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MUNICIPAL WASTE WATER MANAGEMENT GOES DIGITAL

APPLICATION DETAILS

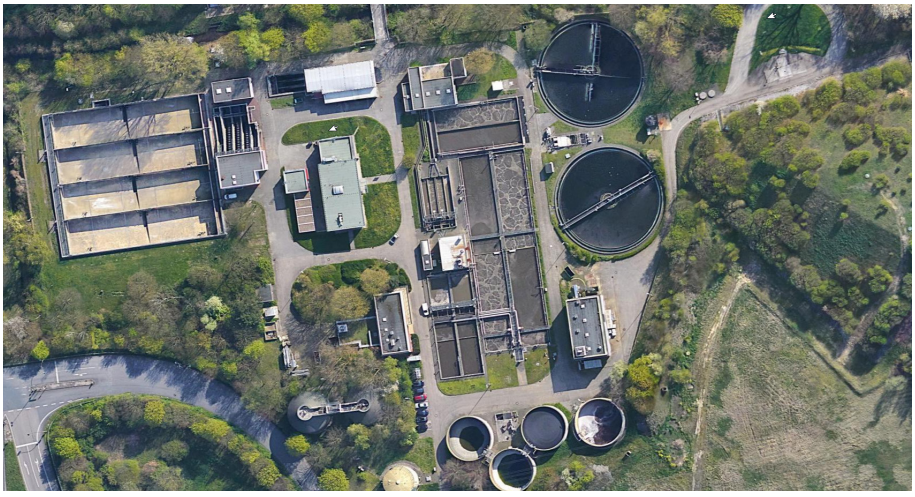
- Sewage sludge with a 3-4% dry solids content
- Conveying capacity: 5–7 m³/h

KEY SPECIFICATIONS

- A mechanically further-developed progressive cavity pump with hydraulic adjustment unit for automated and highly precise adjustment of the stator clamping
- Digital connection for pump monitoring and predictive maintenance

BACKGROUND

The Gelsenkirchen Picksmühlenbach wastewater treatment plant of the Lippeverband (LV) is located in the north of the city of Gelsenkirchen and, as part of the municipal water management system, is responsible for treating wastewater for a local population of more than 57,000. The conveying and further processing of highly abrasive wastewater and sewage sludge are important process steps. For this task, the operator has successfully used a SEEPEX progressive cavity pump for many years.



Gelsenkirchen Picksmühlenbach sewage treatment plant of the Lippeverband (LV)

TASK

Within the wastewater treatment plant, highly abrasive sewage sludge with a dry solids content of about 3-4% is conveyed at 5-7 m³/h and with a 2-6 bar back pressure. Due to its highly viscous and abrasive dry solids content, conveying the sludge is demanding and wear-intensive for the pumps. So far, a SEEPEX BN 52-6LS pump has been used in non-continuous permanent operation. The stator and rotor, in particular, are subject to high abrasive wear, accompanied by a decrease in pump performance. At a constant speed, this becomes noticeable in a steadily accelerating decline in flow rate. Increasing speed can compensate for a reduced flow rate but it is not always possible in a given situation. However, this leads to an increased energy demand of the pump and an ever-increasing growth of the wear rate. In addition to higher operating costs, this would lead to a substantial reduction in service life of the rotor and stator.

INNOVATIVE PACKAGE UNIT – AUTOMATED PUMP WITH MODERN DIGITALIZATION

COST SAVINGS

WEAR COMPENSATION AND INCREASED EFFICIENCY

PREDICTIVE MAINTENANCE MINIMALIZES MAINTENANCE WORK

LESS ENERGY CONSUMPTION

AUTOMATED ADJUSTMENT OF STATOR CLAMPING SAVES TIME

SEEPEX PRODUCTS

- SCT AutoAdjust BN 35-6LAS
  Pressure: 2-6 bar
  Conveying capacity: 5-7 m³/h
- SEEPEX Connected Services with SEEPEX Pump Monitor and Advanced Analytics including a comprehensive sensor package

SOLUTION

In order to further increase efficiency and reliability, SEEPEX replaced the previous solution with the world's first automated progressive cavity pump – SCT AutoAdjust. In September 2019, SEEPEX specialists and the operator successfully commissioned the new pump at the Gelsenkirchen Picksmühlenbach wastewater treatment plant. "SCT AutoAdjust combines a newly developed hydraulic adjustment unit with digital monitoring and control. Making it the world's first progressive cavity pump that automatically adjusts its operating point at the touch of a button," explains Dr. Fabian Pöhl, a SEEPEX Product Manager. This technology allows the pump to compensate for any occurring wear and to always operate at maximum efficiency and the optimal operating point. The pump's streamlined operation enables using a smaller sized drive with a significantly smaller footprint. Compared to the previous solution, the new technology already has saved resources, energy and costs.

