CASE STUDY: PHARMACEUTICAL MANUFACTURING

Treating & Reducing IPA and Acetone in Process Wastewater to Meet Local and EPA Permit Requirements

Customer Pain Point

A leading pharmaceutical manufacturer operates a facility located in the Northeastern United States that uses an isopropyl alcohol-based (IPA) solvent as part of their reaction vessel wash process. Oxidation of isopropanol via biological and other processes can lead to the formation of acetone in wastewater, an EPA regulated compound under Title 40 pretreatment standards.

The customer's goal was to reduce IPA concentration by 90% in the wastewater utilizing the Axine system as a pretreatment step prior to discharge to the sewer. This would ensure their acetone discharge does not exceed the daily 20.7 mg/L or 8.2 mg/L monthly average regulatory limit at the compliance sampling point. In addition, the Axine system needed to demonstrate the capability to treat any IPA peaks while maintaining effluent within acetone limits.

Axine's on-site system installation

Axine's Solution

Under a multi-year service agreement, Axine owns, operates, services and maintains a wastewater treatment system at the facility. The customer's capital investment is minimal and they do not have to allocate resources to operate the system. The Axine system oxidizes the IPA and acetone to trace levels of by-product gases including hydrogen, oxygen and carbon dioxide, which are vented to the atmosphere. No solid or liquid wastes are generated, and no hazardous chemicals are utilized. Axine is responsible for complete end-to-end operation, monitoring and maintenance of the system to ensure compliance.

Axine Value Proposition

- Lowest cost solution for pre-treating organics before discharge to sewer
- Ensures compliance with local, state & federal discharge standards
- Automates & streamlines on-site wastewater treatment system

Treatment Results

Axine solutions are highly versatile and capable of treating a wide range of organic contaminants such as solvents, aromatics, polymers, surfactants, pesticides, active ingredients and other similar complex organic compounds. Initial testing was conducted on the wastewater, with starting concentrations of 500 mg/L isopropanol, and 75 mg/L acetone. Over the test period, both isopropanol and acetone were removed effectively

with concentrations of both compounds reduced to < 1 mg/L as shown in Figure 1.

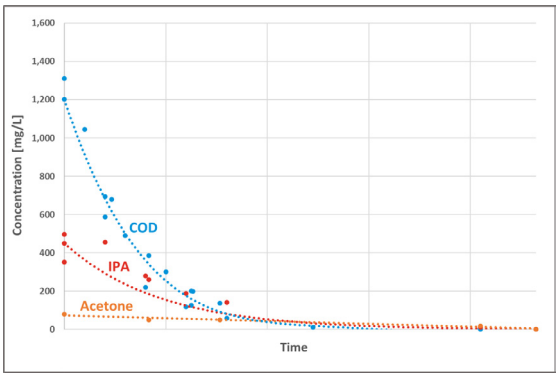

Figure 1 - Baseline wastewater treatment reduction curves for IPA and COD concentrations before, during and after Axine treatment of IPA

A second round of tests was conducted on spiked wastewater, designed to mimic transient peaks of isopropanol concentrations that may occur at the facility. Starting concentrations were 900 mg/L isopropanol and 120 mg/L acetone. Over the second test period, both isopropanol and acetone were removed effectively with concentrations of both compounds reduced to < 1 mg/L as shown in Figure 2.

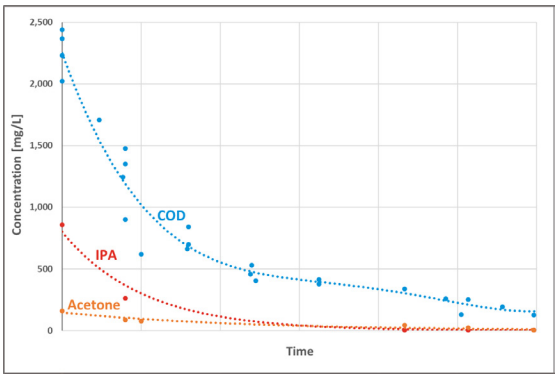

Figure 2 - Spiked wastewater treatment reduction curves for IPA and COD concentrations before, during and after Axine treatment of IPA

Table 1 summarizes the wastewater composition both before and after Axine treatment. The test results were used to design the system to ensure the facility will meet all local, state and US EPA categorical discharge limits for acetone, even during transient peaks, while improving environmental performance.

Parameter	Units	Treatment Requirement	Untreated Water	Axine Treated Water	% Reduction
Acetone	mg/L	< 2	75	< 1*	> 98.6%
IPA	mg/L	< 5	500	< 1*	> 99.8%
COD	mg/L	N/A	1,300	< 10*	> 99.2%

Table 1 – Wastewater parameters and treatment results

*Values indicate the analytical detection limits of these compounds

System Design & Operation

Axine's fully automated turnkey system includes wastewater receiving tanks, electrochemical reactors, power supply, controls and instrumentation, trace by-product gas management and flow management systems. Axine's wastewater treatment "as-a-service" package includes 24x7 remote system monitoring, routine and preventative maintenance, all consumables and replacement parts, rapid-response field service support, on-line system monitoring and monthly KPI reporting. Operational and performance data is collected wirelessly. Our proprietary data analytics monitors a wide range of performance metrics to enable safe and reliable operation. Customers can monitor performance on-line at any time.

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About Axine

Axine has created a new standard for treating toxic, recalcitrant organic pollutants in pharmaceutical, chemical and other industrial wastewater to address a global problem. Axine's breakthrough solution combines advanced electrochemical oxidation technology with a flexible, modular system design and a unique wastewater-as-a-service business model. Axine provides customers with a robust, versatile solution capable of treating all types of organics to meet the most stringent treatment requirements without using hazardous chemicals. Axine's service model enables customers to achieve wastewater and sustainability goals with minimal capital investment and technology risk. For more information, please visit **www.axinewater.com**

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