Radipole Sewage Pumping Station, Weymouth
major improvements in restricted site & timescale

by
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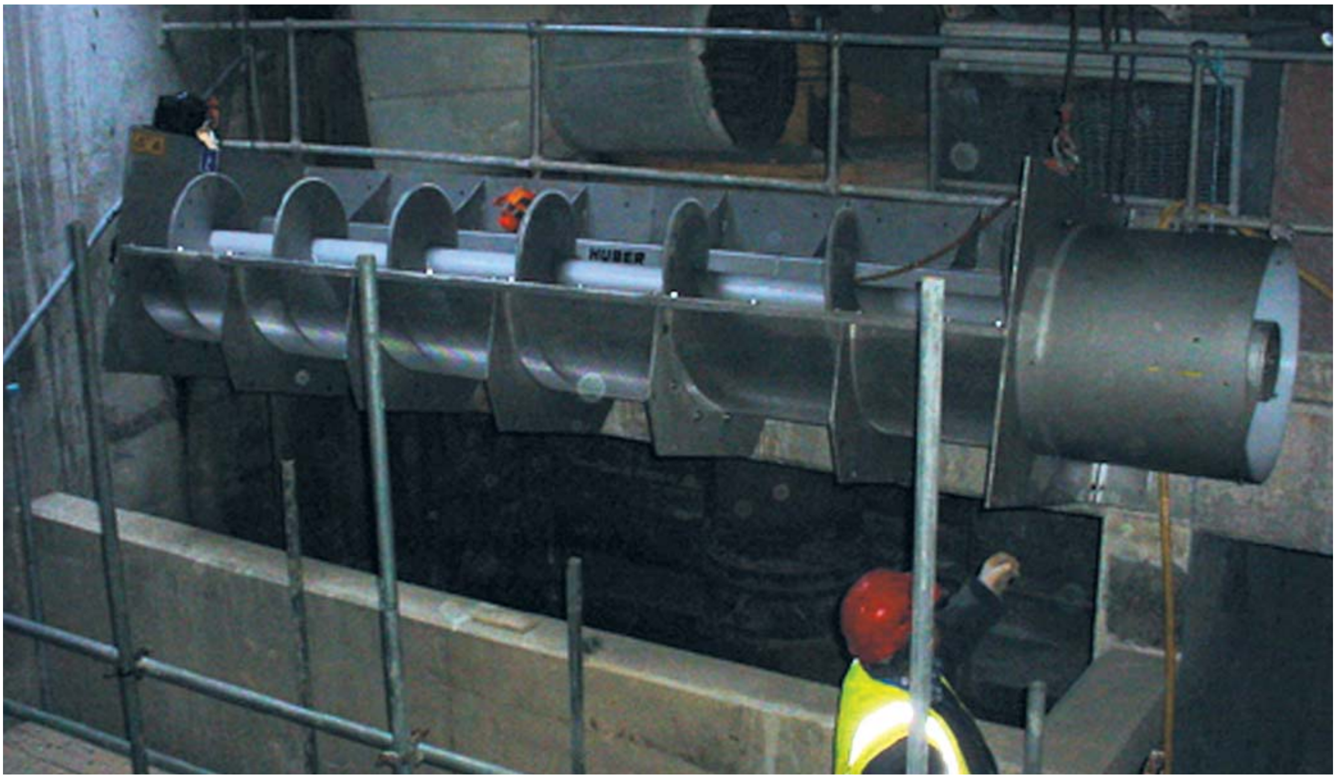
Wessex Water's Radipole sewage pumping station is located adjacent to the busy A354 on the edge of the centre of Weymouth, just above the harbour and opposite a wetland bird reserve. It pumps 70% of the sewage in the resort area of Weymouth to the sewage treatment works located at Wyke Regis. The site was constructed in 1982 and much of the original equipment was nearing the end of its life. The building is constructed in cast concrete with a bespoke roof and the specialist nature of these structures, plus the planning delays that any significant alterations to the buildings would cause, meant that the bulk of any works had to be contained within the existing structure. Extensive building work was also taking place in the grounds of a former college at the rear of the site where developers were building houses. The future occupation of these new houses had to be taken into consideration in some of the decisions made about work at the pumping station site.



Radipole SPS:Huber Screen being installed on new secondary sump courtesy TJ Brent Ltd

The scale of this scheme of major improvements to Radipole PS, both in terms of the imposed time restrictions and the amount of work required, proved a challenge for the team incorporating Wessex *Water's Alliance contractor TJ Brent and its design partner, WS Atkins.* A fast track approach was adopted for design and construction that allowed work to start on site with little more than an agreed concept. Detailed design was developed throughout the construction process.

