

In this paper, we describe a new heat pump calculation model that achieves the following objectives: (i) demonstrates the influences of temperature, flow rate, and load ratio of the heating medium on the system; (ii) describes the system characteristics affected by the heat medium outlet temperature; (iii) analytically solves system equations without iterative convergence calculations; (iv) implements a small number of explanatory variables, thereby allowing the shape of the characteristic expression to be easily overlooked; and (v) is generalizable because the explanatory variables are dimensionless. The parameters of the developed model for the ground source heat pump were estimated, and the calculation results were compared with those of the model developed using the LCEM tool. The ground source heat pump model was developed with a cooling water pump and a ground heat exchanger. The relationship between the cooling water flow rate, partial load rate, and system efficiency was calculated. It was confirmed that the trade-off between the power consumption by the heat pump and the cooling water pump can be described using the cooling water flow rate.