

# Minworth STW - £145 million upgrade

## collaborative alliance drives value & programme

by Richard Thomson & Paul Fisher

**M**inworth is Severn Trent's largest Sewage Treatment Works serving a population equivalent of 1.75 million from Birmingham. The plant treats sludge arising from a population equivalent of 2.5 million due to a high volume of imported sludge tankered from industrial sources and regional works. The average flow is 450ML/d (5.8m<sup>3</sup>/s) with a full flow to treatment of 1,070MLD (12.4m<sup>3</sup>/s). The UWWTD UID requires 61,000 m<sup>3</sup> of additional storm tank capacity which will be achieved by conversion of existing rectangular primary tanks which suffer operational difficulties particularly with the desludging system. A new inlet works and primary tank island will be provided to improve process performance ensuring a greater quantity of fresher sludge will be directed to the digesters to enhance production of renewable energy from the 9MVA generation station. The Fisheries Directive ammonia consent will be reduced from 5 to 3 mg/l in March 2010 requiring significant upgrade to the existing 24 lanes of ASP's 1-6 and provision of an additional ASP 7 configured for conversion to the BNR process in AMP5. The scheme also features an extensive programme of capital maintenance of numerous existing assets.



Minworth STW: PST's first batch of 8 bridges installed

courtesy of Bewater North Midland Alliance

### The Collaborative Team

Framework contractors Bewater Treatment and North Midland Construction with Nomenca formed a strategic alliance to deliver a scheme of this magnitude. In 2006 Severn Trent selected Bewater North Midland Alliance as the preferred contractor and Pick Everard as the Consultant for the civil design and hydraulics.

### Programme Management and Prioritisation

In order to develop the scheme within the tight time constraints it was necessary to identify the work packages, prioritise the design and commence civil enabling works. This required a change in mind set from project delivery to programme management. The team was established in a large office with capacity for 100 staff co-located on site to develop the concept designs into firm proposals, set target prices for works orders and achieve timely Severn Trent Board approval. Key suppliers were embedded in the office to input early design information.

### Definition

Understanding of numerous site specific constraints was critical to the feasibility and design development. Liaison with STW operations was essential to prioritise the extensive list of capital maintenance items. Early win items were identified to be implemented during definition of the remaining work packages.

### Innovation

The new works will be controlled by a series of intelligent iMCC's with Factory Talk FTViewSE SCADA connected via Profibus networks. This solution has been developed jointly by Severn Trent, The Alliance and Saftronics. The technology will allow improved energy management and condition monitoring, both key drivers for Severn Trent.

### Supply Chain Integration - Driving value

STAM were engaged as the formwork sub-contractor across all phases on an incentivised target price contract currently forecasting gain. The continuity of £11m of work has ensured that experienced resource could be allocated long term to deliver H & S best practice. The integration of the STAM management team has been critical in improving constructability, reducing costs and beating programme targets.

### Cost Avoidance

The feasibility and solution development stages have benefited from optioneering and value engineering with early contractor involvement. Specifications have been challenged such as increasing the FST size from 30m to 35.5m diameter saving £700k. Design consultation resulted in 1 less PST being built saving £1m.

Existing assets have been reused such as the blowers which the operators were keen to upgrade rather than replace, saving £1m.



