

TUBULAR POST THE SEEPEX WAY

CONVEYED PRODUCT

- Dewatered sludge
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KEY SPECIFICATIONS

- Long distance transfer of dewatered sludge
- Significantly reduced pressure requirements
- Reduced operating costs
- Energy efficient

BACKGROUND

Thames Water is UK's largest water and wastewater service provider. With a turnover of around £2 billion and more than 6,000 employees, they serve more than 15 million customers which means 4.4 billion liters of sewage and almost 100 tons of dewatered sludge a day. For municipal wastewater treatment facilities such as the sewage treatment works (STW) in Reading - one of their 351 facilities - conveying those high quantities of dewatered sludge over long distances represented a major challenge.

TASK

At Reading STW the sludge is mechanically dewatered by a centrifuge and conveyed further by a pump to feed three separate storage silos. After the dewatered sludge falls into the hopper it needs to be pumped out of the building in a vertical pipe to the top of a silo.

The high dry-solids content and resulting high viscosity of the fluid leads to significant pressure losses. In some cases conveyor solutions such as belt, chain or screw conveyors were used. However, they cause appreciable maintenance and spare part costs – e.g. for long downtime during servicing resulting in high rental costs for a mobile back-up system or for scaffolding to enable service work in hard to reach areas. Moreover, these solutions need another conveyor drive for every change of direction, they are often not enclosed resulting in unpleasant odors, rehydration by rainwater or spillage and they are inefficient for vertical transport.

Alternatively, multi-stage progressive cavity pumps or in some cases piston pumps can be used, since they are particularly suitable for highly viscous media. But as a result of the high generated discharge pressure these solutions involve huge investment costs – the pump must be capable of generating the high discharge pressures and the associated pipework and valving must be suitably rated (in some cases PN150 and more).

Piston pumps in particular lead to significant maintenance costs due to replacement parts, hydraulic oil leakage, routine changing, long downtime and large installed drive power and consequently high energy consumption.

Thames Water was looking for a more economical solution.

ENERGY AND COST SAVINGS

COST SAVINGS

**UP TO 61%
ENERGY SAVINGS**

**CA. £400,000 WILL
BE SAVED IN 20
YEARS OF OPERATION**

PUMP TYPE

Smart Air Injection (SAI)

SOLUTION

SEEPEx experts recommended Smart Air Injection (SAI), a system customized according to the individual requirements of the customer and their pumped media. With SAI, a solid 'plug' of dewatered sludge is compacted by a progressive cavity (PC) hopper pump in the discharge pipe, and is then conveyed onwards by means of pulsed, compressed air injections. The sludge plug is enclosed by a lubrication film that reduces wall-friction and consequently energy losses in the pipeline. Energy efficiency is further improved due to the shear thinning effect for both the lubrication fluid and dewatered sludge. This results in significantly lower effective viscosities (up to factor 10 compared to conventional solutions) at the wall surface due to high shear-rates of the dense phase conveying.

The combination of PC pumping and dense phase conveying enables a permanent reduction of the discharge pressure to approx. 2 bar. The maximum peak pressure during air injection correlates directly with the required energy to initially set the plug into motion. Once the static friction force has been overcome, the sludge plug is accelerated by the expanding compressed air, which directly leads to a relaxation of the pressure level in the pipeline. The low discharge pressure enables the usage of lower pressure rated discharge pipe and components (PN10 to PN16), resulting in a significant reduction of investment costs, particularly over long conveying distances.

In addition, small single-stage (lower pressure rated) PC hopper pumps can be utilized with comparably low maintenance expenses and low energy consumption. In fact, energy savings of up to 61% could be achieved and calculations show that approx. £400,000 will be saved in 20 years of operation.

BENEFITS

- Energy efficient
- Lower discharge pressure needed – reduced wear and tear
- Long-haul transportation up to 1,000 m

