

With the handling of sludge often the most problematic area in the wastewater treatment process, two wastewater treatment facilities, one in Scotland and one in Germany, turned to non-clogging pumps to improve plant efficiency and to reduce maintenance costs.



WASTEWATER TREATMENT NON-CLOGGING PUMPS SOLVE SLUDGE HANDLING PROBLEMS

Various N-pumps from ITT Flygt play key roles in the transfer and recirculation of raw and processed sewage at the Oakenhead Wood, Buckie and Macduff wastewater treatment plants in Scotland.

Efficient solutions for wastewater treatment plants that handle large amounts of sludge are an expensive and complex operation. As treatment plants become larger and more sophisticated, problems become even more complex and costly. That is why it is important to make the right configuration and equipment choices, especially when choosing pumps that will efficiently handle difficult sludge applications. In two separate applications in Europe, wastewater treatment plant operators installed ITT Flygt's N-Pump to solve tough process applications and for greater efficiencies and savings in maintenance.

Problematic Sludge

Untreated domestic and industrial sewage has for long been piped out to sea along the attractive Moray Firth coast in Scotland. This pollution has resulted in a steady decline in the fishing industry and thinning tourist arrivals. However, thanks to a scheme put in place for Scottish Water by a consortium called Catchment, effluent from the local communities with 55,000 inha-

bitants is being carefully treated before discharge. Along with this treatment process, a valuable agricultural fertilizer is being produced. Scottish Water and the local communities decided to meet the environmental demands. Three SBR treatment plants – Oakenhead Wood, Buckie and Macduff – were built to take care of the wastewater from 22 existing pump stations along the coast. The plants process raw effluent, using the SBR method. This is an activated sludge process that forces bacterial breakdown of the crude sewage. As the incoming sewage consists of up to 7% dry solids, it was important to provide a solution that could handle this problematic sludge. Therefore, Scottish Water decided to install various sizes of ITT Flygt's new generation N-Pump with its self-cleaning impeller and high-sustained efficiency. The Oakenhead Wood plant treats 10,000m³ of raw sewage per day. Much of this input comes from its own catchment area, but large quantities of raw sewage are also imported by tankers from other locations in Scottish Water's network. Also, 17% dry solids (DS) sludge cakes from the two other

plants are transported to Oakenhead for transformation to agricultural fertilizer pellets. The plant has been designed with great attention to detail in order to provide trouble-free sludge handling. For instance, the pipe system design is simple and imposes minimal losses for the imported sludge transfer and recirculation applications. The suction pipe from the screened sludge tanks has been sized to present the sludge to the pump in the best manner possible. One pump recirculates the imported raw sludge in order to avoid sedimentation. After screening, the sludge is pumped with another pump to a storage tank. There the sludge is being mixed with the incoming Waste Activated Sludge from the SBR process, using a third pump. The treated effluent is discharged to sea while the sludge cake goes to a sludge dryer where all bacteria are killed by the 220 °C temperatures within the dryer. This procedure transforms the sludge cake to 92% dry solid valuable fertilizer pellets ready for agricultural use. Due to the chosen treatment process, the final effluent is of good quality and is being discharged to sea. In parallel, nearly

five tons a day of valuable bio waste granules for use in agriculture are being produced. The choice of the new pumps has resulted in a trouble-free sludge handling. This, in turn has brought significant savings in both capital and maintenance costs. In all, 13 N-pumps are in operation in the Oakenhead Wood plant, as well as another eleven divided between the Buckie and Macduff treatment plants.

Public Utility Treatment

The municipal wastewater treatment plant in Zweibrücken, southern Germany, is a modern sequential batch reactor (SBR) treatment plant, designed

into larger blockages that got stuck in the screw design. The pumps could be blocked several times a day and much time was spent by the service staff on dismantling, cleaning and reassembling each clogged pump. It was obvious that these – under other circumstances – high-quality pumps, were not suitable for this kind of application. Having heard of the new generation N-pump, the community turned to ITT Flygt in Germany for a trial pump. In July 2002, one of the problem pumps was replaced by a Flygt NZ 3153 - running at 7.5 kW with a capacity of 100 m³/hour (=28 l/s). The pump was easy to install as it could be fitted to the existing piping



Due to continual clogging problems, a trial pump - an N-pump from ITT Flygt - was installed in the digester in July 2002, replacing one of the three screw pumps

for a population of 70.000. Although modernized between 1997 and 2000, the community-owned plant faced continual problems with clogging of its three screw impeller pumps, installed in the digester to circulate sludge from the digester across heat exchangers. Although all solid material more than six millimeters in diameter had been filtered out before the sludge reached the digester, the sludge contained 4,5% dry solids (DS), mostly fine rags and sand. All three pumps were alternating: with one always in operation, and a second pump started when new sludge was being added to the cycle, with a third pump as standby. Rags built up on the front of the screw impeller, compressing

and electrical system. The pump features new designs of impeller and volute that inhibit clogging around the single vane. As a result of the open design of the impeller and a relief groove in the volute, material which could gather on the vane is washed out before it collects up and blocks the pump. For the wastewater treatment plant in Zweibrücken, that means not only fewer stoppages but also smoother running. The installed pump has, in a very short period, led to a more reliable process and remarkably lowered maintenance costs. <<



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