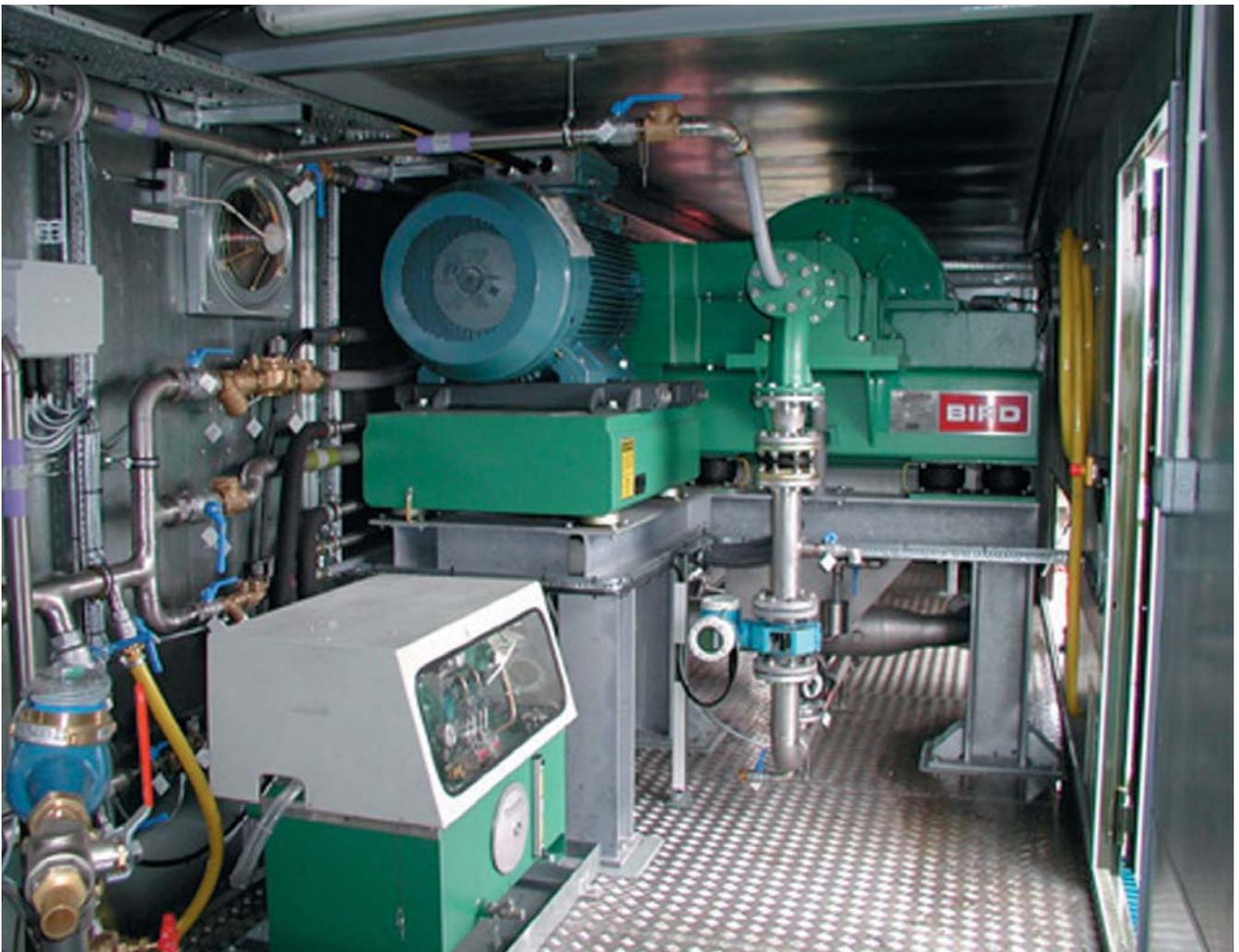


Delivery of Sludge Dewatering Plant Projects Severn Trent Water's AMP3 Programme

by

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As a solely land locked utility company, Severn Trent Water Ltd has a long history of recycling sludge's to land which is recognised by Government and associated regulators as the Best Environmental Option. Agricultural land is the primary recipient of STW's Sewage. Approximately 70% of all bio solids currently recycled to this route. All bio solids agricultural or public amenity (e.g. site remediation and land restoration) are treated to standard as a minimum and must satisfy all UK regulatory and Code of Practice requirements. The application of bio solids to land has traditionally been influenced by weather and seasonal conditions. Water companies to have the capacity to store treated sludge until such times as



Interior of mobile containerised dewatering plant supplied by Euroby

courtesy Euroby & Severn Trent Water

One of the main challenges currently faced by Severn Trent Water is the fact that the geology and associated soils of its catchment area have made it the most affected by the recently extended Nitrate Vulnerable Zones (NVZ's) Regulations (1998). These regulations set annual limits on the application of nitrate to agricultural soils and also set closed periods where liquid sludge's may no longer be applied. Dedicated land status whereby additional nitrate loadings were allowed to be applied to certain areas of land, traditionally held by waste water companies, has also been withdrawn.

The main change in practice associated with the NVZ regulations

has been from the application of treated liquid sludge to the application and incorporation of dewatered sewage cake, with a major impact on the quantity of sludge that can be applied to a farmer's field in a single application. Dramatic reductions in application levels plus the closed application periods have resulted in an intensified campaign period of sludge to land activity from mid-July to early October, with a short secondary period around March and April. This reduction in periods of access to land has extended the need for sludge storage and an associated reduction in mass, for which the dewatering schemes have been crucial.



