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Performance Evaluation and Optimization of an Air Source Heat Pump Water Heater at Low Temperatures

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Residential air source heat pump (ASHP) water heaters can operate at a coefficient of performance (COP) between 2-4 under standard outdoor conditions. In winter usually at outdoor temperatures below 5°C when their heating function is mostly needed, they tend to under-perform with COP usually close to 1. However, residential ASHP water heaters still offer room for further optimization in a bid to achieve a higher operation efficiency even at low temperatures from an energy management perspective.

In this work, we critically analyze the performance of a residential split-type ASHP water heater during winter at ambient temperatures below 5°C (typical of South African climate during winter). The thermodynamic performance parameters and compressor energy consumption are modeled using multiple linear regression models. These models are then simulated in MATLAB incorporating an intelligent control algorithm designed to boost the COP at low ambient temperatures.

Apply to be considered for a student award (Yes / No)?

Yes

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

MSc

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

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Would you like to submit a short paper for the Conference Proceedings (Yes / No)?

Yes

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