PICK EVERARD

# Severn Trent Water



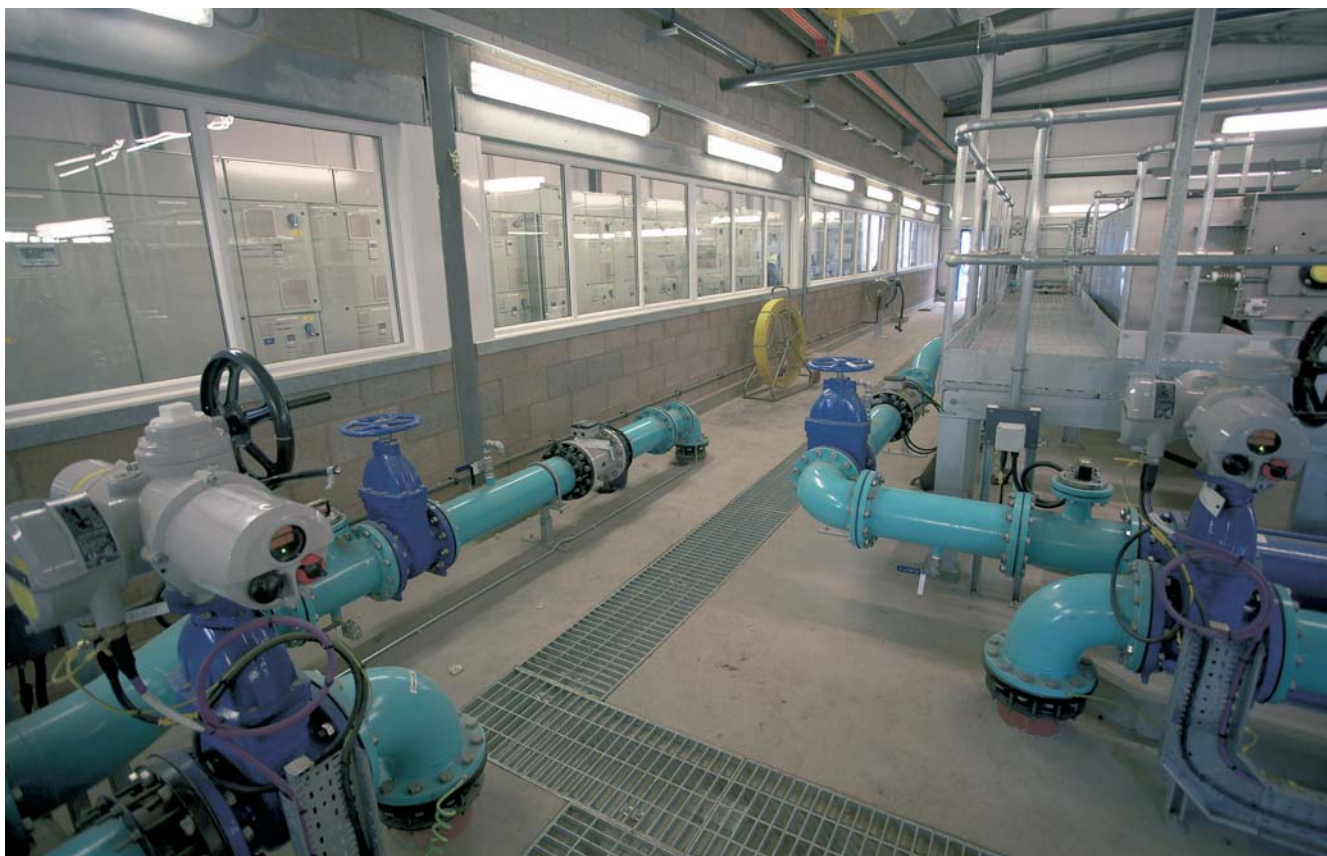
## Delivering Severn Trent's Largest AMP 4 Scheme Through Collaboration



- Effective communication in co-located site office
- Pro-active programme management
- Joint solution development
- Supply chain integration
- Add value/avoid cost
- Challenge and innovation
- Optimised energy efficiency
- Sharing health and safety best practice



STAM



Primary sludge thickener building with iMCC

photo courtesy Biwater Midland Alliance

Close cooperation of the civil designers revising the layout eliminated the need to re-locate the MAFF plant saving £3million. The storm tank design was challenged resulting in a simplified scope saving £3 million.

### PROGRESS UPDATE AT JULY 2008

#### Phase 1.1- Primary Tank Island (£25m)

The civil works have progressed extremely well due to excellent collaboration between the civil designers, planners, site managers and formwork sub-contractor who combined to establish a practical build sequence. The 22 No. primary settlement tanks (30m dia) were completed in just 14 months and construction of the 6 No. distribution chambers and 22 No. desludge chambers is substantially complete to allow backfilling to finished ground level. A two month gain has been captured by early installation of the first 8 No. PST scraper bridges, ram pumps, jib cranes, penstocks, portal frame buildings and intelligent iMCC's. The double-decker PST collection culvert is complete and construction continues around the channel connection where detailed outage plans have been developed to manage the shutdown. The security of supply will be enhanced by 4km of HV ring main with 12 No. associated sub-stations. 2.5km of HV cable has been laid and all transformers are manufactured awaiting delivery.

