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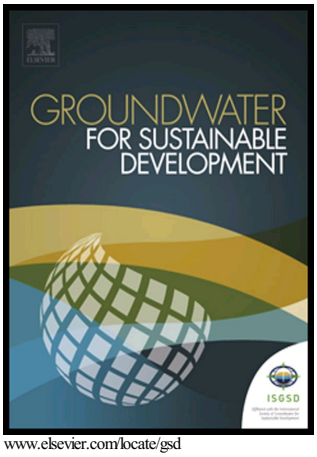

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Improvement of Solar Still Performanceby Covering Absorber with Blackened Layers of Sponge

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Abstract
Algeria has been listed among top countries affected by a shortage of fresh drinkable water. Solar desalination can be used to produce fresh water from brackish water to supply isolated, low-density, population areas located in southern Algeria where solar energy and underground saline water are abundant. This article aims to improve the yield of a solar still by improving absorber performance through the use of an added inner heat storage system. To do this, we tested covering the absorber surface with layers of blackened sponge. The resultant heat storage is used to keep the operating temperature of the absorber high enough to produce distilled water when solar irradiance is low or during night time. Four small-scale solar powered distillation pilot units were set up and operated.The experiments carried out in the "Process Engineering Laboratory of Ouargla University" studied the effect of sponge thickness on the productivity of the solar still. The results obtained showed that a 0.5cm sponge thickness increased the yield by 57.77 % i.e. 58%, relative to the baseline case (i.e. with no blackened sponge added).In contrast, asponge thickness of 1.0cm resulted in a yield improvement of only 23.03 %, whereas a sponge thickness of 1.5cm resulted in a decreased yield of 29.95 % i.e. 30% (relative to the baseline case).

Keywords:
Desalination; Solar energy; Single slope basin still;Sponge; Storage medium.

Nomenclature

Symbols

A_b	Basin area (m^2)
A_g	Glass-cover area (m^2)
C_a	Specific heat of ambient air ($J/kg.K$)
C_w	Average specific heat of brackish water ($4190 J/kg.K$)
E	Sponge thickness *(m).*
€	Euro
DZD	Algerian Dinar
$I(t)$	Solar radiation at time (t), (W/m^2)
Gr	Grashoff number
h_1	Total heat transfer coefficient between brackish water surface and glass cover ($W/m^2.K$)
h_2	Total heat transfer coefficient between glass cover and ambient air ($W/m^2.K$)
h_b	Convective heat transfer coefficient throughout basin liner ($W/m^2.K$)