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Prediction of Coefficient of Performance of an Air Source Heat Pump Water Heater under Two Critical Operating Scenarios

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The air source heat pump (ASHP) water heater is an efficient and renewable energy device for sanitary hot water production. Modeling and simulation of the coefficient of performance (COP) of an ASHP water heater can lead to optimization and prediction of its performance. A data acquisition system (DAS) was constructed to measure the predictor parameters (E, electrical energy consumed and , product of ambient temperature and relative humidity) as well as the thermal properties to compute the COP during the vapor compression refrigerant cycles (VCRC) of the ASHP unit. It was depicted that the mean COP in the both scenarios of the heating up cycles (firstly, where there was no successive hot water drawn off and secondly, where there was hot water drawn off occurring simultaneously with the ASHP running) was on average above 2. Again, using multiple linear surface fitting models in conjunction with the simulation linear model plots in the both scenarios, it was delineated that increases in both predictors resulted to increase in the COP in the drawn off mode. The models were used in the mathematical blocks of the Simulink to design the ASHP water heater's COP simulation application. The multiple comparison procedure test was employed to demonstrate that there exists no significant difference of COP under the both scenarios.

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Level for award (Hons, MSc, PhD, N/A)?

PhD

Main supervisor (name and email) and his / her institution

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