#### Phase 1.2 - New Inlet Works (£17m)

The construction of the new 8 lane inlet works structure was completed in March including all the benching as specified by the hydraulic model to minimise grit settlement. Access platforms, open mesh flooring and stairways were fitted early to minimise temporary scaffolding. This greatly improved the safety for the installation of the Ham Baker penstocks and other equipment. The 8 No. inlet screens (6mm) each 2m wide by 8m high were installed by Adams during the lulls in a stormy week in March. Spirac then installed the screw conveyors incorporating improved drain deck designs developed to give operators safe access for cleaning. The Thetford screenings compactors have been manufactured and tested and await

delivery once the concrete base slab is complete. Construction of the 4 No. grit detritor structures was completed in June with the mechanical installation undertaken sequentially by EIMCO from April to July as soon as the individual structures became available. The civil construction is now focussed on the settled sewage pumping station with fabricated special steel shutters for the complex benching to optimise suction conditions for the 6 No. axial flow pumps each with 160kw motors currently in manufacture by Bedford Pumps.

#### Phase 1.3 - Storm Tanks and Carrier Channel with flow control (£13m)

The construction of the 360m carrier channel 5m wide by 3m deep is substantially complete with preparations underway for the complex tie-in to the existing inlet. The radial gate flow control device is under manufacture at specialist sub-contractor Taylor and Sons factory in Cardiff with the hydraulic system being supplied by Bosch Rexroth.

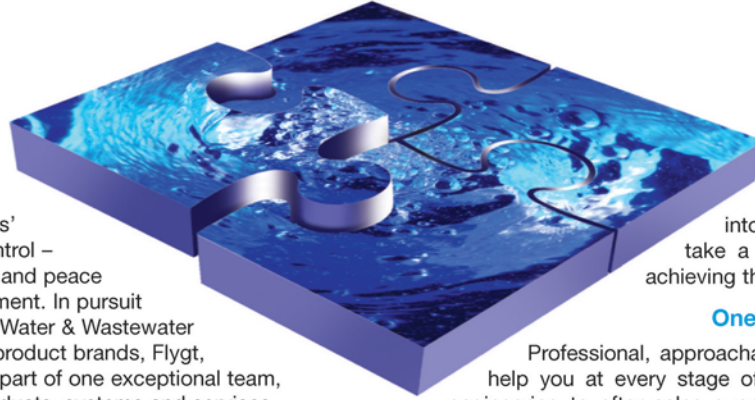
#### Phase 2-1 - New Activated Sludge Plant (ASP) 7 (£30m)

The earthworks, demolition and piling are complete. Construction of the megastructure 120m long x 90m wide x 7.5m deep is progressing on programme. The ASP7 has been constructed using H & S best practice with all high level steel fixing from scissors lift platforms, 6 of the 8 No. FST's each 35.5m dia have been constructed and the scraper bridges are being designed. Complex service diversions have been achieved and all major MEICA subcontracts have been placed to secure design deliverables.

#### Phase 2.2 Improvements to ASP 1-6 (£20m)

The replacement of the diffusers by Sanitaire is progressing on schedule with 8 out of the 24 lanes complete and operating under the updated control system with new Hach Langer DO probes. The 12 No. existing SG60 Howden Blowers are being re-gearred, refurbished and fitted with 450kw motors to increase their output. 4No. additional SG80 blowers will be installed resulting in a 50% increase in air capacity to meet the ammonia consent.

# The total solution in water and wastewater



**ITT** Water & Wastewater's vision is to be their customers' first choice for fluid handling and control – offering a complete service, security and peace of mind within a sustainable environment. In pursuit of this vision, the new company, ITT Water & Wastewater UK Limited, comprises four leading product brands, Flygt, Sanitaire, Wedeco and Leopold – all part of one exceptional team, and the UK's premier provider of products, systems and services specialising in the transport and treatment of water and wastewater.

### Investing in the future

All four of these brands are leaders in their fields, each investing heavily in research and development to ensure that their products are the best in class.

### First choice for a total solution

The recent merger of Flygt, Sanitaire, Wedeco and Leopold allows customers access to a greater breadth of complementary products and services, including pumps, aeration, filtration, ozone and UV disinfection

– driving the business forward into new markets, enabling them to take a significant step forward towards achieving their goal.

### One exceptional team

Professional, approachable, competent staff are there to help you at every stage of the process – from design and engineering to after sales support. Whether your business is in construction, public utilities, industry, mining or other sectors, highly skilled, knowledgeable and reliable personnel take pride in each project undertaken – giving you the right equipment to get the job done and keeping your business moving forward.

### New MD at the helm

In his new role as Managing Director, ITT Water & Wastewater UK Limited, also Ireland, Peter Lewington comments "The combined expertise and experience of these four businesses will create a real force in the market, allowing us to fully utilise the high levels of technical knowledge, to the benefit of our customers."

## The picture is now complete



Flygt is a world leader in submersible heavy duty pumping and mixing technology – internationally recognised as offering high quality, efficient and versatile products. The company offers customers outstanding life-long performance and added value through its products, people and services.

