CASE STUDY

Bioxi

Removal of Persistent Minority Pollutants, Recalcitrant Organic Matter and Ammonia Nitrogen from Wastewater Using Advanced Oxidation Technologies and Electric Biofilters

The Challenge

The objective Persistent Organic Pollutants (POPs), internationally known by their acronym POPs, are chemical substances posing a global threat to human health and the environment. Their resilience to degradation allows them to persist in the environment, and their bio-accumulative nature leads to increased concentrations in living organisms as they move up the food chain. POPs are toxic to both human health and the environment, and their ability to travel long distances makes them capable of reaching regions where they have never been produced or used. In response to this issue, the European Union implemented Regulation (EC) No. 850/2004, aiming to protect human health and the environment from these persistent organic pollutants. The annexes of the Stockholm Convention have been modified to include new POPs, originating from various sources such as the use of pesticides and biocides, industrial refrigerant fluids, retardants, and unintentional emissions during thermal processes involving organics and chlorine.

The Solution

The advancement of biological and chemical oxidation technologies is being pursued as a highly effective solution for eliminating hazardous substances, notably Persistent Organic Pollutants (POPs) and various contaminants present in industrial waste and wastewater. The proposed strategy entails the seamless integration of sophisticated biological and chemical oxidation processes, with a specific focus on electro-oxidation. The project's objectives encompass the optimization of electrode materials for cost-effectiveness, refinement of electrode configuration, and enhancement of operational conditions to minimize energy consumption. Furthermore, the exploration extends to advanced biological oxidation methods rooted in microbiological electrochemical processes. The notable advantages of these approaches include the elimination of chemical reagent addition, reduction in organic matter and nitrates, lower energy consumption, and the absence of solid waste generation. Moreover, the project delves into the synergistic combination of these technologies to amplify the efficacy of contaminant removal and facilitate hydrogen production.

Benefits

The development of the BIOXI project will contribute valuable insights into two oxidation techniques that have the potential to expand business opportunities. This would enable the treatment of complex aqueous streams at a lower cost compared to current methods. Existing treatments, depending on the volume and contaminant load of aqueous streams, often involve high-energy and material-consuming processes such as incineration, or post-treatments like activated carbon, leading to a significant increase in treatment costs. The proposed advanced oxidation technologies, electro-oxidation, and biological treatments, aim to optimize these processes, allowing the company to offer more competitive prices with a reduced environmental impact.

The technologies proposed in the project would lower operational costs through decreased energy and material consumption, as well as a reduction in the production of residual sludge destined for landfills. Furthermore, the potential for hydrogen and electricity production through these technologies, for self-consumption, could result in a reduction in the facility's current energy consumption.

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Crew members: Technical Department

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