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Short-Term Energy Efficiency Decay and Risk Analysis of Ground Source Heat Pump System

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Abstract : The objective of this paper is to investigate the effect of short-term heat exchange decay of ground heat exchanger (GHE) on the ground source heat pump (GSHP) energy efficiency and capacity. A resistance-capacitance (RC) model was developed and adopted to simulate the transient characteristics of the ground thermal condition and heat exchange. The capacity change of the GSHP was linked to the inlet and outlet water temperature by polynomial fitting according to measured parameters given by heat pump manufacturers. Thus, the model, which combined the heat exchange decay with the capacity change, reflected the energy efficiency decay of the whole system. A case of GSHP system was analyzed by the model, and the result showed that there was risk that the GSHP might not meet the load demand because of the efficiency decay in a short-term operation. The conclusion would provide some guidances for GSHP system design to overcome the risk.

Keywords : capacity, energy efficiency, GSHP, heat exchange
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