Operating in all market sectors, Flygt also provides pump rental, monitoring and control capabilities and after market services as part of its total solutions package.



Sanitaire is a leader in diffused aeration systems, SBR technology, instrumentation and monitoring for municipal and industrial facilities. Products include diffused aerators, package plants, oxidation ditches, clarifiers, airlifts and ozone dissolution systems.

Operating turnkey projects, they can provide design, project management, installation and start-up services plus full scale field testing of oxygen transfer efficiency. With this breadth of services, systems are designed to meet customers' specific needs.



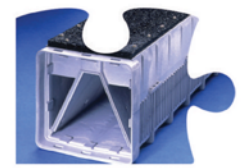
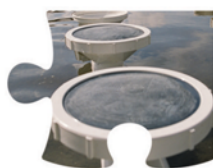
Wedeco leads the field in UV Disinfection and Ozone Oxidation systems.

Highly efficient UV Systems provide chemical free disinfection solutions to a diverse range of applications, whilst Ozone Oxidation Systems are used to oxidize harmful contaminants in industrial wastewater and to eliminate colour, taste and odour in drinking water.

Customer service extends from delivery and system installation to bespoke solutions, including laboratory and pilot testing, water analysis and tele-diagnostics.



Leopold produces filtration systems which provide powerful and reliable solutions for both potable and wastewater treatment applications. Each of the tertiary filters is designed and engineered, based on extensive systems knowledge and application experience, to achieve the specific performance characteristics of individual treatment plants. Using Computational Fluid Dynamics (CFD), a customer's application requirements can be modelled in their hydraulics laboratory.



## Four leading brands. One powerful force



*Detritor*

*photo courtesy Bewater Midland Alliance*



*ASP 7 under construction*

*photo courtesy Bewater Midland Alliance*



Graham Johnson, Technical Support Manager:

“Saves a lot of energy.  
And saves you a lot of time.”



The highly energy-efficient and robust Top Premium Line motor range is a great example of how WEG works for you: it is simply the most efficient standard motor in the market. Its operational costs are exceptionally low, saving you money as well as downtime. Two things which Technical Support Manager, Graham Johnson, and his colleagues at WEG always have in mind when working for you.



**Transforming energy into solutions. [www.weg.net](http://www.weg.net)**



Photo shows the inlet works (left) & the 8 Fine Screens (right)



photo courtesy Biwater North Midland Alliance



H&S Best Practice - Scissor lift formwork fixing  
photo courtesy Biwater North Midland Alliance

**Capital maintenance 1-24 No. FST scraper bridges (£4m)**

A rolling programme of replacement is underway with 2 No. bridges installed and a further 6 No. in manufacture. Civil works comprises new peripheral pathways including handrailing fitted with fall arrest system.

**Capital Maintenance 2.1 Primary Thickening Sludge Plant (£6m)**

A new primary thickening plant to replace the power hungry centrifuge installation. The green and brown sludge routes will be served by 9 No. Simon Hartley 3m wide gravity belt thickeners of which 4No. are installed and commissioned. 3D modelling has been utilised to design the sludge thickener layouts including mezzanine platforms.

**Capital Maintenance 2.2 Tanker Trade Effluent (£1.5m)**

The designs are well advanced and the estimating progressing for the tanker reception facility and acetic acid storage system. Both plants will provide revenue streams for STW and feed waste into the digesters to improve biogas production.

**Liquor Treatment Plant (£1m)**

A fast track scheme to refurbish the existing LTP with provision of 2 No. new primary tanks (11m dia) caustic dosing package and diffuser replacement with improvements to access for maintenance. Design & procurement ongoing as civil works in progress.

**Generation Station (£1m)**

The works to install new exhausts to the Waukesha Biogaas engines had to be re-sequenced due to operational constraints. MidTherm completed works successfully with commendations from STW operations. The Siloxane filters have been commissioned with associated gas shutdowns and are now operational. This has resulted in a noticeable improvement in biogas quality improving engine efficiency and power recovery.

**Summary**

The Alliance are on course to deliver this prestigious scheme on programme and within budget due to constant collaborative working to integrate all phases.

**Note:** *The Editor & Publishers wish to thank Paul Fisher, Delivery Manager with Severn Trent Water, Richard Thomson, Mark Lee, Ady Brown of the Biwater North Midland Alliance, Ron Ashton of Pick Everard and Dave Clark of Severn Trent for preparing the above article. ■*