

## Development of a hybrid solar distillator of a basin type distillator and a membrane distillator

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Received 15 September 2008; Accepted 29 March 2009

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### ABSTRACT

A tube-type solar distillator hybridized a conventional basin still with an air-gap membrane distillator using PTFE membrane was numerically and experimentally investigated for drinking water or irrigation. A tube-type basin still is directly combined with a flat-type membrane distillator through an absorber for solar irradiation within the distillator. Membrane distillation enables water to flow under an absorber at the stable state and water vapor to transfer in the downward direction due to support of membrane. Distillate productivity in case of a bilateral water feeding operation at the steady state almost equals to the summation of productivity in the case of one-way feeding method independently for basin still and membrane distillator. The numerical simulation revealed that membrane distillation mostly produced distillate water at the range of low solar irradiation and basin distillation contributed to productivity at the high irradiation. Dynamic characteristics of the hybrid distillator were investigated in the indoor laboratory by using a meteorological data in Japan. The distillate per a day was produced to be 2.18 kg/(m<sup>2</sup>-d) at an irradiative intensity of lamps per a day, 22.6 MJ/(m<sup>2</sup>-d). The hybrid solar distillator will contribute to enhance distillate productivity for practical use.

*Keywords:* Hybrid solar distillator; Membrane distillation; PTFE membrane; Basin still

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