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Research on the optimal submergence depth of the surface aerator in an oxidation ditch by computational fluid dynamics method

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ABSTRACT

The effect of the submergence depth of surface aerator on the structure of flow field, aeration gas-volume-fraction distribution, and the ability to move fluid in an oxidation ditch (OD) was studied by using an experimentally validated computational fluid dynamics model (in FLUENT6.3.26). The gas–liquid two-phase model with the three-dimensional (3D) renormalized group k–ε turbulence model was used to describe the gas–liquid two-phase flows in ODs; the pressure-implicit with splitting of operators algorithm was used to solve the velocity and pressure; and the volume of fluid method was used to simulate the water surface. The concept of the submergence depth ratio was introduced to describe the submergence depth of the surface aerator in the OD. With the different submergence depth ratios of 1/4, 1/3, 1/2, and 3/4, the velocity fields and gas content distributions were computed, by which the optimal submergence depth ratio from 1/3 to 1/2 of the surface aerator was obtained. The research result has a certain reference for reducing sludge deposit and prolonging liquid-gas mixing time in an OD.

Keywords: Oxidation ditch; Numerical simulation; Optimal submergence depth; Surface aerator

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