

Retrofitting Primary Settling Tanks

ZICKERT Shark™ Sludge Removal System

CASE STUDY

Location: London, UK
Owner: Beckton Sewer Treatment Works

Background

Beckton, located in the London Borough of Newham, is one of Europe's largest sewage treatment works, and currently serves 3.5 million people. In 2006, the discharge consent for the works was 22 mg/L BOD, 6 mg/L NH₃ in winter, and 1 mg/L NH₃ in summer. The operational target for the flow to treatment under storm conditions is 2 million m³/day (450 MGD). When this consent was tightened in 2007, major improvements to the works were required.

The sewage is treated by a traditional process comprised of screening of crude sewage, settlement in rectangular clarifiers to remove organic solids, nitrogen removal via a series of activated sludge plants, followed by final sedimentation to remove further solids. Sludge is treated via an incineration process.

There are 16 primary sedimentation double tanks, configured as two sets of eight double rectangular tanks, each of which is approximately 10,000 m³ in volume (totaling 32 single tanks). Each tank has two scraper mechanisms – the main tank scrapers and the sludge hopper scraper. Both bottom sludge and surface scum is removed.

Existing Scraper System

The existing scraper systems, prior to installing the ZICKERT Shark scrapers, were conventional traveling bridge scrapers. These transferred both the bottom and surface sludge into sludge hoppers, using chain-and-flight scrapers to transfer sludge from the sludge hopper to the desludge pit.

Many of the existing traveling bridge scrapers had problems with corrosion. Moreover, there began to be mechanical failures to the equipment. There was a catastrophic failure in one tank in 2006,

and this led to the first replacement of scrapers in 2007.

Selection of New Scrapers

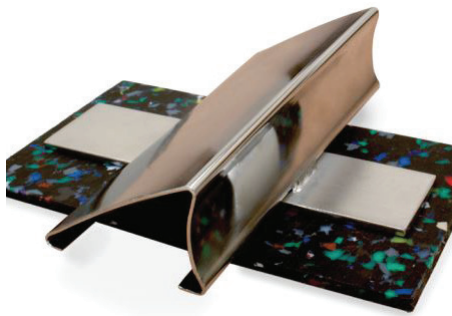
Three technologies were evaluated, including ZICKERT Shark reciprocating scrapers, chain-and-flight scrapers, and traveling bridge scrapers. As part of the major upgrade of Beckton Sewer Treatment Works, consideration had to also be given to future covering and odor control of the primary sedimentation tanks. This raised a number of new design challenges for the chosen equipment, such as risk of corrosion under the covers, explosive atmosphere,



and ease of access to the equipment. Other aspects that were taken into account were maintenance costs, tank cleaning, and sludge and scum removal. Each option was assessed against the issues identified above.

The disadvantages of traveling bridge scrapers were identified. These included serious concerns with corrosion, their high-profile design making it difficult to add odor covers, their air-cleaning systems being more expensive, as well as historic issues with failures on existing scrapers. The reasons for not preferring the chain-and-flight scraper design included its unacceptable scum disposal method, the fact that its large span might cause deflection, concerns over maintenance (particularly belt tensioning), historic issues with chains jamming up, and the fact that catastrophic failure can result from the failure of any one of many parts.

It was decided that the ZICKERT Shark scraper system, manufactured by Nordic Water Products, should be adopted for replacement.



With more than 3000 installations worldwide, the ZICKERT Shark is ideal for wastewater treatment plants and performs well in all sedimentation processes.

The reasons for this were:

- All stainless steel construction resists corrosion, leading to long life
- Proven design
- Prepared for future covering of tanks
- Lightweight construction not requiring substantial support
- Minimal risk of distortion resulting from self-weight
- Minimal structural modifications to tank required
- All running items supported by plastic bearings
- Meets sludge and scum removal requirement specifications
- Scum removal equipment accessible when tank is filled

Performance Results

Over a three-month period, the performance of the reciprocating scraper was compared to the performance of other traveling bridge scrapers onsite. Measurements were made on suspended solids and BOD removal. The results indicated that the ZICKERT Shark reciprocating scraper outperforms traditional traveling bridge scrapers by increasing sludge removal by 30% for both SS and BOD.

The reason for this is the unique design and performance of the ZICKERT scraper. The scraper profiles only remove the densest and thickest sludge on the bottom of the tank, leaving no dead zones and creating no turbulence.

The general feedback is that there is better reliability and overall performance from the reciprocating scrapers since they have been installed. This led to ZICKERT scrapers being installed in four further primary sedimentation tanks as the next phase of redevelopment in 2009. The remaining 12 double tanks were refurbished with ZICKERT scraper systems from 2011 to 2014.

