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CFD for the influence of submergence depth of impellers on the flow field and sludge concentration distributions in an oxidation ditch

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ABSTRACT

It is a big problem that the submergence depth of impellers is optimized in an oxidation ditch (OD) to improve mixture flow characteristics and to reduce energy consumption. The mixture model along with the renormalized group κ–ε turbulence model was used to simulate the flow velocity and sludge concentration under different submergence depth ratios of 0.2, 0.4, 0.5, and 0.7 of impellers in an OD, and then the distribution of flow velocity and sludge concentration in the channels were analyzed. The equations for the mixture model was discretized by the finite volume method, and solved by the pressure-implicit with the splitting of Operators algorithm. The results show that, when the submergence depth ratio ranges from 0.4 to 0.5, the velocity and the sludge concentration distributions are more uniform, which can improve the flow field distribution and reduce sludge deposit in an OD; therefore, the range of 0.4–0.5 of submergence depth ratio is optimal and has reference value for the design of ODs.

Keywords: CFD; OD; Submergence depth of impellers; Flow field; Sludge concentration

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