

Case Study

Wessex data shows total compliance at Sherborne

A wastewater treatment repurpose project carried out at a Wessex Water site not only delivered a 75% cost saving, but figures show that ammonia discharge levels are below the level of detection.

The Challenge

Population growth in the town of Sherborne in Dorset meant that the rural water recycling facility owned and operated by Wessex Water required an upgrade to manage overload. Initially the utility was planning to construct two to three additional 30m-diameter trickling filters, but such a development posed an issue around footprint on this land-constrained site. It also required major investment and months of civil engineering works.

The Solution

The utility was looking for an alternative solution to the trickling filters and was scouting for high-rate wastewater treatment processes and ways of utilising existing abandoned structures onsite. Andrew Gulliford, process design manager at Wessex Water, identified the WPL Hybrid-SAF™ enhanced biological treatment process via an article in an industry publication and invited the company to the Sherborne site.

A key advantage of WPL's Hybrid-SAF precision-engineered system is that it can be retrofitted into any vessel, regardless of shape or size, to deliver more efficient wastewater processing. During the initial collaborative planning stages of the project, the repurposing potential of an abandoned 12m-diameter onsite sludge tank was identified.

Retrofitting the circular vessel with modular WPL Hybrid-SAF cells could utilise the entirety of the vessel, whilst providing secondary biological treatment for 50% of the works' flow-to-full-treatment. By doubling the process capacity, a permanent alternative to the planned trickling filters was identified and, looking at a 20-year horizon, one that was significantly cheaper.

Off-site manufacture of the modular process technology cells meant that the onsite project delivery time would be a couple of days, rather than a possible 12-months for the civils work required for new trickling filters.

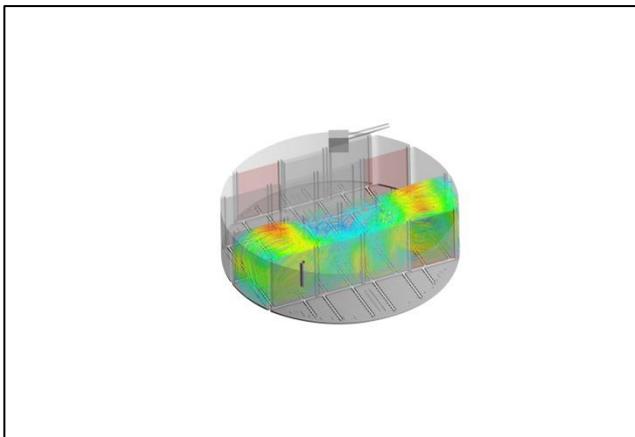


How it works

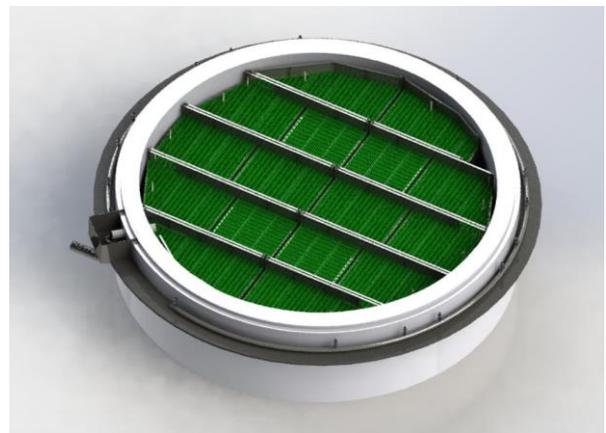
WPL's Hybrid-SAF technology comprises a submerged moving-bed, fixed-film reactor and can treat wastewater in a more sustainable and cost-effective way than traditional submerged aerated filters (SAFs). The patented modular technology is built off-site in a quality-controlled environment and can be installed within days.

WPL has used computational fluid dynamics modelling to optimise the hydraulic design of the Hybrid-SAF and ensure uniform velocity in flows of nutrients and oxygen over the high specific surface area media.

This is maintained even during peak and low flow situations, providing ideal conditions for biological growth and treatment, delivering a highly efficient process. The slow-moving media bed and hydraulic design ensure that the suspended solids that normally settle out are carried up and through the process to be captured in the final clarification stage.



Computational fluid dynamic modelling scan of empty vessel



Graphic of finished repurposed tank with modular WPL Hybrid SAF™ cells

Application

Getting-in-early on the project and meeting the end-user face-to-face and onsite meant WPL was able to fully understand the objectives of the client. The full scope of the project, including everything from the type of media installed in the biozone to the logistics of restricted access to this rural site, could be considered in designing the optimum solution.

Wessex Water also shared the 2040 design horizon with WPL, which ensured a solution that was futureproofed. The utility now has more flexibility in how throughput can be increased at Sherborne for anticipated population growth from 12,600 to 15,700 in the catchment.

