

Research on position control application for the roll drive system in continuous hot rolling lines

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Abstract: This study investigates the application of position control for the drive system of rolling stands in a continuous hot rolling mill. The precise synchronization of roll gap and rotational position is critical for maintaining product thickness, shape, and tension stability across successive stands. A mathematical model of the electromechanical drive system, incorporating nonlinear friction and load disturbances, is developed. To address the challenges of high dynamic response and robust tracking under varying operational conditions, a cascade control structure is proposed, integrating a proportional-integral (PI) velocity loop with a position controller. Advanced compensation strategies, including feedforward control and disturbance observers, are implemented to enhance accuracy and reduce steady-state error. Simulation and experimental results demonstrate that the proposed control scheme significantly improves positioning precision and dynamic response compared to conventional methods. The findings confirm the feasibility of the approach for industrial application, offering a reliable solution for enhancing product quality and operational efficiency in continuous hot rolling processes.

Keywords: position control, rolling mill drive system, continuous hot rolling line, control application