

The Effective Removal of Pharmaceutical Residues with Arvia's Nyex™ Treatment System

Background

As part of the UK water industry's undertaking to achieve tighter water quality targets, a UK Water Industry Research (UKWIR) collaborative programme of work is underway. The Chemicals Investigation Programme 2 is being led by the water utilities and environmental regulators and seeks to investigate the sources of trace substances, where they occur and their removal from final wastewater effluents.

One part of the investigation was to assess, at pilot and full scale, technologies capable of removing trace substances such as pharmaceutical residues and natural hormones. Anglian Water took the opportunity to trial Arvia's Nyex treatment system.

Pharmaceutical residues and Active Pharmaceutical Ingredients are released in wastewater streams from manufacturing sites and drug development bases. The production and use of a comprehensive portfolio of pharmaceutical products results in wastewater with a complex composition which is difficult to treat to levels in compliance with regulation from industry authorities.

By adopting a wastewater treatment process which has the ability to remove even trace levels of pharmaceutical residues, manufacturers can not only meet regulations but also ensure the continual supply of their products (by avoiding downtime due to treatment failures) and prove commitment to the protection of the environment.

The Objectives

The onsite trial aimed to assess the performance of Nyex in treating a sidestream of real effluent containing a range of 60 selected trace substances over a 12-month period in 2016-17. Anglian Water carried out analysis on water samples pre-and post- treatment throughout the period.

The treatment target was: parts per billion level >80% removal of individual pharmaceutical residues including antibiotics, prescription and non-prescription drugs.

The Solution

Arvia's Nyex™ Treatment System combines adsorption with advanced oxidation in a single, scalable unit. Trace organics are concentrated on the surface of Arvia's proprietary media, which is non-porous with high electrical conductivity. This patented adsorbent media allows for targeted and continuous oxidation.

Unlike granular activated carbon, Nyex media is effectively regenerated in situ and the process can continue without interruption or replacement. Results are achieved without chemical dosing or the generation of sludge, reducing costs in terms of transport of chemicals and specialist waste disposal.



The system provides a chemical free and environmentally sound solution, which comes in a modular design and can be bolted onto an existing treatment solution (**Figure 1**). It is also versatile and can be modified to suit a manufacturer's specific requirements.

A laboratory-scale version of Arvia Technology's Nyex treatment system was initially tested in partnership with Anglian Water at Arvia's in-house facility. The capabilities proven by Arvia's Nyex 1-20a resulted in the project being scaled-up, with the construction of a Nyex 7-50a pilot system on the site of 16,000 population equivalent wastewater treatment plant owned and operated by Anglian Water. The system deployed for this operation was stored inside a secure container (**Figure 2**).

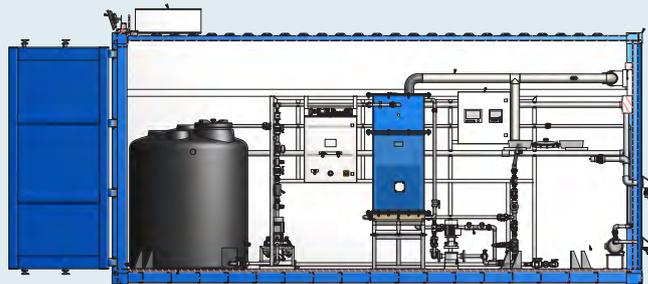
The Results

The results detailed in Figure 3 are from the in-house trial at Arvia's facilities. Full results from the 12-month on-site trial will be available from UKWIR later in 2018, however removal of pharmaceutical residues to within regulatory limits was achieved. The average energy use during the 12-month trial was 1.27kWh/m³.

On average, removal efficiencies of 90% were demonstrated, achieving the treatment target for removal of over 80%.

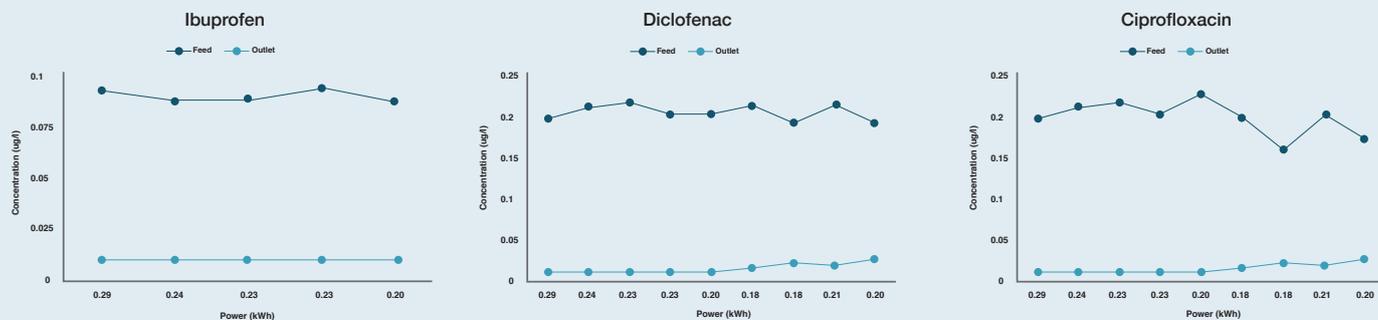
The results for Ciprofloxacin, Diclofenac and Ibuprofen treated using the Nyex treatment system can be seen in (**Figure 3**).

The Solution - Figure 1



The Results - Figure 3

In-House Non-Prescription Drugs Study



Treatment Results: >90% removal of Ibuprofen and Diclofenac achieved

Get in touch to discuss your company's treatment challenges and arrange a treatability trial on your wastewater today.