Inlet screens
Raked bar screens and return macerators were located in a large wet well that extended under the site car park and out under the A354. The screens had become unreliable and prone to frequent breakdowns requiring expensive repairs and hand raking of bypass screens. Arrangements for the removal of the raked screenings were poor and the storage of screenings on site awaiting disposal was causing odour problems. The recently negotiated discharge consent for the site would not permit the return of macerated screenings. Value engineering was applied to this problem and it was concluded that the screens should be removed and the main flow pumped unscreened to the STW, where inlet screens would remove the screenings.

Grit removal
Downstream of the inlet screens the flow splits into two aerated channel grit traps where grit accumulated in six hoppers in each channel base. The grit was originally removed by an air lift system into sumps and then pumped to a grit classifier. The air lift grit removal system had broken down and it was decided to re-profile the channel base so that the grit would accumulate at three points per channel, from there it would be pumped direct to a refurbished grit classifier. The aerator blowers, previously located on the wet well walkway, were replaced and the new blowers installed in the motor room.

Emergency overflow
Just downstream of the grit channels, the flow weirs into the pump sump where suction pipes for the five pass forward pumps are

located. Two *Sulzer* canister pumps, each capable of pumping 1800 l/s, located at opposite ends of the pump sump, provide emergency overflow for the site. Screening the flows from these pumps is essential to comply with the discharge consent. It was decided that the best way to achieve this was to create secondary sumps separating the emergency overflow pumps from the rest of the pump sump, and to screen flows into the secondary sump using *Huber Rotamat* screens. A physical model of the pump sump was used to confirm the viability of this decision.

Construction of the secondary sumps was facilitated by the presence of a dividing wall and penstock in the pump sump which allowed work to proceed in part of the pump sump whilst maintaining the ability to pass flows forward to the STW. Notwithstanding this, close co-ordination of the sump construction and pump replacement was necessary so that the maximum number of pumps were available at any time with the minimum of delays in the construction programme.

The secondary sumps were configured as dry sump to prevent septicity issues but this had unforeseen consequences for the emergency overflow pumps. Floating debris had accumulated unseen in the straightening vanes above the impeller and when this dried out it formed a solid plug and possibly accelerated corrosion of the impeller. With the new screens in place this problem will not recur and the pumps are currently being refurbished and corrosion proofed.

Pump replacement.
The main pumps were configured as two *Sulzer* DWF pumps with rotor resistance starters discharging into a DWF rising main and similar but larger storm pumps discharging into a storm rising main. A third storm pump with a VSD drive had been added a few years previously but the VSD was suffering with overheating and sulphur corrosion.

The discharge consent required that the station should be capable of passing forward 2,200 l/s however, the original Sulzer pumps were not capable of doing this – they were replaced with more powerful *Flygt* dry well submersible pumps. The sequencing of the pump replacement was coordinated with the work in the pump sump so that only one pump from the dry side of the sump was replaced at any time.

Power supply
The more powerful pumps needed an uprating in the incoming power supply. The original supply was rated at 2MW but was not capable of running all the existing pumps and a new supply, rated at 3MW, was requisitioned from SSE.

The existing HV switchgear was located inside one end of the building adjacent to the site LV switchboard with two 1MW transformers located externally at the end of the building. To create sufficient room for the new HV switchgear, its housing and a transformer, the existing transformer area had to be extended back into the hillside by constructing an auger pile retaining wall and excavating.

The new incoming supply comes into the building at a high level using *Predecre*te bus bars suspended on a bespoke gantry. The new LV switchboard was located on a mezzanine floor that had to be constructed over the existing HV switchgear and three new MCC panels, an active filter panel and a control/telemetry panel were located in the limited space available on the new floor and area below.

Ventilation
The arrangement that blew air into the wet well area was retained with replacement Ex-rated fans. This had previously caused gases from the wet well to pass back up the personnel access from the motor room to the wet well area. It has also given rise to sulphur attack on electrical components in the motor room. To combat this an airlock arrangement was installed with a door at either end of the stairs to the wet well and separate ventilation arrangement to the outside of the building.

The positive pressure in the wet well was also thought to be the source of smell problems in the town. Access slabs over the inlet screens had been uncovered from under the site landscaping and removed. During this stage the smell complaints appeared to reduce so some of the slabs were left out when they were replaced and formed as permanent vents.

Additional ventilation incorporating chilling was added to the site for the motor control room.

Programme
Careful attention to programme at all stages of the scheme was necessary. At some stages up to 40 people were working on the site. A night shift was instigated so that the re-cabling of the site could be carried out without interfering with the progress of other trades.

Work started on site on 6 January 2003 and the works were completed approximately one week ahead of the deadline of 31 May, 2003. ■

Note: *The author of this article Andy Quinn, is Project Manager, Wessex Water Engineering Services.*