Rinsability Study

TRITON X WASTEWATER RESTRICTIONS

PROJECT DESCRIPTION

The Hyde Analytical Laboratory was contracted to develop and perform a study to determine the volume of water required to rinse Triton X-100 (Triton X) from full-scale tanks. Triton X, commonly used in pharmaceutical manufacturing as a surfactant, for protein extraction, and for virus removal in vaccine development, poses significant environmental risks. Due to its severe pollution effects on freshwater ecosystems and threats to wildlife, local authorities have enforced strict measures to prevent its entry into the environment through pharmaceutical waste streams.

SCOPE AND DELIVERABLES

- **HPLC Method Development & Verification**: Develop and verify a robust HPLC method tailored for Triton X detection and quantification.
- **Triton-X Rinsability Study**: Develop a technology to determine the volume of water required to rinse Triton X from tank surfaces based on small-scale studies.
- **STAT Sample Analysis:** Perform rapid UHPLC sample analysis to confirm Triton X levels in rinse samples during full-scale runs.

SOLUTIONS, RESULTS & ACCOMPLISHMENTS

The study generated rinse scale-up factors in mL/in2 based on vessel measurements and soiling scenarios.

Delivered required inputs for developing full-scale cleaning cycles and established an HPLC method for subsequent confirmation runs.

Ensured confidence that the production process did not introduce Triton-X into wastewater streams while optimizing water usage.

Implemented sustainable practices by minimizing water consumption and preventing environmental contamination.

Sustainability Integration: Efficient Water Usage; Environmental Protection; Waste Minimization.

STUDY OVERVIEW

The laboratory conducted a small-scale rinsing method using a specific Ultrahigh Performance Liquid Chromatography (UHPLC) method to determine the necessary volume of water per surface area to remove Triton X from full-scale tanks. This rinse volume is collected for proper disposal in compliance with the City of Boulder's regulations for wastewater streams containing Triton X. Full-scale confirmation runs were performed to verify that rinse samples collected during and after rinsing contained expected or permitted levels of residual Triton X. Samples were transported to the Hyde Analytical Laboratory for STAT UHPLC analysis. Results confirmed that the calculated rinse volumes effectively removed Triton X to levels accepted by regulatory bodies.

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