



Bauer PMSM technology and Allweiler pumps help Stendal wastewater treatment facility become energy self-sufficient

Municipalities across Europe are looking to reduce their energy consumption and minimise carbon footprint. Producing biogas from wastewater treatment processes offers a way for facilities to become self-sufficient. However, achieving self-sufficiency relies on using efficient equipment.

Bauer Gear Motor, a leading manufacturer of geared motors, has teamed up with Allweiler to reduce the energy usage of eccentric screw pumps installed at the Stendal wastewater treatment plant in Germany, by fitting highly efficient permanent magnet synchronous motors (PMSMs).

[See the case study video here.](#)

The wastewater treatment plant at Stendal is aiming to be entirely energy self-sufficient by 2025. The site has a biogas production facility which provides low carbon energy from waste. Sludge produced from treating wastewater is pumped into storage tanks then transferred to the biogas plant.

To reduce reliance on the grid and grow the percentage of operations supported by low carbon energy, operators at the plant began assessing equipment improvements to achieve this. The eccentric screw pumps were quickly identified as an area for enhancement.

Eccentric screw pumps (also known as progressive cavity pumps), are used to transport the large amounts of sludge generated during wastewater treatment. This design of pump is preferred as it is resistant to clogging and can accommodate fluids containing solids. Eccentric screw pumps operate around-the-clock, supporting continuous wastewater treatment processes.

However, continuous operation requires a large quantity of energy. Furthermore, pumps often work at low speeds, which can result in the motors powering them operating inefficiently. With the stated aim of self-sufficiency in energy, Stendal wastewater treatment plant operators wanted to enhance the efficiency of these pumps to reduce overall energy demands. Luckily, a proven solution was ready and available to plant operators.

"We are a world leader in geared motor technologies," says Marc Piwko, Key Account Manager at Bauer Gear Motor - a leading brand of Altra Industrial Motion Corp. "This is illustrated by our range of PMSMs, which offer exceptional efficiency across the whole performance curve. These units are ideal for continuous operations where operators are looking to reduce energy consumption and maximise cost-effectiveness."

Bauer PMSMs feature an incredibly efficient rotor design matched to optimised permanent magnets, offering a distinct performance and efficiency advantage over traditional designs. There are no heat losses from the rotor, with total losses down by 25%. Operators typically benefit from consistent motor efficiency improvements of over 10% when compared to other drives. Bauer PMSMs are available to meet IE3, IE4 and even IE5 efficiency standards according to IEC TS 60034-30-2.



A key advantage for PMSMs in eccentric screw pump applications is that they deliver high torque at low speeds with increased efficiency. At Stendal, the pumps typically run at around 25 Hz to reduce wear and provide a performance reserve for high volumes of water - a frequency at which an asynchronous motor would have to be oversized to deliver the desired torque figure, resulting in energy inefficiency. However, due to inherent characteristics under partial load, PMSMs can deliver full torque at this speed with a smaller motor size. High torque is available from start-up too, ideal for pumping applications. Furthermore, operators can expect energy savings of more than 30% when under partial load compared to asynchronous motors.

These benefits haven't gone unnoticed by CIRCOR'S German entity Allweiler GmbH, a leading pump manufacturer that has collaborated with Bauer to combine its pumps with PMSMs. In 2017, both companies trialled an installation at Bayreuth sewage treatment plant, which delivered a sizable improvement in efficiency.

For Stendal, Allweiler specified Series AE2E Eccentric Screw Pumps, a popular choice in wastewater applications due to the ability to handle highly viscous or aggressive liquids that contain solids or fibres. The pumps also have high wear resistance, extending service life. These were coupled to Bauer BG30 Helical-Series gears with PMSMs and installed in the cellar of the pumping house at the facility.

"Another benefit of the PMSM design is that it is very power dense. This means that we can effectively downsize motors without any loss in performance while improving efficiency. At Stendal, we were able to downsize from the 5.5 kW original asynchronous motor to a 3 kW," Marc says.

"Additionally, the low heat characteristics of PMSMs mean forced cooling fans can be eliminated, providing another value advantage."

The benefits to the facility of moving to Allweiler pumps powered by Bauer Helical PMSM geared motord have been illustrated by the data, as Micheal Riske, Head of Wastewater/Water Department at Stendal discovered: *"We operated two identical pumps alternately with a PMSM and an IE3 asynchronous motor for a month each, comparing electricity demand and primary sludge pumping. The pump with the PMSM installed was found to have consumed 24% less energy."*

During assessment, the pump with the PMSM consumed 495.3 kW of energy to pump 2,410 m³ of primary sludge. The IE3 asynchronous motor required 729.3 kW to pump 2699.5 m³ of sludge. This equates to 4.866 m³ per kW for the PMSM and 3.7 m³ per kW for the IE3 motor. At Stendal, the Allweiler Eccentric Screw Pumps can pump almost a third more sludge at the same output. As well as increasing power efficiency, the Bauer geared motors also delivered improved performance in the application.

Klaus Kaiser, Sales Engineer at Allweiler, drawing on findings at multiple installations, added: *"From our experience, it takes no more than 6 months to achieve return on investment (ROI) on a PMSM."*

In fact, the low power consumption of the drives at Stendal ensured that ROI was achieved after only three months. This while reducing power consumption, enhancing performance and taking a large stride in switching to low carbon energy at the site.

Image Captions:

Image 1: Bauer Gear Motor has collaborated with Allweiler, combining highly efficient permanent magnet synchronous motors (PMSMs) with Allweiler progressive cavity pumps, at Stendal wastewater treatment plant in Germany.

Image 2: With the PMSMs installed, the pumps consumed 24% less energy when pumping primarily sludge compared to using an IE3 asynchronous motor.

Image 3: The wastewater treatment plant at Stendal is aiming to be entirely energy self-sufficient by 2025, so it is installing new, efficient equipment.

About Bauer Gear Motor GmbH

Bauer Gear Motor has been a provider of solutions within geared motors for more than three quarters of a century. We provide products of the highest quality with focus on flexible solutions, reliability and customer understanding. Bauer Gear Motor has a strong foothold especially within food & beverage, alternative energies, waste water, steel industry and material handling.

Bauer Gear Motor has production facilities in Germany and Slovakia, together with sales offices and assembly facilities around the world.

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