Goscote STW

meeting a new tight water quality consent by installing an IFAS system and Mecana filters

by Joan Hernandez Puy & Fernanda Agorio Comas

Goscote STW is an activated sludge process (ASP) works located near Walsall in the West Midlands which serves a population equivalent (PE) of 120,806 (including trade). The site discharges into the River Tame catchment. Its upgrade was key to meet a tighter environmental permit in AMP6, being 10 mg/l BOD, 1.3 mg/l ammonia and 0.2 mg/l Total-P and allows for the population increase to the design horizon of 2028, which is 133,553 (PE). This project is part of the ASP Batch, which consists of twenty-six wastewater projects with a contract value of £179M delivered by a JV agreement between Mott MacDonald Bentley (MMB), CiM6 (Costain and Stantec), nmcn PLC and Severn Trent with fully shared risk and reward.

Installation of biggest two-stage Mecana unit in the world - Courtesy of MMB

Optioneering

A core team created by different members of Severn Trent, MMB and the ASP Batch carried out an extensive whole life cost assessment during feasibility stage considering various innovative options. This included commissioning several surveys in different disciplines to fully understand the risks and opportunities on site prior to adopting a definitive solution. At an early stage ground risks from an abandoned mine and unknown gas services were identified as items that could jeopardise delivering the initial solution on time and budget. Process-wise, incoming ammonia spikes that the new process would need to deal with were observed.

The initial commercial value of the project was £16.9m and the proposed solution was to increase the volume of the existing ASP from 19,000m^3 to 29,900m^3 plus installing a tertiary solids removal (TSR) system, an approach that carried out a significant whole life carbon footprint of 8.2 million kg CO_2e over 20 years.

Following an impressive efficiency focus led by MMB and Severn Trent, the team obtained endorsement for an innovative proposal lined up with best sustainability principles practices.

Process selection

The solution comprised installing integrated fixed-film activated sludge (IFAS) media and the largest two-stage Mecana pile cloth filter in the world (both from Eliquo Hydrok) as well as 3-point chemical dosing. This option would reduce the construction footprint by 60%, the costs by £4m and the whole life carbon footprint down by 2.7 million kg CO_2e to 5.5 million kg CO_2e.

The IFAS system has the advantage of being able to be retrofitted within the existing ASP civil structure, eliminating the risk of building new structures around the mine shafts on site. The IFAS cages were installed in a section of each ASP lanes to supplement the suspended biomass within the system with fixed film biomass.

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Aerial view of IFAS cages - Courtesy of MMB


Tertiary solids removal slab pour - Courtesy of MMB


Installation of the IFAS Cages - Courtesy of MMB


Aerial View of Goscote STW - Courtesy of MMB

Ferrous chloride chemical dosing equipment was installed into the IFAS ASP for simultaneous chemical phosphorus removal, and ferric sulphate to precipitate any residual ortho-P from the IFAS system before the final settlement tanks and pre-TSR cloth filter plant.

A number of capital maintenance items were also addressed as part of the project to optimise and facilitate the required outcomes of the quality project, such as the provision of new inlet screens, new blowers, new instrumentation for monitoring and aeration diffusers to meet the requirements of the IFAS process.

Programme

The programme was divided into two phases to optimise the number of IFAS cages needed to achieve the desired performance success criteria. Optimising the number of IFAS had the potential to reduce the capital cost of the scheme by £500k. A wide panel of experts in design, process, asset creation, operations and contracts met weekly to chase the shared goal in a collaborative environment.

The team also benefitted from synergies achieved with other projects in the ASP batch like Walsall Wood and Finham STWs. Sharing information with the Walsall Wood team was key to select an innovative geotechnical solution like controlled modulus columns (Vibro Menard) to limit the settlement of the Mecana slab down to 5mm, with clear benefits on the programme, safety and environment over conventional methods.

Sharing experience with Finham STW helped the teams to avoid repetition of lessons learned on design, installation, craneage, quality issues and process optimisation. Key parameters that had been identified as critical during the Goscote commissioning, such as sludge age or returns, are having a positive impact on maximising the performance for both sites. Goscote is an excellent example of team achievement through collaboration.

Conclusion

This innovative project consists of an upgrade to the existing Goscote STW to meet the new BOD, ammonia and Total-P requirements, including the installation of an IFAS system within the existing structure, two-stage Mecana Filters -the largest worldwide- and two chemical dosing rig installations.

The creation of a sharing group between MMB, the client Severn Trent, specialist subcontractors and the other ASP Batch D&B partners delivering similar schemes (CiM6 and nmcn), led to collaborative working, sharing knowledge of engineering principles, resulting in significant benefits which included efficiencies in design, procurement and contract management.

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Supply Chain	Company
Principal designer & contractor	Mott MacDonald Bentley
Process	Eliquo Hydrok
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Mechanical screens	Longwood Engineering
Mechanical installations	Rosewood Engineering
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