Thermal modeling of gas engine driven air to water heat pump systems in heating mode using genetic algorithm and artificial neural network methods

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Abstract

The gas-engine driven air-to-water heat pump, type air conditioning system, is composed of two major thermodynamic cycles (including the vapor compression refrigeration cycle and the internal combustion gas engine cycle) as well as a refrigerant-water plate heat exchanger. The thermal modeling of gas engine driven air-to-water heat pump system with engine heat recovery heat exchanger was performed here for the heating mode of operation (in which it was required to model engine heat recovery heat exchanger). The modeling was performed using typical thermodynamic characteristics of system components, artificial neural network and the multi-objective genetic algorithm optimization method. The comparison of modeling results with experimental ones showed average differences of 5.08%, 5.93%, 5.21%, 2.88% and 6.2% which shows acceptable agreement for operating pressure, gas engine fuel consumption, outlet water temperature, engine rotational speed, and system primary energy ratio.

Keywords: **gas engine driven air to water heat pump, plate heat exchanger, thermal modeling, artificial neural network, genetic algorithm**

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