



The Targeted Reduction of Phenol Levels with Arvia's Nyex™ Treatment System

Equipment Capacity/Flow Rate
Low Flow

Compounds of Concern
Phenol

Influent Concentration
645 mg/L

Treatment Targets
<0.5 mg/L

Unit Energy Consumption
12.8 kWh per kg of phenol

Background

A global leading manufacturer of thermoset resins and speciality chemicals approached Arvia to help them reduce phenol levels in their wastewater. They needed to treat various phenol waste products in the manufacture of phenolic resin.

Phenol is widely used in the manufacture of everyday products including non-stick coatings, paints, adhesives and cleaning agents. Chemical compounds like this are often persistent in nature, meaning they can pass through traditional wastewater treatment systems. This results in these compounds being released into waterways within wastewater effluent and even entering sources of water used for drinking purposes.

Furthermore, some chemical substances do not degrade but bioaccumulate in the bodies of humans and animals. Researchers have found over 300 substances in human blood samples and breast milk, some of which can interfere with the hormone system or nervous system (endocrine disruption).

Improvements in analytical capabilities over recent years has meant that the visibility of persistent chemical compounds in waterbodies has increased.

This has led to:

- Consumer pressure over human health and the environment
- New technology development to cope with compounds of emerging concern
- New directives and regulations from controlling bodies



The Objectives

The aim of this trial was to demonstrate and evaluate the effectiveness of the Nyex-a system in the reduction of phenol levels in wastewater to as low as possible, preferably below 0.5mg/L. Two samples of wastewater were supplied for treatment – a chemical distillate and an effluent.

Successful treatment of phenols in the wastewater will prevent the need for transporting this wastewater off-site for incineration, which is extremely costly and damaging to the environment.

Phenol removal would also protect the Biological Aerated Flooded Filters (BAFF) process employed on the client's site, which has previously been proven to be inhibited by phenols.

The Solution

Arvia's Nyex-a system combines adsorption with advanced oxidation in a single, scalable unit. Problematic contaminants 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.



Figure 1: Nyex 1-20a

The system provides a chemical free and environmentally sound solution, which comes in a modular design and can be bolted onto an existing treatment process. It is also versatile and can be modified to suit specific treatment requirements for reuse or effluent discharge.

The trials were carried out on Arvia's laboratory scale Nyex 1-20a system (figure 1).



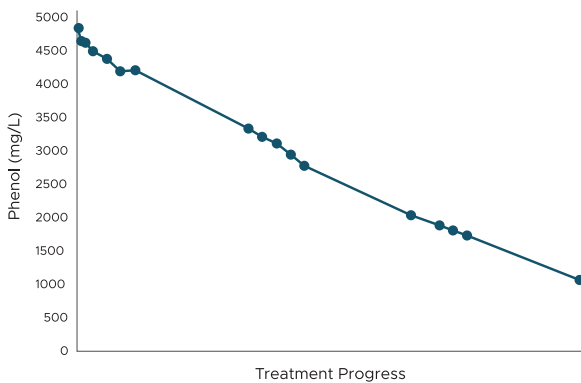
Figure 2: Nyex™ containerised system

The Results

Successful removal of the phenol content was achieved (see figure 3 & 4 below). Recommended next steps are to install a Nyex™ treatment system prior to the bio

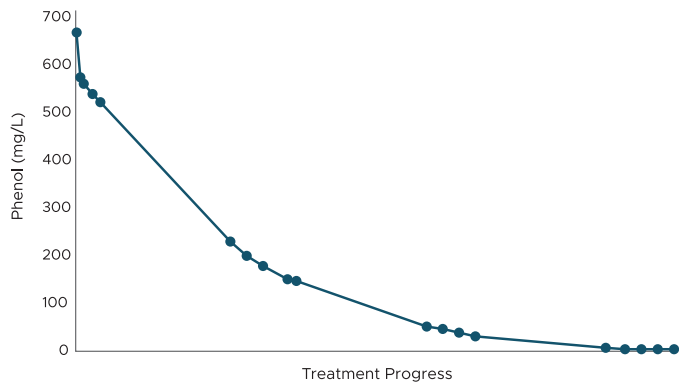
plant treatment process at the client's facility to protect this treatment step from the damage caused by this compound.

Figure 3. Sample 1: Phenol Removal from Chemical Distillate



- The phenol content was reduced from 4,761 mg/L to 1,096 mg/L
- This indicates an approximate removal of 75% of the initial phenol content of the sample
- The phenol concentration would be reduced to below 500 mg/L for a longer trial period.

Figure 4. Sample 2: Phenol Removal from Chemical Effluent



- It can be observed that the phenol dropped from 645 mg/L to <0.5 mg/L
- This approximately shows a 99% reduction in phenol levels with just over 600 mg/L being removed from the initial sample.
- The limit of detection (LOD) was 0.5 mg/L

These results demonstrate the capability of the Nyex™ process to deal with a range of phenol concentrations to provide almost complete removal.



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