Abstract :

This paper illustrates the effect of selling price on the optimum design parameters of a heat recovery steam generator (HRSG) and the selection of its ideal configuration for an outlet temperature range of 350–650 _C. The Particle Swarm Optimization (PSO) method was used, considering the steam cycle specific work as an objective to be maximized, the net present value as another objective to be maximized for the economic optimization and a combination of both. Three configurations of heat recovery steam generators are considered with one, two and three pressure levels and a reheat. The results show that, the three pressure level system is the best configuration from a thermodynamic point of view, but with respect to the economical aspect the two pressure levels is the best configuration for the low and medium selling prices (0.04 $/kW h, 0.08 $/kW h and 0.2 $/kW h), whereas the three pressure level configuration would only be interesting for a high selling price of 0.3 $/kW h and a temperature range 450–600 _C. For a temperature of 650 _C, the high cost of the three level system leads to a decrease in the net present value.
As the selling price increases the optimized design parameters of the three pressure level HRSG based on economic or thermodynamic optimization are similar. The obtained results are used to elaborate a new correlation relating the net present value with the gas turbine outlet temperature, gas mass flow rate.