

Research on improving the quality of the motion control system for stable frequency of Diesel generators

Vo Van Hung

Abstract: This study focuses on enhancing the control quality of the motion control system for stabilizing the frequency of a diesel generator. Diesel generators are critical for off-grid and backup power applications, yet their frequency stability is often compromised by load variations and the nonlinear dynamics of the prime mover. This research proposes an advanced control strategy to improve transient response and steady-state accuracy. A mathematical model of the diesel engine and generator system is developed, capturing key nonlinearities. A novel controller, integrating adaptive and robust control techniques, is designed to regulate the engine speed and, consequently, the electrical frequency. Simulation and experimental results demonstrate that the proposed system significantly reduces frequency overshoot and settling time compared to conventional PID controllers. The findings offer a practical solution for enhancing power quality in diesel-based microgrids, ensuring more reliable operation under fluctuating load conditions.

Keywords: Improving quality, motion control system, frequency stability, Diesel generator