

Research on the Aeration Systems' Efficiency of a Lab-Scale Wastewater Treatment Plant

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Abstract : In order to obtain efficient pollutants removal in small-scale wastewater treatment plants, uniform water flow has to be achieved. The experimental setup, designed for treating high-load wastewater (leachate), consists of two aerobic biological reactors and a lamellar settler. Both biological tanks were aerated by using three different types of aeration systems - perforated pipes, membrane air diffusers and tube ceramic diffusers. The possibility of homogenizing the water mass with each of the air diffusion systems was evaluated comparatively. The oxygen concentration was determined by optical sensors with data logging. The experimental data was analyzed comparatively for all three different air dispersion systems aiming to identify the oxygen concentration variation during different operational conditions. The Oxygenation Capacity was calculated for each of the three systems and used as performance and selection parameter. The global mass transfer coefficients were also evaluated as important tools in designing the aeration system. Even though using the tubular porous diffusers leads to higher oxygen concentration compared to the perforated pipe system (which provides medium-sized bubbles in the aqueous solution), it doesn't achieve the threshold limit of 80% oxygen saturation in less than 30 minutes. The study has shown that the optimal solution for the studied configuration was the radial air diffusers which ensure an oxygen saturation of 80% in 20 minutes. An increment of the values was identified when the air flow was increased.

Keywords : flow, aeration, bioreactor, oxygen concentration

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