Modelling and control of solar driven humidificationïdehumidification desalination plant

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Abstract

This article reports on mathematical modelling and control of a solar-driven humidificationïdehumidification desalination plant. Mathematical models for the components are constructed using CARNOT toolbox in MATLAB environment. Model validation has been shown by comparison with published experimental data. Solar collector outlet temperature control is a key parameter to optimize plant performance. In this study, solar field pump flow rate is controlled to maintain the collector outlet temperature at a predetermined set value. Three types of PID controllers are tested. These include PID, nonlinear PID and fractional-order PID. Controllersô gains are optimized using genetic algorithm technique. The results show that FOPID controller offers a superior dynamic and static performance and can be automatically adjusted to compensate for weather changes.

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