Novel multiple effect direct solar distillation system of integrated solar still and HDH system

Hassan Fath*, Nikita Jayswal, Abdul Qadir

Water and Environment Engineering (WEE) Program, Masdar Institute of Science and Technology, Masdar, Abu Dhabi, UAE
Email: hfath@masdar.ac.ae

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ABSTRACT
A novel stand alone direct solar distillation system of integrated solar still with humidification–dehumidification (HDH) sub-system is presented and numerically studied. The integrated system utilizes the heat of condensation of the still for additional water production in the HDH sub-system. Both forced and naturally driven HDH air circulation is studied. A numerical model is developed to simulate the integrated distillation system for 24 h of operation on a typical winter and summer days of Abu Dhabi (UAE). The effect of various environmental, design and operational parameters on the system’s operational performance, productivity and efficiency is studied. The results show that natural air circulation can replace the forced circulation and simplify the system complexity and reduce its CAPEX and OPEX. For selected operational parameters, the system productivity was found to be near 10 kg/m².day for a typical summer day which is almost double the normal still production.

Keywords: Solar desalination; Humidification–dehumidification; Energy efficiency

*Corresponding author.

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