

Thermodynamic Modeling of Three Pressure Level Reheat HRSG, Parametric Analysis and Optimization Using PSO

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Abstract : The main purpose of this study is the thermodynamic modeling, the parametric analysis, and the optimization of three pressure level reheat HRSG (Heat Recovery Steam Generator) using PSO method (Particle Swarm Optimization). In this paper, a parametric analysis followed by a thermodynamic optimization is presented. The chosen objective function is the specific work of the steam cycle that may be, in the case of combined cycle (CC), a good criterion of thermodynamic performance analysis, contrary to the conventional steam turbines in which the thermal efficiency could be also an important criterion. The technologic constraints such as maximal steam cycle temperature, minimal steam fraction at steam turbine outlet, maximal steam pressure, minimal stack temperature, minimal pinch point, and maximal superheater effectiveness are also considered. The parametric analyses permitted to understand the effect of design parameters and the constraints on steam cycle specific work variation. PSO algorithm was used successfully in HRSG optimization, knowing that the achieved results are in accordance with those of the previous studies in which genetic algorithms were used. Moreover, this method is easy to implement comparing with the other methods.

Keywords : combined cycle, HRSG thermodynamic modeling, optimization, PSO, steam cycle specific work

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