SEEPEX.
An Ingersoll Rand Business

MONITORING SAVES $10,000 PER YEAR IN OPERATING COSTS

APPLICATION DETAILS

- Pumped media varies in volume and consistency
- Conveying Capacity: approx. 50 m³/h, 8 h/d
- Pipeline Length: 6 and 8 km
- Alternating dry matter of ~3-5% DS
- Pressure: 6-20 bar, max. 25 bar

KEY SPECIFICATIONS

- Several kilometers of primary sludge transport
- Pump monitoring and analysis to optimize operating performance
- Reduced maintenance costs

BACKGROUND

The Ruhrverband is a municipal water utility that provides water to 4.6 million people and wastewater treatment for 60 towns and cities. Its 65 wastewater treatment plants process the wastewater of 2.2 million people and businesses in the region every day, ensuring that only clean water is returned to the river.

The Ruhrverband and SEEPEX have a long-standing partnership with regard to sludge pumping. Since 2021, both partners have been analyzing recorded sensor data with the aim of optimizing the performance of the installed SEEPEX pumps and reducing their maintenance requirements.

Two pumps were selected for the project to transport primary sludge from different locations for further processing. One NS 70-24 pump transports the primary sludge from the Essen-Kupferdreh wastewater treatment plant over a distance of eight kilometers to the sludge treatment plant, while the other BN 130-12 progressive cavity pump transports it from the Essen-South wastewater treatment plant over a distance of six kilometers. Both conveying methods have to be adapted to the capacity of the sludge treatment plant.

TASK

The long pumping distance, as well as the varying volume and consistency of the pumped media, make for a challenging and often non-transparent process with great potential for optimization. The corporation commissioned SEEPEX to collect and analyze pump data such as flow, pressure, vibration and temperature to monitor the pump components and process conditions. The analysis was to provide optimization suggestions regarding the operating parameters, operating times and energy consumption of the pumps. Other objectives were to monitor and optimize critical pressure conditions and pump wear.

Source: Ruhrverband

SOLUTION

The first Pump Monitoring unit was installed in February 2021, followed by a second site in March 2021. SEEPEX provided the monitoring hardware, including a customized set of sensors, as well as the communication infrastructure and associated services for data collection, monitoring and analysis. SEEPEX supported the Ruhrverband with monthly reports, presentations on findings and algorithms and expert-based action items.

During the initial analysis, SEEPEX experts were able to uncover previously unknown problems and determine the causes. The discharge pressures were elevated and at times outside the pump specifications. Resonance frequency-related stresses in the mechanical components were identified, resulting in loosened bolt connections and a broken tie rod.

Over time, the monitoring system gave clear insight into the condition of the rotor and stator, enabling SEEPEX to determine the ideal time for their replacement a month in advance. This allowed the customer to schedule a service visit ahead of time and to avoid process interruptions. The customer could also take full advantage of the wearing parts without compromising process reliability. Combined with other adjustments, the service life of the rotor and stator was improved by more than 50%, resulting in annual savings of more than $6,000 per pump.

The Ruhrverband was impressed with the detailed analyses of the energy consumption of its pumps. The SEEPEX monitoring system can determine the energy consumption and the specific energy costs per m³ of conveyed sludge at any time, making for a very transparent process.
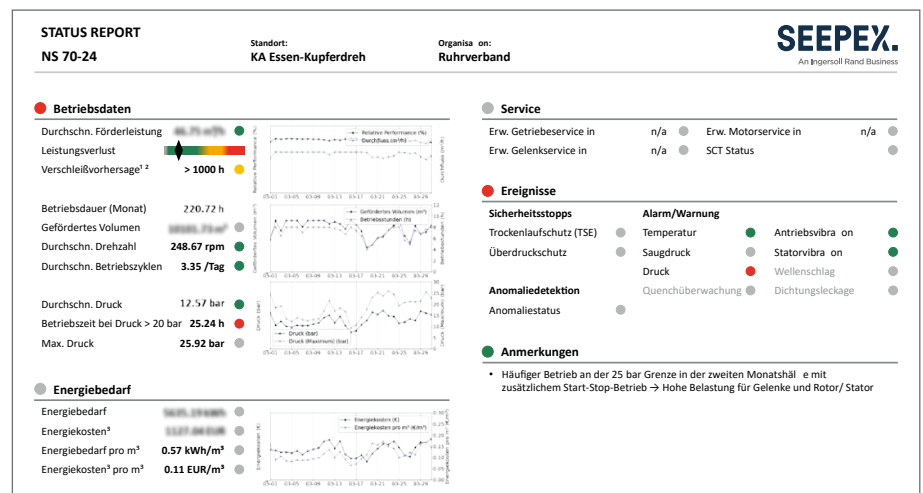
Monthly status reports and recommendations are based on continuous condition monitoring and pump and process expertise.

Further analysis also identified the three main factors influencing energy consumption. Based on these finds, the SEEPEX team was able to identify potential energy cost savings of more than $3,000 per pump (equivalent to 25%) and make concrete recommendations to improve energy efficiency. Ruhrverband is working closely with SEEPEX to implement the recommendations, including changes to the process control system.

SEEPEX Pump Monitoring at the WWTP in Essen-South.

The Ruhrverband gained additional value from monthly reports that summarize key performance indicators (KPIs), trends and error messages. The customer also provided valuable input for content adjustment. The close cooperation allowed for continuous adaptation of the monthly report to better fit the needs of Ruhrverband. In the future, all SEEPEX customers will benefit from the results - the extended monthly report is now part of the SEEPEX monitoring solution.

"The biggest advantage of the continuous condition monitoring, the analysis and the associated reporting is the predictability of the maintenance cycles, which significantly reduced operating costs," says Gregor Lorenz, Project Manager for Digitalization Projects at Ruhrverband. "We were particularly grateful for the in-depth analysis of wear monitoring and minimization of energy consumption for each m³ of sludge conveyed."

At the end of the test phase, Ruhrverband decided to adopt the solution and to continue working with SEEPEX Pump Monitoring.

BENEFITS

- Provides visibility by monitoring the pump and component health
  - Wearing parts (rotor, stator, etc.)
  - Components (mechanical connections such as tie rods, joints, drive, etc.)
- Deviations from the ideal state are reported early and notifications are sent when things go wrong
  - Performance (flow rate), pressure, temperature, vibrations, etc.
- Optimizing/reducing operating costs
  - Increased component life: Rotor and stator life extended by more than 50%, saving more than $6,000 annually
  - Optimized energy consumption: Determine the optimal operating point for minimum energy consumption per m³