Wanlip overview

Supplied by Euroby courtesy: Severn Trent



Mobile containerised dewatering plant

Supplied by Euroby courtesy: Severn Trent

Of the scheme sites, **Stoke Bardolph** was the most affected by MVZ legislation, having traditionally recycled all the works sludges in liquid form to its own farm land which had dedicated land status. Approximately 85% of the bio solids produced at Stoke Bardolph now require recycling to alternative land banks, an operation which could not realistically be undertaken without the availability of dewatering and storage facilities.

The preferred process for these projects utilises containerised dewatering plants in conjunction with the construction of a permanent cake pad allowing for up to 6 months storage. In line with STW's contract strategy, a 'batched' approach was adopted to deliver the schemes by engaging a team that would work together for the duration of the AMP.

A number of sites were considered for the original sludge dewatering strategy in both the East and West of the region, a contractor and consultant were appointed specifically for these projects. Following submission of a competitive tender, *Edmund Nuttall Ltd* was selected as the preferred contractor and *Pick Everard* was appointed as consultant.

Supply chain management

With all the projects, including the installation of one or more Containerised dewatering plants it was recognised that the dewatering plant supplier would be a key player in the successful delivery of this and other similar projects in the company. To build up the relationship a framework agreement was set up with the supplier; *Euroby Ltd*. That Agreement focussing on the benefits that *Euroby Ltd* could offer to STW Ltd, such as:

- * containerised dewatering process plant reducing the need for buildings;
- * standardised 'off the shelf' type template design for all sites;
- * mobile standby 'plug and go' units thus reducing the need for standby plant;
- * standardised equipment and thus less need for strategic spares holding.

The nature of these projects has meant that the supply chain is limited with a few key players. These key players have been involved through each project from the design phase, through to target pricing and construction and then during reviews to ensure continuous improvement and efficient management of technical complexities.

Dewatering process plant — Containerised

To take advantage of the opportunities for cost savings that can arise from managing a reasonably large number of projects and with a view to improving the product to the benefit of *Euroby Ltd* and STW; a Working Group was established. That group includes representatives from the Supplier, STW Engineering, Purchasing, and Service Delivery functions; and has realised significant improvements of which the following are examples:

- * process optimisation and maintenance support by the supplier;
- * ensuring that the dewatering plant being installed within the Severn Trent Water region operate reliably and, are a robust process solution;
- * standard process performance reporting signals, reporting directly to the management centre for plant performance analysis.

Project cost management

From the outset the team has adopted Value Engineering principles developed after lessons learned from AMP2. The ongoing delivery of projects by the team has ensured that cost savings identified for one site can benefit subsequent projects; problems experienced at

one site can be communicated by contractor and consultant staff between sites. In addition, the management of risk has been handled through the development of design risk assessments and risk registers in an effort to manage the events and minimise impact on the projects financial outturn. Once risks are identified further evaluation and detailed investigations can be carried out to provide more accurate information upon which designs and construction methods can be based.

Delivery of sludge dewatering treatment plant projects

At the start of the design process *Pick Everard* reviewed with Severn Trent where the sludge dewatering facilities should be located on each of the sites. The aim was to re-use existing assets wherever possible and to minimise impact on the surrounding environment; both of which would assist the schemes in achieving planning permission.

At **Netherbridge, Hayden and Kidderminster** it was possible to use existing concrete areas for the cake storage by adapting redundant filter beds and existing sludge storage areas. At **Wanlip and Stoke Bardolph**, where larger areas were needed, new build cake stores were built on land outside of the existing operational site in close liaison with the local planning authorities, on land owned by Severn Trent Water.

The consultant realised that the cost advantage of reusing existing concrete surfaces for cake storage is somewhat offset by the difficulty in providing adequate drainage to the area, whereas newly built cake storage areas can be profiled to drain to collection points. Drainage on the surface of the slabs needs to be designed to avoid blockages by cake. Open channels which can be cleaned are better than pipes and collection points are located in vehicle areas rather than cake stockpile areas. The profile of each cake slab had to be a combination of adequate falls to provide good drainage, minimum falls to avoid steep gradients for vehicles and best 'cut and fill' to the original ground profile.

In August 2002, *Edmund Nuttall Ltd* was awarded a £4.0m target price/cost reimbursement contract for the first batch of dewatering schemes at Wanlip, Netherbridge and Hayden STWs. Work commenced on these sites in January 2003 with two, **Hayden** and **Netherbridge** completed by December 2003.

At **Wanlip**, a concrete cake storage slab of 32,000m² had to be constructed. *Edmund Nuttall* proposed a value engineered option to construct this using roller compacted concrete (RCC), which would generate both savings in time and cost. RCC was first developed around 30 years ago and has been extensively used in North America for container terminals, distribution centres and log stacking yards. It is placed using asphalt paving equipment and then compacted with rollers and it does not contain reinforcement.

RCC has the same ingredients as conventional concrete but it is a drier mix that is stiff enough to compact with vibratory rollers. This solution was ideal for cake storage and offers a saving of approximately £150,000 for the Wanlip scheme, where a reduced design life was considered acceptable. The whole area was laid in 12 days after a batching plant was erected on site. RCC was also used at Stoke Bardolph for a slab of 25,000m² which, commenced on site in August 2003 and is due for completion in May 2004. In March 2004, works commenced on a further scheme at **Kidderminster STW**.

In summary, *Severn Trent Water, Nuttall Ltd, Euroby and Pick Everard* have worked most efficiently together in the delivery of this batch of projects. ■

Note: The author of this article Simon J. Ellis, is Project Engineer, Severn Trent Water Ltd