Respect for the environment

Thanks to a new rotary screw blower from KAESER, the wastewater treatment plant in Germany's Treis Karden is now even more efficient than ever and also respects the environment.

The regional municipality of Cochem in Germany operates a highly innovative network of wastewater treatment plants and is always looking for new ways to improve efficiency whilst also respecting the environment.

With the help of a new rotary screw blower in the town of Treis Karden, purified water flows continuously into the Mosel River at an astonishing rate of 344 litres per second – all with a reduced burden on the municipal coffers.

The wastewater treatment plant in Treis Karden is a Sequencing Batch Reactor (SBR), a configuration in which the wastewater is processed in batches. Each cycle takes place in a basin filled to around 5.5 metres and lasts for some 300 minutes at physical pressures of around 570 mbar.

Another challenging aspect of this particular application is the dramatic variation in the volume of wastewater over the different seasons of the year. In the summer months, the flood of tourists and many local vintners generate significant volumes, whilst much less is generated during the winter months. To accommodate this, the pressure varies between 480 and 570 mbar (g) depending on the water level in the SBR plant.

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Previously the Treis Karden wastewater plant used rotary lobe blowers – a solution with which the operators were very satisfied. At six metres, the depth of the treatment plant basin is essentially average for such applications. This is advantageous since the optimal depth for air injection is about five metres. This water depth ensures the best air input. Although the previous equipment performed well, the innovative design and technology of the new recently launched rotary screw blower are now delivering significant energy cost savings and reduced sound emission levels in comparison.

Considerable cost advantages

When the time came to replace the older rotary lobe blowers, the regional municipality of Cochem therefore opted for trial installation of a new FBS-type rotary screw blower with a free air delivery of 67 m³/min. The unit itself features a blower airend with initial pressure of 650 mbar, which integrates perfectly with the rest of the wastewater treatment system.

The new rotary screw blower boasts a range of impressive advantages. Compared to conventional rotary lobe blowers, it delivers up to 35 percent better efficiency – depending on operating conditions. At the same time, this new technology offers significant energy advantages compared to many rotary screw and turbo blowers available on the market. These energy savings are largely achieved by the internal initial pressure of the rotary screw blower which already closely approximates the system pressure. This reliably avoids the phenomenon known as “over compression”. This results when rotary screw blowers produce higher pressures than which will ever be required by the wastewater treatment plant and is caused by the internal geometry of the unit. In such unfortunate cases, the energy advantage of the screw compression method is lessened, or in worst case scenarios, is negated completely.

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Long-term efficiency

The rotors are not coated, which ensures that efficiency remains constant, even after years of use. The airend concept (patent pending) offers yet more advantages to enhance potential energy savings, whilst also considerably boosting the specific power of the system overall. One significant effect is that even when operating at a lower speed, the machine can still be operated more effectively than with previously available rotary screw blowers – in other words, these new screw blowers deliver a broader control range than most other units on the market. Moreover, the rotary screw blowers are delivered as a complete system. This means that the blower system comes pre-equipped with the integrated Sigma Control 2 controller as well as all required control electronics, such as a frequency converter. Installation is greatly simplified since the frequency converter is already pre-programmed and the entire unit has undergone extensive testing and inspection at the factory.

The controller additionally ensures constant and comprehensive system monitoring whilst simultaneously enabling straightforward and cost-effective integration with the wastewater treatment plant's existing process control systems. Such integration can be accomplished either via conventional, floating contacts or also via Profibus DP and Ethernet connectivity. Since wastewater treatment plants are already equipped with the latest process controllers and support Profibus DP, the screw blower unit concept meshes seamlessly into the forward-looking operations of the wastewater treatment plant. In short, the easy installation and commissioning procedures enable operators to take advantage of even further cost savings.

The FBS rotary screw blower in the Treis Karden wastewater treatment plant will replace the previous rotary lobe blower

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Clever design

The new rotary screw blowers also offer further benefits that enhance energy efficiency and, as a result, achieve greater cost savings. They incorporate a clever cooling concept that eliminates the high energy consumption associated with oil pumps and oil coolers, and their highly effective sealing concept also ensures long-term seal fastness – without a vacuum pump.

Dispensing with subsystems and oil circulation lubrication additionally improves machine durability and reliability. Optimal cooling and efficiency are achieved by separate inlets for the cooling and process air and by arranging them outside of the enclosure. So, for the same power consumption, this allows the blower to deliver a greater usable air mass flow. The blowers are also exceptionally reliable and ensure extraordinary durability – even with continuous operation. Intelligent component layout enables unit installation either against a wall or side-by-side with other machines, which not only makes maintenance convenient and cost-effective, but also minimises installation space requirement.

In Treis Karden, the wastewater system had been retrofitted with a sludge press which partially blocks access to the basement area where the blower system was to be installed. This hurdle, combined with the fact that it was not possible to decommission the sludge press during plant operation, presented no problem however, because the rotary screw blower's modular design meant that it could be separated into individual parts, and then be reassembled and commissioned in the installation room itself.

The results have been impressive, but since the previously installed rotary lobe blowers already delivered relatively high energy cost savings for their class and the water treatment plant experiences fluctuating water levels, the actual savings in this instance are not as high as they potentially could be. Despite the fluctuating water levels (with a maximum counter pressure of 570 millibar) though, impressive energy savings of up to 25 percent compared to the rotary lobe blowers have been achieved during certain periods; the values were measured and confirmed by a local engineering firm.

Get in touch if you have any questions or are looking for advice about the best compressed air solution for your operation to achieve the lowest total lifecycle costs. HPC KAESER offers a range of products, including blowers and rotary screw compressors supported by experienced and knowledgeable engineers and a nationwide network of authorised distribution partners. Contact us to find out more.

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