USP technologies™
Solutions for a clean environment

TECHNICAL BULLETIN
INDUSTRIAL

IN-BATH NOX EMISSIONS CONTROL AND SURFACE FINISHING WASTEWATER TREATMENT

Introduction

Wastewater streams and process baths at metal surface finishing operations can be very challenging to effectively treat. USP Technologies (USP) can help metal finishers and processors by characterizing each unique situation and matching it to our technically sound and proven options for NOx emissions control in stainless steel and titanium pickling operations, as well as for treatment of organic compounds, cyanide and a range of wastewater contaminants.

Treatment Technologies

In-Bath NOx Control: Metal surface treatment operations such as bright dipping, phosphatizing, desmutting and pickling often utilize nitrates, nitrites or nitric acids, which evolve vapor phase nitrogen oxides (NOx) and must be controlled. **Hydrogen Peroxide (H_2O_2)** is ideally suited to remove NOx in metal pickling baths, as H_2O_2 rapidly reacts with NO and NO_2 in the liquid phase as it is formed, thereby eliminating volatilization into the gas phase. The oxidation product is nitric acid (HNO_3), so in this way, the nitric acid pickling reagent is regenerated/recovered in-situ. In addition to cost savings realized from reducing the consumption of nitric acid, this in-bath approach can reduce or eliminate the expense of gas scrubbers.

USP's experience at numerous production facilities has shown that hydrogen peroxide is very effective for in-bath NOx control. Laboratory scale and on-site testing by USP can reliably estimate dose requirements and help operators make well-informed decisions for NOx control technology selection. All applications are custom designed to effectively and reliably meet the environmental requirements for NOx control.

Organic Compound Treatment: Airplane and other paint stripping operations can generate very high strength (BOD/COD) wastewaters. These waste streams contain toxic organic compounds such as methylene chloride and various phenolic compounds. **Fenton's Reagent** (iron catalyzed hydrogen peroxide), is a time proven technology and has been used in industrial wastewater treatment for over 40 years. This technology oxidizes organic compounds by generating the hydroxyl radical (OH*), which is one of the strongest oxidizers known:

$$Fe^{2+} + H_2O_2 \rightarrow Fe^{3+} + OH^- + \mathbf{OH^*}$$

Fenton's Reagent is extremely effective at oxidation of these toxic organic compounds and can significantly reduce the BOD, COD and toxicity of these wastewaters. It is best suited for treatment of high strength, lower volume wastewater streams and is often used as a pretreatment prior to onsite biological treatment or discharge to a POTW.

Cyanide Removal: Cyanide is used in a number of metal plating and processing applications. Cyanide is highly toxic and process wastewaters must be treated prior to discharge. USP offers several options for cyanide treatment:

- **Hydrogen Peroxide** – is a liquid oxidizer and relatively simple to store and feed. It reacts readily with free and weakly acid dissociable (WAD) cyanide compounds. H_2O_2 alone will oxidize these forms of cyanide to very low levels in 1-2 hours. If faster oxidation of cyanide is needed, the addition of a few ppm of a copper (Cu) based catalyst (e.g. copper sulfate) significantly improves the speed of reaction. Under optimal conditions, with catalyst and H_2O_2, cyanide removal can occur in as little as 15 minutes.
- **Persulfates** – are solid (granular) oxidizers and have the advantage of oxidizing cyanide beyond the cyanate state without pH adjustment. The reaction with persulfate is relatively slow but doesn't require metal catalysts. The simplicity and convenience of the process makes it well suited for small scale batch operations.

USP's Value Added Offering

USP will characterize each unique surface finishing or in-bath process, match to best-fit treatment technology and employ our value-added chemical logistics capability, state of the art engineered storage and dosing systems as well as ongoing technical applications expertise to provide the best solution for your treatment needs. Take control today and contact USP Technologies.

About USP Technologies

USP Technologies' ongoing mission is to help customers meet their water quality objectives by providing eco-efficient solutions that reduce and recover cost, energy, resources and space. Through a collaborative method of working closely with customers to solve problems, we are dedicated to developing innovative, sustainable and cost-effective solutions that successfully meet the highest standards of environmental stewardship. Our consultative approach includes application assessment, technology selection and field implementation of a custom engineered treatment solution. Our turn-key programs seamlessly integrate storage and dosing equipment systems, chemical supply, inventory and logistics management, and ongoing field and technical support. USP Technologies has been serving the water, wastewater and remediation markets for more than 20 years and has offices and field service locations throughout North America. We are the largest direct supplier of peroxygen-based technologies for environmental service applications and we manage hundreds of successful full-service chemical programs that treat over 1.0 billion gallons of water per day.

Getting Started

We look forward to supporting your treatment needs, whatever the scale of your requirements. To obtain a streamlined treatment solution tailored to your specific project, give us a call at (877) 346-4262.

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