The pump is equipped with a newly developed hydraulic adjustment unit and associated sensors. In combination with digital connections (SEEPEX Pump Monitor and Connected Services), it enables automatic adjustment of the stator clamping. The stator clamping can be optimally adapted to the operating conditions of the pump, which highly determines the pump's performance.

SEEPEX Pump Monitor (SPM) is the digital connection that records operating data and parameters such as flow rate, pressure, rotor speed or temperature in real time. Together with the SEEPEX Cloud and SEEPEX Connected Services (SCS), it analyzes the above parameters using modern algorithms and artificial intelligence. The plant operator can easily monitor the operating status of the pump and remotely adjust the stator clamping. Any occurring wear that would significantly reduce the performance of the pump can be effortlessly compensated for by readjusting the stator clamping. This makes it possible to always set the pump to its optimal operating point, which is characterized by a defined flow rate per rotor revolution.

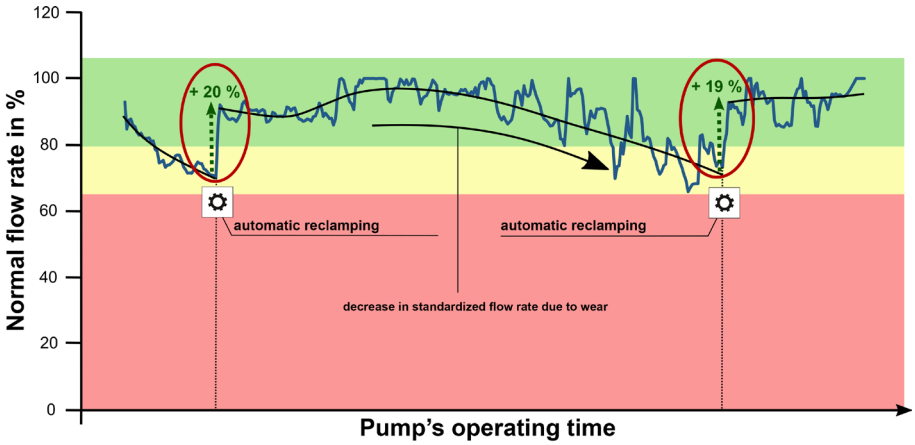
Installation of BN 35-6LAS including SEEPEX Pump Monitor at the plant.

TECHNICAL INNOVATIONS

- SEEPEX Pump Monitor and state-of-the-art sensor technology monitor operation and make specific adjustments to the stator clamping on site at the pump, or via app on any smart device
- A digital connection to the SEEPEX Cloud with SEEPEX Connected Services maximizes efficiency with minimal maintenance efforts

Progressive wear of the rotor and stator increasingly reduces the normalized flow, drastically diminishing the pump's efficiency. In the diagram below, the black arrow between the two adjustments of the stator clamping illustrates this behavior. Wear causes an increasing reduction in clamping between the rotor and stator. The changed flow conditions not only reduce efficiency in terms of flow, they also lead to an increased wear rate. Without adjusting the stator clamping or a compensation of the occurring wear, this enhancing effect would lead to a significant decrease in the pump's efficiency and lifetime.

