KOVALUS Separation Solutions™

CASE STUDY

Woolston Wastewater Treatment Plant (MBR) – Southampton, UK

Overview

The Woolston Wastewater Treatment Plant (WWTP) is a municipal wastewater facility located in Southampton on the south coast of the United Kingdom. The plant serves a dense urban and residential catchment adjacent to a marina, where odor control and architectural integration into the surrounding environment were critical.

The project was delivered for Southern Water (end user and operator) via 4D, a consortium of four companies that formed specifically to act as EPC contractor for this turnkey build. Their role covered design, construction, and commissioning of a new MBR-based WWTP.

Separation challenge

The plant needed a reliable membrane filtration solution to separate activated sludge within a Membrane Bioreactor (MBR) system and produce treated effluent that meets tightened UK discharge requirements.

Previously, Woolston operated as a conventional activated sludge plant using secondary sedimentation tanks. While this system remained stable, the effluent quality could no longer comply with new legal standards, necessitating a technology upgrade rather than a remedy for failure.

Key Highlights

Advanced municipal MBR facility delivering high capacity within a compact footprint.

1. Largest MBR in UK
2. Reliable compliance with tight UK discharge standards for coastal waters
3. Energy-efficient membrane aeration modulated according to hydraulic demand

CASE STUDY

Solution

The main goal was to build a compact, high-performance WWTP that consistently complies with updated legal effluent limits, is fully covered to prevent odor emissions in a nearby residential area, and presents a modern, visually appealing design compatible with the adjacent marina setting. Achieving this required a high-capacity MBR filtration unit with scalable membrane performance and robust integration support.

Kovalus supplied **PURON® LE membrane filtration modules** for integration into the MBR filtration unit, tailored to 4D's engineering requirements.

- Supply of PURON LE modules, **single-header module design,** simplifying maintenance and hydraulic layout with **central aeration,** enabling efficient scouring and stable flux performance
- Support during design and integration so the modules were installed in a **well-functioning filtration unit**
- Ongoing technical collaboration to ensure performance targets were met

Operation Experience

The main goal of the Woolston project was to deliver a compact, high-performance municipal WWTP using MBR technology that could satisfy tighter UK discharge regulations while fitting in a highly sensitive site location. The former conventional activated-sludge plant with secondary sedimentation tanks was still operational, but it could no longer meet the new legal effluent limits, so a membrane-based separation step was required. From the outset, the plant was designed to treat an annual average flow of 19,037 m^3/day and to reliably handle hourly peak flows of 1,753 m^3/h, all within a much smaller footprint than a conventional clarifier-based facility. Because the plant is located beside a marina and near residential areas, it also had to be architecturally attractive and fully enclosed to avoid odor emissions.

To meet these combined performance and location requirements, the project focused on:

Effluent compliance and reliable sludge separation at scale

- Achieve stable activated-sludge filtration in the MBR so discharge quality consistently complies with updated legal limits
- Provide membrane capacity sized for 19,037 m^3/day average flow and 1,753 m^3/h peak flow from the original design
- Install a large filtration surface of 62,640 m^2 membrane area to ensure operational stability and regulatory compliance under varying loads, even with longer periods of FFT and winter temperatures going down to 10°C

Compact footprint through MBR design

- Replace secondary sedimentation tanks with membrane filtration, enabling high treatment capacity within a significantly reduced plant footprint while maintaining performance at municipal scale

Future-proof scalability for higher peak flows

- Ensure the filtration system could be expanded as demand increased
- In 2022, this scalability was proven when additional membrane rows were installed, increasing module density from 36 to 44 rows per module with 76,560 m^2 of membrane area and raising the peak capacity target to 2,088 m^3/h

Odor control and architectural integration

- Fully cover the plant to prevent odor emissions affecting nearby residents
- Deliver a modern, visually appealing structure suitable for a marina-adjacent, public-facing environment

In addition to the technical fit of PURON® LE for large municipal MBR filtration, Kovalus was selected because of strong trusted relationships between Kovalus staff and key project decision makers — supporting confidence in delivery and long-term performance. Overall, the objective was not only to meet strict effluent standards in a compact form, but to do so with a large, high-capacity, and expandable MBR filtration unit that could sustain compliance at one of the biggest municipal MBR plants in the UK.

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