Computational Fluid Dynamic Simulations of Single-Phase Flow in a Spacer-Filled Channel of a Filter-Press Electrolyzer

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Computational fluid dynamic (CFD) simulations were performed for single-phase flow in a spacer-filled channel of a filter-press electrolyzer solving the Reynolds-averaged Navier-Stokes (RANS) equations with the $k-\varepsilon$ turbulence model. For the first time the physical presence of a turbulence promoter in a pre-pilot scale filter-press electrolyzer was included in the simulation, obtaining excellent agreement of simulations with experimental residence time distribution (RTD) results. CFD simulations evidence that net-like spacer homogenizes the flow distribution, provoking an increase in local Reynolds numbers. Also, the velocity profiles are strongly affected by the flow distributor at the inlet of the electrolyzer, but these become more uniform in the presence of the turbulence promoter.

Keywords: Flow hydrodynamics, Filter-press electrolyzer, Turbulence promoter, Turbulent flow

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