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CFD MODELING AND SIMULATION OF A SURFACE WATER TREATMENT PILOT PLANT

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Abstract

The hydrodynamics of two equipments from a surface water treatment pilot plant has been investigated through residence time distribution (RTD) experiments using brine solution as tracer. Computational Fluid Dynamics (CFD) procedure, which is increasingly utilized to study a wide variety of complex environmental fluid mechanics processes, was used to predict the flow patterns and other properties of flowing fluids (e.g. velocity, concentration of species etc.). In this work, ANSYS Fluent 14.0 has been chosen as CFD modeling environment and a standard k-ε turbulence model (along with Reynolds Averaged Navier-Stokes equations) was used to describe the transport of the turbulence kinetic energy and dissipation rate per unit in time. The tracer behavior was simulated by incorporating a user-defined scalar (UDS) in the CFD model. The comparison of the simulation results with RTD experimental data has clearly shown that by using CFD software it is possible to predict the flow patterns and the degree of variability of energy dissipation along the pilot plant line, allowing variations in turbulent kinetic energy to be taken into account in the evaluation of equipments efficiency.

Key words: computational fluid dynamics, residence time distribution, standard k-ε turbulence model, turbulent flow

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