



Removal of Triton X-100 from Pharmaceutical Wastewater

Equipment Capacity/Flow Rate
Low Flow

Compounds of Concern
Triton X 100

Influent Concentration
16 mg/L

Treatment Targets
0.01 mg/L

Unit Energy Consumption
€0.70 per m³

Background

Triton X-100

Triton X-100 (TX-100) is a non-ionic surfactant with various uses in the pharmaceutical industry, including for cleaning and as an ingredient in some medicinal products.

Removal of Triton X-100 from Pharmaceutical Wastewater is now on the agenda because, due to potential endocrine disrupting properties, the substance has been placed into Annex XIV of the REACH regulation. This means that it cannot be used or placed on the market after the “sunset date” which is 4th January 2021 unless an exemption certificate is held. Those with the certificate need to entirely remove Triton X-100 from wastewater to comply.

This regulatory amend has forced users of Triton X-100 to investigate options to fully remove it from wastewater to prevent its release into the sewer or aquatic environment.

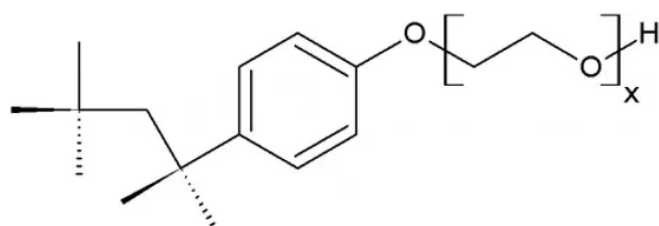
A method currently adopted for the management of contaminated water is thermal oxidation. This process involves the water being collected and trucked off to a



third-party specialist to be incinerated – a very expensive process with negative environmental implications.

This has led to pharmaceutical facilities looking for onsite wastewater treatment alternatives which are lower maintenance, as well as more cost-effective and sustainable.

Additional benefits for onsite treatment include complete traceability of hazardous waste for audit purposes and retaining complete control over compliance with upcoming legislation.



The Objectives

The Triton X-100 Project

The aim of this project was to study the ability of the NyexTM-e system to destroy Triton X-100 from an aqueous solution to as low concentration as possible.

Oxidation experiments were conducted using a NyexTM-e to evaluate its effectiveness in destroying the Triton X-100.

HPLC and LCMS analysis was carried out on each sample to determine the concentrations of Triton X-100, starting from 16 mg/L. Experiments were conducted in a re-circulation mode and sampled from the container.

The Solution

Removal of Triton X-100 from water

Arvia's Nyex™-e system was deployed against this application. This process uses electrochemical oxidation in a single, scalable unit. A low electrical current is passed which fully mineralises the contaminants to H₂O, H₂ and CO₂.

Results are achieved without chemical dosing or the generation of sludge reducing costs in terms of labour, transport of chemicals and specialist waste disposal.

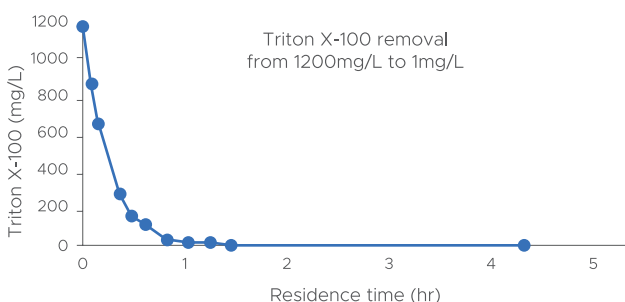
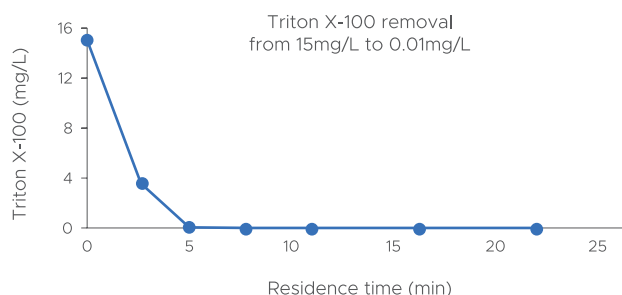


The Results

Removal of low concentrations of Triton X-100

The first graph shows the treatment profile for the experiment using a Nyex™-e system.

Removal from 15 mg/L was demonstrated and a reduction to 0.01 mg/L was reached in less than 6 minutes residence time using about 0.70 Euros worth of energy per m³. The Nyex process can remove nicotine to a very low concentration. It offers no sludge production, small footprint and a scalable design that can accommodate any flow rate.



Removal of higher concentrations of Triton X-100

This second graph shows the treatment profile for the removal of a much higher concentration of Triton X-100, still using a Nyex™-e system.

Removal from 1200 mg/L was observed and a reduction to 1 mg/L was reached in about an hour and a half residence time with an energy consumption of 0.44 kWh.

Removal of Triton X-100 and other organic substances

These results show that it is possible to reduce the concentration of Triton X-100 in aqueous solutions using the Nyex™ process. We are continuing to work with several pharmaceutical facilities that use Triton X-100 in their daily activities to ensure that treatment is optimised to be as cost-effective as possible.

Our team has extensive experience in removing problematic substances to ensure the avoidance of regulatory breaches and fines. For more information on Triton X-100 treatment, please reach out to one of our experts.



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