The Use of Ozonation to Improve the Treatability of Pulp and Paper Mill Effluent

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EXTENDED ABSTRACT

The goal of this project is to investigate the efficacy of using ozone in conjunction with an existing wastewater treatment scheme to improve the discharge quality of Graphic Packaging, International's (GPI) wastewater. GPI is a pulp and paper mill plant and its wastewater effluent contains organic compounds, including tannins and lignins. Due to the chemical composition of these compounds, they are often non-responsive to typical wastewater treatment. It is believed that ozone can help convert the lignins and tannins from a recalcitrant pollutant into organics that are more readily utilized by the bacteria in the aeration basin of activated sludge treatment. The effluent from GPI is treated at the Rocky Creek Wastewater Treatment Plant located in Macon, Georgia. The current treatment method at the Rocky Creek facility is extended-aeration activated sludge, which incorporates aeration basins at the influent. Ozone (O_3) and activated sludge are two very different techniques for treating wastewater, that when used in tandem can produce a high-quality effluent. Ozone treatment is an effective disinfectant and can be used in conjunction with other treatment techniques.

A 10-L clear PVC, semi-batch, bubble column was used to supply ozone to the wastewater during the bench-scale study. Ozone was supplied from an Ozotech ozone generator at a rate of 1.7985 mg O_3 min^{-1} for 20 minutes. To ensure that the contents of the bubble column were completely-mixed, a continuous recycle stream (290 ml min^{-1}) was provided using a peristaltic pump. A 4.725 L vessel served as the aeration chamber. One pump equipped with 2 diffusers was used to ensure adequate dissolved oxygen concentrations.

Analysis on the wastewater include pH, temperature, turbidity, color, soluble chemical oxygen demand, a five-day biochemical oxygen demand, oxygen uptake rate, solids volume index, absorbance and solids. These tests were conducted before and after ozonation and post aeration. Results from before and after treatment were compared. A control experiment was conducted to determine color and COD removal on the industrial wastewater treated in the bench-scale aeration basin only; no ozone was applied to the wastewater used for the control. Preliminary results show that ozonation decreases the COD and color of the industrial wastewater. Experiments also show improved settleability of the wastewater samples as well as a significant decrease in COD, color and absorbance.