SIGNIFICANT ENERGY SAVINGS THANKS TO ALLWEILER PUMPS WITH PERMANENT MAGNET MOTORS

The Stendal sewage treatment plant has been using, Allweiler progressing cavity pumps with ALLDUR stators, and Allweiler centrifugal pumps of the “NB” type since 2019 and are very satisfied with the products. The pumps have proven to be more reliable than comparable pumps from other manufacturers. In 2019, the first of two competitors redundantly installed primary sludge pumps, was replaced with an Allweiler pump. At the time of installation, the head of the sewage treatment plant emphasized the importance of controllability, low speeds and long, reliable running times as key criteria. The second pump will be upgraded in 2020. As in 2019, controllability, low speeds and long, reliable running times are key customer requirements.

The STP in Stendal is sized for 115K inhabitants and is operating at full capacity. It is fed by a 116 km long canal network with 30 pumping stations.

The installed Allweiler progressing cavity pumps with ALLDUR stators have been specially developed for the use and delivery of abrasive fluids.

Thanks to the new formulation of the elastomer and the optimized manufacturing process, the service life increases by up to three times.

This results in a multitude of advantages for the user: longer maintenance intervals, shorter downtimes, longer pump service life, higher wear resistance, longer service live and overall lower maintenance costs.

The key requirement by the customer, that the system needs to be completely independent of external electricity by 2025 at the latest. Raises the importance of the pump’s efficiency, and the minimum possible electricity usage requirement.

The example of a similar sewage treatment plant in Bayreuth, showed that significant energy savings are possible with a suitable combination of pump and drive.

Allweiler PC Pumps with controlled Bauer permanent magnet motors have been in use there since 2017. They have proven themselves and led to significantly lower power consumption.

The choice of motor can therefore have a decisive influence, on the efficiency, and thus the power consumption with the same delivery flow and service life. PC Pumps are often controlled via frequency converters and run at the lowest possible speed to precisely match the current flow requirements. This increases the service life of the pump, and at the same time there is enough reserve for exceptionally large amounts of water. In the case of the asynchronous motors predominantly used up to now, the efficiency drops.

The motor then does not generate the required torque, but heat. In addition, external fans are therefore often required for their operation. Since PCPs require a high breakaway torque due to the interference fit of its hydraulic, asynchronous motors must be oversized compared to the requirements in operation - the higher power is only required when the pump starts up. Permanent magnet motors, on the other hand, deliver their power regardless of the speed. They can therefore be designed at least two sizes smaller than asynchronous motors.

The Bauer permanent magnet synchronous motors used meet the legal requirements of IE3 and IE4. Their strength lies in their use in the partial load range. In standard applications under partial load conditions, energy savings of more than 30% can often be achieved compared to asynchronous motor technology. In an optimized combination with Allweiler PC Pumps, it is not only the efficiency that increases. The costs of the overall system are also improved. The energy savings reduce the electricity costs and the grid connection power - and thus the operating costs of the entire production site.

Two identical Allweiler PC Pumps of the type AE2E 750. They redundantly pump primary/raw sludge (6 - 10 m³/h at 61 to 97 rpm). The maximum pressure is 6 bar, the solids content is 8% DS. On left-hand side with Bauer permanent synchronous motor (2.35 KW), and on the right-hand side with conventional IE3 asynchronous motor (5.5 KW).

Michael Riske, Head of the sewage treatment plant in Stendal stated: “We operated two identical pumps alternately for a month and compared the power requirement and primary sludge pumping. The pump with the permanent magnet motor consumed 24 percent less energy.” With the permanent magnet motor, the energy consumption for pumping 2,410 m³ of primary sludge was 495.3 KW. The pump with IE3 motor requires 729.3 KW for 2,699.5 m³ of primary sludge. This corresponds to 4.866 m³ per KW with a permanent magnet motor and 3.7 m³ with an IE3 motor. With the permanent magnet motor, the Allweiler PC Pumps conveys approx. 33% more sludge with the same power consumption.Considering the elimination of external fans which are not required, the additional costs for a permanent magnet motor are quickly amortized upon purchase. Summarizing his experience from various systems in operation, Klaus Kaiser Sales Engineer at Allweiler states this takes six months at most to achieve.

In Stendal, the lower power consumption compensated for the additional costs of €160 for the permanent magnet motor after just three months. Are there any disadvantages when using a permanent magnet motor? From the point of view of Marc Piwko, Sales Engineer at Bauer Gear Motor GmbH, there are no disadvantages. Only the tendency of operators to continue using conventional drives, instead of a new approach, proves to be an obstacle on the way to have more economical and efficient solutions.

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