

Modeling and simulation of equivalent second-order pendulum model of casting crane based on liquid slosh

ABSTRACT

Because the load of the foundry crane is the molten metal of high temperature liquid, the liquid in the load will produce different amplitude sloshing during the operation process, showing a complex solid-liquid coupling phenomenon. The conventional modeling method of treating the load as a solid can no longer meet the control requirements. In order to solve this problem, the equivalent second-order pendulum model of liquid sloshing is established in this paper. On this basis, the dynamic equation of casting bridge crane is derived by Lagrange method. Then a sliding mode variable structure controller is designed and simulated. The experimental results verify the dynamic characteristics and effectiveness of the nonlinear model, and realize the precise positioning of the trolley and the effective anti-swing of the load.