CFD study on the effect of baffle arrangements on flow patterns in tubular membrane channel

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ABSTRACT

A computational fluid dynamics (CFD) study was conducted to simulate turbulent flows in tubular membrane channel with different baffle arrangements, i.e., wall baffle, central baffle and baffle combination (combined use of two types of baffle). It reveals that baffle combination generates a rather more complex flow fields within membrane module than single type of baffle, thereby causing the more intense fluctuations of crossflow velocity or wall shear stress and producing the fairly higher turbulence level of fluid flow. Baffle combination can greatly enhances the eddy mixing action in the inter-baffe regions, resulting in the uniform distribution of particle concentration in the vicinity of membrane surfaces. CFD simulation suggests that baffle combination can achieve better membrane filtration performance than single type of baffle, which was validated by the microfiltration experiment.

Keywords: CFD; Turbulence promoter; Microfiltration; Membrane fouling; Flux enhancement