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Enhanced Oxygen Volumetric Mass Transfer in a Geometrically Constrained Vortex

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Abstract:

Aeration is one of the most cost intensive steps in water and wastewater treatment due to the large energy requirement for the creation of large surfaces for sufficient gas exchange as well as for providing efficient liquid transport in order to exchange saturated liquid elements at the surface with unsaturated ones from the bulk. In this work we show that geometrically constrained vortices in a hyperbolic funnel are a promising aeration technique as they meet these criteria and allow oxygen transfer coefficients up to 50 h^{-1}, a number significantly higher than that of comparable methods like air jets or impellers (<10 h^{-1}).

Keywords: aeration systems, vortex, oxygen diffusion, hyperbolic funnel