PUMP OPERATION BASED ON MEASURED OPERATING DATA



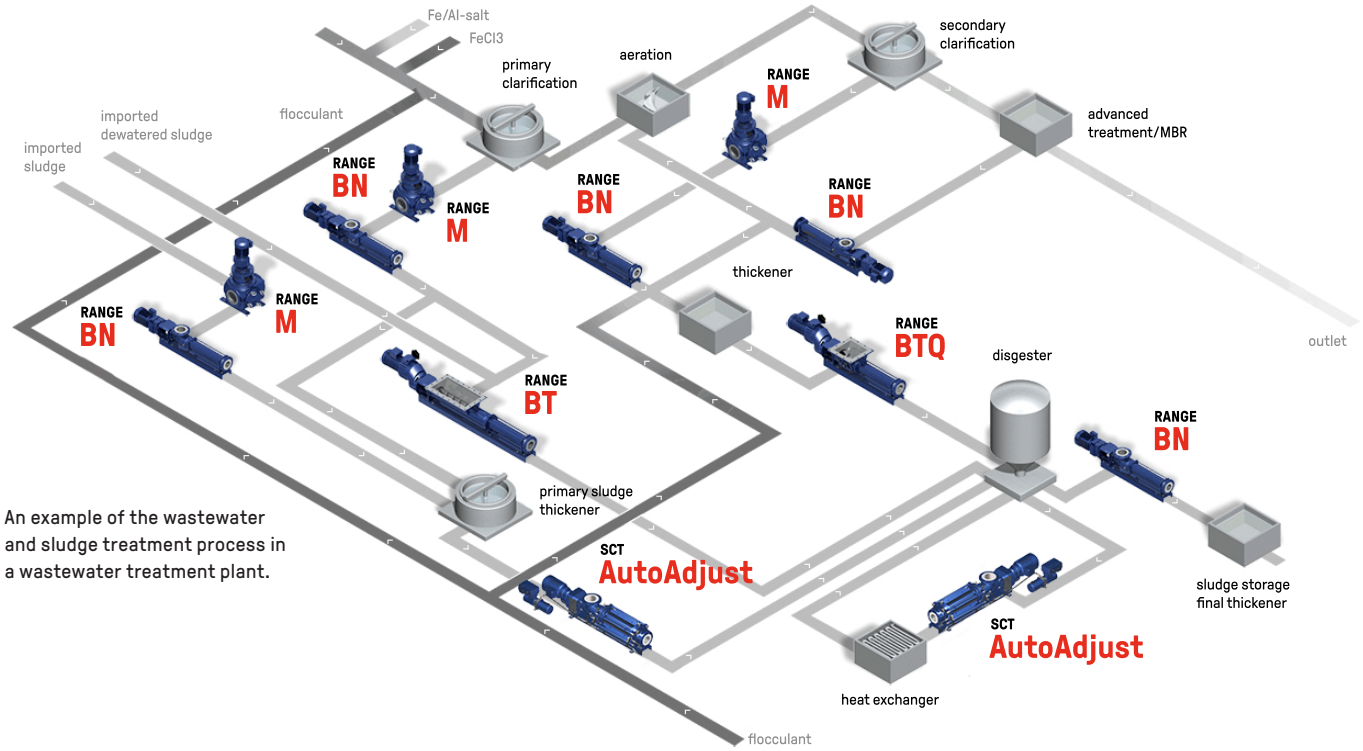
For better representation, the flow rate per rotor revolution is normalized to the set point or optimal operating point. Thus, corresponding 100% to the optimal, required operating point of the pump. Due to usual operating fluctuations, the pump should be running in a range between 80-100% (green area).

RESULTS

The hydraulic adjustment unit adapts the stator clamping to changing conditions at the touch of a button and compensates for any occurring wear without overclamping. In the diagram, two red circles mark the result of this process. The increase in the normalized flow rate into the range of the optimal operating point is clearly visible.

Both stator adjustments immediately achieve an efficiency boost of 20%. In the restored optimal operating range, the wear rate drops to a minimum and service life increases.

Based on the recorded operating data and its analysis with modern algorithms in the SEEPEX Cloud, the operator precisely knows the wear condition of the stator and can easily plan its replacement in advance. As a result, unplanned downtimes did not occur at the plant and service technicians proactively carried out maintenance work with maximum efficiency. This streamlines operating costs overall.



An example of the wastewater and sludge treatment process in a wastewater treatment plant.

Another positive effect of using SCT AutoAdjust at the Gelsenkirchen Picksmühlenbach water treatment plant is the optimized pump operation, which made it possible to switch to a smaller pump size. Compared to the previous solution, this not only increased performance and efficiency, but also saved resources and energy due to the smaller drive, which helps to optimize operating costs. The world's first automatic progressive cavity pump – SCT AutoAdjust – has already demonstrated its great potential and advantages in the wear-intensive conveying of abrasive sewage sludge at the Picksmühlenbach wastewater treatment plant. As part of the plant, it makes an important contribution to sustainable, reliable and cost-effective water management.

BENEFITS

- Increase conveying efficiency by up to 20%
- Reduce wear rate due to optimized mechanical stress
- Smaller pump size with lower energy consumption
- Optimize operating costs
- Digital monitoring and predictive maintenance – no unplanned downtime

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