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Optimizing the sparging condition and membrane module spacing for a ZW500 submerged hollow fiber membrane system

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ABSTRACT

The present study characterized the surface shear forces induced by sparging for different sparging conditions (i.e. continuous, alternating and pulse) and the membrane module configurations (i.e. spacing). The root mean square (RMS) of surface shear forces induced by gas sparging, which has been reported to be related to the extent of fouling control in membrane systems, were relatively similar for continuous, alternating and pulse sparging. Considering that pulse sparging uses approximately half of the volume of sparged gas than continuous or alternating sparging, the results suggest that pulse sparging is the best sparging approach. The RMS of surface shear forces were substantially higher for the wide module spacing than for the standard (i.e., narrow) module spacing, indicating that fouling control can likely be significantly improved by simply increasing the distance between the membrane modules.Because of the heterogeneous distribution of surface shear forces and sparged bubbles, it is essential to consider the hydrodynamic conditions throughout the system, rather than just those at the periphery, to optimize the sparging conditions and the module spacing.

Keywords: Fouling control; Hollow fiber membranes; Membrane module spacing; Sparging conditions; Submerged hollow fiber; Surface shear forces

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