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Performance assessment of an existing multi-effect desalination system driven by solar energy

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A B S T R A C T

An experimental study was carried out to assess the performance of a 14-effect desalination plant driven by solar energy located in the Plataforma Solar de Almería (PSA). The required thermal energy to run the system is supplied by means of hot water generated from flat-plate solar collectors. In order to compensate for the solar energy variation, a thermal energy storage system is coupled. The desalination unit is built in a forward feed configuration. A gas boiler is used as an auxiliary heat source for operating the MED plant when solar energy is not available. A set of experiments was carried out for evaluating the impact of the heating water temperature and feed seawater flow rate on the water production and performance ratio of the system. According to the factorial experiments, heating water temperature rise within the considered range had a positive impact on the water production but a negative impact on the performance ratio of the desalination system. On the other hand, feed seawater flow rate increase led to a reduction in both the water production and the performance ratio. The maximum performance ratio of 12.4 was recorded for the system which is higher than the previously published value.

Keywords: Multi-effect distillation; Performance ratio; Water production; Solar energy

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