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Investigation of Melt Stirring in Aluminum Melting Furnace through Water Model

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In the present study, an optimized low-cost numerical model has been developed to simulate melt stirring and mass transfer in aluminum melting furnace. To validate the numerical model, scaled-down water model experiments were also conducted. The present numerical results revealed good agreement with the experimental observations. Faster speeds of impeller rotation could improve the stirring efficiency; however, a strong surface vortex was formed at the free surface under these conditions. The perfect mixing time was the longest at middle immersion depth of impeller and the strong surface vortex was generated at the largest immersion depth. The mechanism of surface vortex generation was explained in terms of pressure distribution around the blades, which is created by the impeller rotation.

Keywords; Aluminum, Water Model Experiment, Numerical Simulation, Melt Stirring, Casting

1. Introduction