, guarantee lowest possible life-cycle costs.

Years of satisfaction

The wastewater treatment plant at Pennant Hills was commissioned around 12 years

ago and has been providing up to 650,000 litres of high-quality, recycled water per day ever since. Approximately 98% of the water sourced from the sewer system is recycled for the purposes of irrigating the greens, with the remaining 2% flowing back into the sewers as activated sludge.

Kurt Dahl, Managing Director at Permeate Partners, sums up his satisfaction with the four rotary lobe blowers: "In operation now for over 12 years, they have proven their reliability and are still running perfectly. As the plant is nestled within the course, it was im-

portant that we selected equipment with low noise levels and the KAESER blowers have certainly proven to be quiet operators, contributing to the overall whisper-quiet sound level of the plant."

Author: Petra Gaudiello



All images: TRATAVE S.A.

The Pillaerator LP 14000 turbo blower from KAESER achieves the project's needs in full, with 25% less power consumption than the previous system.

Portugal: Wastewater treatment with KAESER

Compressed air for a cleaner future

For almost 200 years, the wastewater management sector in Portugal has had to face ever increasing challenges, brought about in large part by the rapid population growth since the beginning of the industrialisation process around the middle of the 19th century. This growth was compounded by rapid development of the textile industry in the north of the country, where many of the manufacturers are located in the region around the Ave River.

Home to approximately 700,000 people, the heavily industrialised Vale do Ave region (Valley of the Ave River) covers an area of some 1400 km² and comprises 14 municipalities in the districts of Braga and Porto. During the twentieth century, the textile industry saw strong growth in the region around the Ave River and its tributaries, due to the fact that water was required not only as a resource, but also as a means for discharging industrial wastewater. As the industry grew, so did the demand for labour, which in turn led to corresponding population growth and increased pressure on the local environment. Deterioration of

the water quality in the rivers of the catchment area was therefore inevitable – in fact it became so bad that the water was deemed “not suitable for consumption” and, in some parts of Vale do Ave, even “harmful to aquatic organisms”. It was clear that urgent improvement measures were needed, the implementation of which began to take shape in 1998 with the establishment of SIDVA (the Portuguese acronym for Vale do Ave Integrated Rehabilitation Project).

Extensive rehabilitation
TRATAVE is the name of the institution established that same year exclusively to

manage and operate the SIDVA project, making it responsible for the drainage, purification and end use of both industrial and domestic wastewaters in the municipalities of Guimarães, Vizela, Vila Nova de Famalicão, Santo Tirso and Trofa. Its most important objectives include protecting the local ecology and improving the quality of the environment, in collaboration with local residents and businesses. The sustainable activities undertaken and encouraged by TRATAVE are credited with a significant increase in water quality and a corresponding improvement in the quality of life for the inhabitants, thereby helping to mitigate the

effects of the human population and industrial activity on the region's ecosystem, which remains one of the most heavily affected in the country.

Around the middle of 2020, TRATAVE took the decision to invest in modernisation of the aeration system for the biological reactors at the Serzedelo II wastewater treatment plant – a system which uses ambient air to ensure healthy growth of the microorganisms active in the clarification tanks. Seeking a low-pressure compressed air supply that would not only be completely dependable, but which would also provide the perfor-

mance, energy efficiency and environmental friendliness that only the very latest technology can offer, TRATAVE turned to KAESER Portugal to implement the project – one that happened to be tailor-made for turbo blowers. Pillaerator turbo blowers from KAESER were developed specifically with aeration applications in mind; equipped with an innovative magnetic bearings system, the drive system on these machines operates completely wear-free. Moreover, the combination of a directly driven, magnetic bearing rotor and an intelligent controller means that Pillaerator turbo blowers are exceptionally efficient, saving up to 25%

of the energy consumed by machines using conventional technologies.

Turbo control
Pillaerator blowers make a significant difference when it comes to saving energy. They not only enable optimised, application-specific operation, but are also able to react quickly to changing conditions. Use of the very latest measurement technology and perfect interplay between all components allow motor power to be modulated anywhere between 15 and 100% capacity. Integrated, continuous measurement of the process air mass flow allows the delivered



KAESER turbo blowers support us in achieving our environmental goals.

flow rate to be adjusted in accordance with the changing needs of the application. This makes the process simple to control and also prevents energy losses due to over-aeration.

Energy efficiency par excellence

Prior to the modernisation project, the TRATAVE air station consisted of a rotary lobe blower supplied by another manufacturer. Owing to its frequent faults and a relatively high power consumption of 400 kW, this machine was no longer fit for purpose, hence, following an intensive analysis and the decision to go with KAESER technology, a superior system design was proposed for the rejuvenated facility, delivering an air volume of 220 m³/min and pressure of 750 mbar.

As a result, the air supply for one of the plant's aeration tanks is now provided by a PillAerator LP 14000 turbo blower from KAESER (flow rate 75 – 267 m³/min, gauge working pressure 0.3 – 0.9 bar), which delivers the exact amount of air required for the process.

Operating in the low-pressure range of 750 mbar with a power consumption of 300 kW, this system achieves a saving of 25% compared to its predecessor. The actual consumption figures confirm the energy savings calculated in advance by the KAESER experts, yet the system still provides the performance necessary for the treatment process.



The project team at TRATAVE is extremely satisfied with the environmental friendliness and energy efficiency of the KAESER system.

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Author: Petra Gaudiello



More sustainable use of a vital resource

Digitalisation and automation in the water management sector

“Networking of machines and processes”, “Smart Factory”, “Internet of Things and Services”: these kinds of terms are very familiar to us nowadays, particularly in relation to Industrie 4.0, and we come across them on an almost daily basis in the media. Similarly, the approach to Water 4.0 has also been placed within a systemic water management context for some time. Water 4.0 creates the conditions for effective digitalisation and automation of the water management sector..

The prerequisite for implementation of this change in industrial production, also referred to as the 4th Industrial Revolution, and which is now also transforming the water technology sector, is the possibility of comprehensive communication between individual machines within a system and also, ultimately, with a master process control system. The aim of this communication is to facilitate greater flexibility regarding control of the machine, as well as diagnostics of its operating and status data in real-time, in order to ensure maximum reliability with optimum cost control. This is made possible thanks to the extensive sensor technology that is used to record status data, while the internal SIGMA Control 2 machine controller processes these data. To make sure that advanced modern compressed air controllers such as these also meet the associated requirements of Industrie 4.0 and Water 4.0, they transmit a large amount of operating

and status data from the individual blowers and the station in real-time to the master process control system, where the gathered information is further processed.

Core intelligence

The Sigma Air Manager 4.0 master controller is key technology for successful implementation of Water 4.0. It ensures efficient interplay of all components within the blower station and therefore provides significantly higher savings potential. The control and regulation algorithms of this core intelligence technology were developed specifically for operation in the low pressure range and are far more nuanced than those used with simple switching cascade control. Rather, it is a matter of simulating the best possible combination of the machines within a system prior to each switching operation, in order to meet current air demand not only as reliably, but also as energy-ef-

ficiently as possible. The operator benefits from significantly lower operating costs and maximum data transparency, which helps with energy management system implementation as per DIN ISO 50001 and provides key information pertinent to DWA worksheet A 219 (Energy check and energy analysis – Instruments for energy optimisation of wastewater systems).



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