CASE STUDY

Wilmington

South West Water

ARMPhos™

Project
Wilmington Phosphorus Removal Scheme

Location
Devon, UK

Project type
Design and construction of ARMPhos™ system

Wastewater type
Secondary treated sewage

Treatment process
ARMPhos™ system (reactive media treatment wetland)

Need

The concentration of phosphorus (P) in freshwater systems has increased significantly since the 1980s due to the introduction of P based detergents, population growth and the growing application of P fertilisers, with >30% of UK rivers currently failing to meet the P standard required to achieve a good ecological status. Consequently, there is growing demand for low cost, low maintenance, sustainable P removal solutions to meet new and increasingly stringent regulatory discharge limits.

Wilmington Wastewater Treatment Works (WwTW) is a rural site treating average daily wastewater volumes of 137m^3/d generated by a 246-population equivalent. The WwTW required upgrading to incorporate a P removal process that would comply with a new total P permit limit of 2.5mg/l.

The installation of the conventional P removal chemical dosing solution was undesirable due to the site's rural location and preference for a passive solution with minimal operator intervention requirements. The client therefore progressed the process design and installation of an innovative reactive media treatment wetland solution.

Solution

Over a decade of research and development has culminated in the innovative development of the **ARMPhos™** solution: a reactive media filled treatment wetland system that removes P through mechanisms of adsorption and precipitation.

The **ARMPhos™** solution for Wilmington was designed based on hydraulic and kinetic modelling which identified that the final effluent limit of 2.5mg/l could be achieved by treating 40% of the peak flow with additional volumes, typical of stormwater conditions, by-passing treatment and being re-blended with the treated effluent within a level control chamber, prior to discharge.

This approach optimised the process surface area to allow application within the sites space constraints and maximised the operational lifetime of the reactive media therefore minimising the solution CAPEX requirements and further improving operational net present value whole life costs.

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CASE STUDY continued

Willmington





Photographs of the ARMPhos™ system during construction and before and after operation.

The **ARMPhos™** system was constructed by ARM through September 2022, within a space constrained area downstream of the existing treatment processes. The new system comprised of a pump station designed to deliver a controlled batch to the filter surface area to prevent short-circuiting, and an earth bunded and lined formation that was filled with proprietary media layers of site bespoke depth, including the reactive media. The bed was configured similar to a Saturated Vertical Flow (SVF) treatment wetland and planted with a mixed species of aquatic macrophytes, specifically selected to provide broadleaf and shallow rooting characteristics. Monitoring of the system performance has demonstrated full compliance with the final effluent regulatory limit of 2.5mg/l total P.

The application of the **ARMPhos™** solution at Wilmington WwTW was awarded the prestigious green apple award at the Houses of Commons on 20th November 2023, having been recognised nationally for its innovation and environmental best practice.

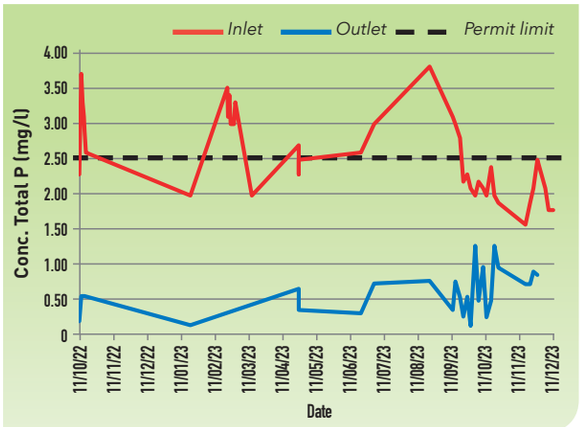
Benefits

The **ARMPhos™** solution is an innovative development of SVF treatment wetland technology incorporating a processed reactive media to ensure consistent, long-term P removal to meet new and increasingly stringent regulatory treatment requirements.

- Consistent long-term P removal/capture
- No elevation of pH, typical of alternative reactive medias
- Passive operation and low maintenance requirements
- No chemical dosing or routine sludge management requirements
- Saves up to 80t CO_2 equivalent over 40 year operating period compared to chemical dosing
- Green solution creating habitat with high biodiversity value
- Potential for P recovery creating a more sustainable circular economy

Summary of total P removal November 2022 to December 2023 (53 samples)

VALUE	VOLUME M^3/D	INLET MG/L	OUTLET MG/L	REMOVAL %
Average	123	2.46	0.61	75
St. Dev. ±	75	0.53	0.35	32
95th%ile	271	3.35	1.30	61



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