



LANDFILL LEACHATE - LIQUID PHASE TREATMENT

Introduction

Landfill leachate can be very challenging to effectively treat as it is often characterized by significant odor, high COD, phenols and dissolved metals. In some cases, leachates can be toxic or inhibitory to downstream biological treatment systems. Furthermore, due to the variability of landfill material, weather patterns and content age, leachate constituent levels can change over time, adding to the complex nature of treatment. Landfill operators contend with additional challenges stemming from general public odor complaints, discharge compliance and fines or surcharges from municipal wastewater treatment plants. USP Technologies (USP) can help landfill operators by characterizing each unique leachate stream and matching it to our technically sound options for liquid phase treatment for leachate odor control, phenols, metals and high COD or toxicity.



Treatment Technologies

Odor Control: Leachate odors are complex and may involve hydrogen sulfide (H_2S), mercaptans and disulfides, along with other non-sulfur odors such as amines. USP has several options for leachate odor, depending on the predominate odors, which include hydrogen peroxide (H_2O_2), USP-OC31™ (chlorite-based oxidant) and permanganate.

- **H_2O_2** is ideally suited to remove H_2S from landfill leachate. The efficiency of treatment depends upon the available reaction time, the initial level of H_2S and the relevance of non- H_2S odors. Under optimal conditions, the effective dose ratio of H_2O_2 to H_2S is 1 to 1, with practical dose ratios typically in the 1.5 - 2 to 1 ratio of H_2O_2 to H_2S . If leachates contain a few ppm of iron (Fe^{+2} or FeS) the reaction rates and efficiency of H_2O_2 is further improved.
- **USP-OC31** has been shown to provide control of an even broader range of complex odors including not only sulfur based compounds, but organic and amine based odors. Optimal dosage requirements can be reliably estimated through laboratory testing.
- **Permanganate** is also an effective treatment for a wide range of sulfur and non-sulfur based leachate odorants. Permanganate reacts extremely quickly and is well suited for situations when limited reaction time is available.

Experience has shown that all of these oxidants can be very effective for leachate odor control. The specific makeup of the leachate odors will dictate when one technology may be favored over another. Laboratory scale testing of these liquid phase treatment options by USP can reliably estimate dose requirements for specific leachate streams and help landfill operators make well informed decisions on odor control technology selection.

Phenols: Depending on the type of waste a particular landfill accepts and if the leachate is sent offsite for treatment (e.g. POTW), phenols can be an issue in leachate. Fenton's Reagent (iron catalyzed hydrogen peroxide) and permanganate are both extremely effective for treating phenols.

- **Fenton's Reagent** has been used in industrial wastewater treatment for over 40 years and rapidly oxidizes phenols by generating the hydroxyl radical (OH*), one of the most potent oxidizers known. Phenol oxidation can occur in as little as 20-30 minutes.
- **Permanganate** is another powerful oxidant that USP has effectively used for phenol treatment in a range of industrial wastewaters and landfill leachates. The oxidation is rapid and can be accomplished without the need of a catalyst. The theoretical ratio of permanganate to phenol for complete oxidation (mineralization) is 15.7 to 1. The practical permanganate to phenol ratio is closer to 6-7 to 1 for oxidation to carboxyl acids.

Metals Removal: Hydrogen peroxide, permanganate and other USP offerings can oxidize iron, manganese and other metals to allow for subsequent precipitation/removal from the leachate.

COD and Toxicity Reduction: Depending on the age of the landfill, leachate characteristics, where the leachate goes after being collected (discharge to municipal sewer, off-site hauling/disposal or on-site treatment) high COD and/or bio-toxicity/inhibition can be an issue for the landfill operator. Fenton's Reagent is extremely effective at reducing the overall COD of the leachate, while also converting recalcitrant compounds to forms that are more readily biodegradable. This allows improved biological treatment in downstream processes. Lab testing must be completed to confirm the level of COD removal and treatment economics.

USP's Value Added Offering

USP will characterize each unique landfill leachate stream, 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 landfill leachate 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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