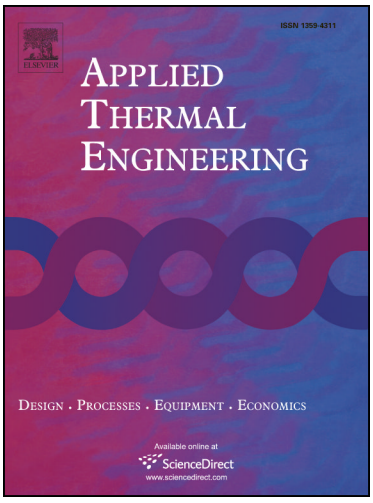

Research Paper

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Pseudo-online optimization of condenser pressure for the cold-end system with variable speed pumps

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Abstract:

The operation conditions of the cold-end system have significant impact on the unit thermal economy. However, due to the difficulty of online determination of some key parameters, the condenser pressure optimization has been a challenging task for a long time. This paper proposes an online applicable approach to optimize the condenser pressure with variable speed pumps, taking the mass flow rate of the circulating water as the manipulating variable, to achieve better thermal economy. After the exhaust steam wetness fraction is online identified, the condenser thermodynamic characteristics under varying working conditions are investigated based on the effectiveness and steady-state energy balance of the condenser. By maximizing the net power benefit, defined as the difference between the unit power increment and the pump power consumption increment, the optimal mass flow rate of the circulating water is derived. To validate the approach, pseudo-online simulations are conducted with the history data from an ultra-supercritical unit. The retention time during which the set value of the mass flow rate of the circulating water remains constant is studied in context with the implementation of the manipulation strategy under on-site scenario. Simulation results reveal the energy-saving potential of condenser pressure optimization with the proposed approach.

Keywords: coal-fired power plant, cold-end system, condenser pressure, variable speed pump, pseudo-online optimization

1. Introduction

The coal-fired power generation is a dominant source of power supply in China. The latest statistics