The modular WPL Hybrid-SAF cells were manufactured within six to eight weeks, installed in two days and the process optimised within three weeks. The existing vessel was measured using 3D laser scanning at a point density of 3mm to ensure accuracy.

Results

Water quality data from the first year of operation shows that discharge from the plant is well within the Environment Agency's permit. Ammonia levels in the discharge effluent are below the level of detection on a consent of 10mg/l. Parameters on biological oxygen demand, turbidity and temperature have also been met.

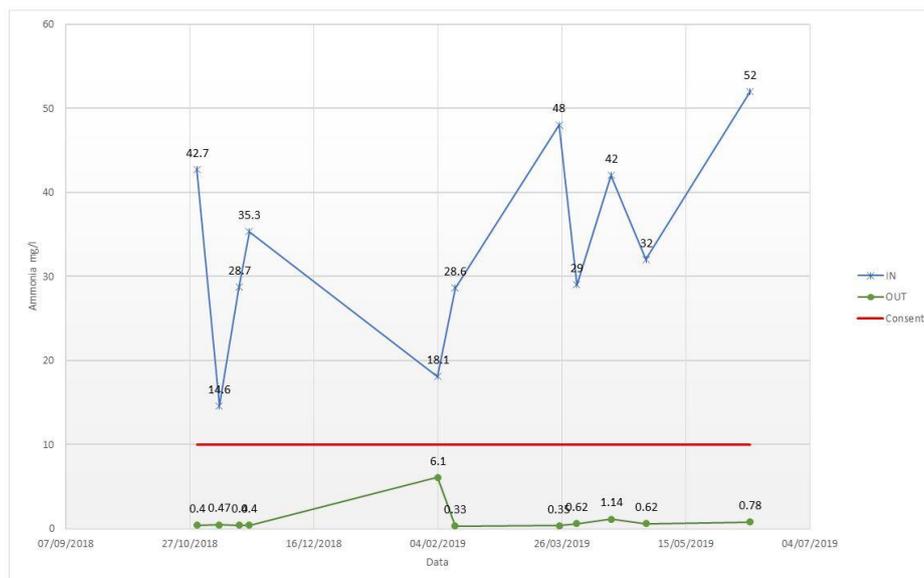
The partners have calculated that a cost-saving of 75% in capital expenditure has been achieved by retrofitting this existing infrastructure with WPL Hybrid-SAF technology as an alternative to the planned project. A 30% smaller site footprint was required at Sherborne in comparison with trickling filters originally planned.

Energy consumption was reduced by a similar measure and variable speed blowers are delivering 50-100% of design requirements, allowing greater headroom for power optimisation.

Offsite manufacture meant onsite health and safety risk was reduced and quality control easier to maintain. Height and width restrictions for vehicles and plant both onsite and in accessing the site were considered at the design stage. Off-site manufacture and shorter project time also meant fewer vehicle journeys, causing less disruption for the local community and reduced carbon emissions.

Lower levels of operator maintenance are required than with traditional treatment systems and individual cells can be replaced in a few hours without impacting on service or taking treatment vessels offline.

Other sustainability benefits include the repurposing of the tank, which meant there was no need to rip out the existing process treatment vessel and dispose to landfill. A minimal amount of concrete was required in lining the repurposed 12m-diameter tank. In addition, the WPL Hybrid-SAF's neutrally buoyant media is manufactured from recycled materials.



Sherborne wastewater treatment works ammonia results 2018 - 2019

Andrew Gulliford, process design manager at Wessex Water said, "Working closely with WPL at the earliest stages of planning for Sherborne water recycling facility meant that together we could completely reimagine the possibilities at this constrained site. Wessex Water customers will benefit from the 75% cost saving on this project and the energy efficiencies achieved will help deliver our sustainability targets."

Expert's view

WPL's technical director Andrew Baird says, "This application is a significant step forward for submerged biological treatment. Wessex Water's own data shows that the WPL Hybrid-SAF has fully complied with the environmental regulator's discharge requirements at Sherborne.

“Our research and development team has conceived the hydrodynamic profile underpinning the technology in a new way, which has been made possible by the use of a high specific surface area media. The result is that significant process efficiency advantages have been achieved, including reductions in cost, physical footprint and electricity consumption, all whilst increasing the overall process capacity of the site and ensuring environmental compliance.

“Being involved in the project at the start and working collaboratively with Wessex Water meant the best solution for the site could be identified very early on.”

Facts and stats

- Ammonia discharge below detectable levels
- Effluent quality well within Environment Agency consent
- Wessex Water customers benefit from 75% cost saving
- Process capacity doubled within existing site footprint
- Energy consumption reduced by approximately 30 per cent
- Onsite project delivery reduced from 12 months to two days

