

# Minworth Sludge Dewatering Plant

## an environmentally friendly revenue stream for Severn Trent Water

by Richard Thomson & Mellish Kett

**M**inworth is Severn Trent Water's largest sewage treatment works serving a sludge population equivalent (PE) of 2.5 million, and features an extensive sludge facility with 16 (No.) digesters, and an impressive biogas generation station producing 10MW of renewable energy. The 22 (No.) primary settlement tanks, 28 (No.) lane activated sludge plant and 62 (No.) final settlement tanks produce a tremendous volume of indigenous sludge, which is supplemented with a high volume of imported trade wastes from industry and sludge from regional works. Total sludge throughput equals approximately 5,000m<sup>3</sup>/day.



21% sludge cake product for storage before spreading on agricultural land (14 day pathogen kill)

Courtesy of Bewater North Midland Alliance

The Minworth Sludge Dewatering Plant (SDP) was designed and constructed by the Bewater North Midland Alliance (BNMA) in collaboration with Severn Trent Water to provide the optimum wholelife cost solution to dewater digested sludge to replace the high CAPEX centrifuge installation which was asset expired.

### Pilot trial

Ashbrook Simon-Hartley (ASH) undertook a pilot trial to assess the suitability of the *Klampsess* process on the specific secondary digested sludge in order to confirm the design parameters. The dry solids guarantee of 19% - 22.3% was agreed to ensure the product would be suitable for spreading on agricultural land. Slump tests were also carried out to compare the properties of the *Klampsess* versus Centrifuge Cake with very favourable results.

### The benefits of biosolids for use in agriculture

The biosolids product offers nitrogen and phosphorus release and contains organic matter which improves the workability and drainage of heavy soils, reducing the risk of soil compaction a major factor in crop yield and quality. It improves soil biological activity and fertility and is more cost effective than fertiliser. Biosolids

contain sulphur, magnesium and trace elements which are of benefit to all crops on most soil types. Farmers now purchase the sludge cake which was previously given to them for free due to the rising cost of commercial fertilisers.

### OPEX savings

The 6 (No.) redundant power hungry centrifuges which suffered from H&S issues were decommissioned under the scheme and replaced by 10 (No.) 2m wide *Klampsess* units. The *Klampsess* drives are 2 (No.) 2.2kW with a hydraulic motor of 0.75kW. Total power per *Klampsess* is 5.15kW, versus a centrifuge at 80kW, offering considerable electricity savings. Another significant OPEX saving is polymer consumption with the *Klampsesses* running at 5.5kg/tds which is half the poly dose of the centrifuges at 9kg/per tonne dry solids of cake. Polymer is a petrochem derivative so carbon footprint is also reduced.

### Safe O&M

The design of the *Klampsess* building involved consultation with Operatives to ensure a very safe workplace was provided. Permanent and mobile platforms were manufactured to give excellent access



# Clamp down on dewatering costs

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**Ashbrook**  
**Simon-Hartley**

WATER AND WASTEWATER TREATMENT SOLUTIONS





10 (No.) Series 7000 high performance Klampress units with 2m wide belts and 12 (No.) roller configuration

Courtesy of Bewater North Midland Alliance

to all parts but with flexibility to be lifted out of the way for major maintenance. The operators and maintenance technicians were invited to view the units during manufacture at the factory in Stoke. Specifically designed features were incorporated into the machine guards and have now been incorporated into the standard design under ASH's continuous improvement process. An overhead crane serves the whole plant for ease of belt replacement.

**Operational liaison**

The project has benefited from close working relationships with Severn Trent Water Operations who have assisted in design development, commissioning and process optimisation. The Sludge Technician takes daily samples and analyses the product using an oven to accurately measure %dry solids.

**Project scope**

- Sludge tank air mixing by Monsal which keeps 2.5% ds digested sludge fresh.
- Sludge feed Mono pumps with macerators to ensure no rag blockages.
- 10 (No.) ASH Klampress belts and ancillaries.

- 10 (No.) Spirac cake conveyors.
- Modification to poly silo pipework and electrical connections.
- New poly dosing pump station.
- Filtrate return pumping station.
- Wash water system complete with automatic back wash filters.
- HV Transformer with ring main unit.
- Sludge Dewatering Intelligent Control Panel iMCC.
- Portal frame clad building with over head gantry crane.
- Modifications to cake pad.

**Intelligent control panel iMCC**

The iMCC and SCADA system offer considerable benefits to the Severn Trent Water Technical Delivery Team as the extended information produces multiple reports to monitor plant performance including invaluable chemical and power consumption data.

**Innovative scum treatment**

Primary scum is notoriously difficult to handle and treat and so much thought went into the design of an innovative process to



Feed pumps with gantry crane - filtrate return PS in foreground Courtesy BNMA



Washwater auto-backwash bollfilter

Courtesy of BNMA





10% sludge after gravity dewatering stage

Courtesy of BNMA

reduce the operational headaches and maximise the calorific value by getting the scum, rich in fats and greases, into the digesters bypassing the primary belt thickeners. This helped increase the gas yield and reduced issues with fats on the belts.

The scum is drawn off the PST's with 2 (No.) boxes with spring tension devices. It then collects in scum chambers which are emptied with vacuum tankers weekly to avoid the problems associated with pumping scum such as frequent pipe blockages. The process innovation is to mix the scum with warm digested sludge in a Vogelsang "quick-mix macerator" to ensure the transfer into the digester is blockage free. BNMA recycled a silo and provided an intelligent control panel to fully automate this sidestream process. Due to the success of the unit STW plan to install this new technology at other problematic sites.

#### "Sludge Buster" air mixing system

A novel solution was developed, trialled and installed by the commissioning team to reduce pump blockages caused by thick sludge at the end of the storm water return cycle. A compressor, pipework and diffuser have been installed to achieve coarse air mixing without entrainment around the pump bowl, lowering the viscosity and variability of the return liquor.

A 'cowhorn' shaped manifold was fixed to the pump guide claw and connected to the compressor via a flexible hose. This ensures easy removal and re-attachment to replacement pumps.



Innovative scum treatment facility

Courtesy of BNMA



2.5 T bucket loader &amp; 20 T lorry export cake to land - Courtesy of BNMA

- Blockages have been vastly reduced at a lower capital cost than alternative solutions, e.g. pump replacement or changes to the civil structure of the sump.
- Levelling out process demand spikes that have been experienced in the past when the high concentration load occurs at the end of the storm return cycle.
- Reduced number of manual interventions in terms of both cost and H&S risk exposure.

#### Sludge dewatering plant summary

The sludge dewatering plant has been operational since beneficial use in July 2010 with good performance averaging 21% dry solids. Both the haulage company Whites, and local farmers are pleased with the product handability, and the entire year's production has been sold in advance by Severn Trent Water, earning valuable revenue at reduced production cost.

*The editor and publishers wish to thank the following for preparing the above article for publication. Matt Pugh & Mellish Kett, Asset Creation with Severn Trent Water, Andy Bennett, Commissioning Manager with STW, Richard Thomson, Project Manager with Biwater North Midland Alliance, Pat Heffernan, Site Manager BNMA, Ron Ashton, Project Manager with Pick Everard, and Matt Gibson, Managing Director of Ashbrook Simon-Hartley.*



Sludge cake in field ready for spreading

Courtesy of BNMA