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Development of a solar assisted drying system using double-pass solar collector with finned absorber

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[Azmi M.S.M.](#)^a ; [Othman M.Y.](#)^b; [Sopian K.](#)^c; [Ruslan M.H.](#)^c; [Majid Z.A.A.](#)^d; [+2 authors](#)

^aSchool of Applied Physics, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor Darul Ehsan, Malaysia

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Abstract

The Solar Energy Research Group, Universiti Kebangsaan Malaysia, International Islamic University Malaysia and Yayasan FELDA has designed and constructed a solar assisted drying system at OPF FELDA Factory, Felda Bukit Sagu 2, Kuantan, Pahang. The drying system has a total of six double-pass solar collectors. Each collector has a length of 480 cm and a width of 120 cm. The first channel depth is 3.5 cm and the second channel depth is 7 cm. Longitudinal fins made of angle aluminium, 0.8 mm thickness were attached to the bottom surface of the absorber plate. The solar collectors are arranged as two banks of three collectors each in series. Internal manifold are used to connect the collectors. Air enters through the first channel and then through the second channel of the collector. An auxiliary heater source is installed to supply heat under unfavourable solar radiation condition. An on/off controller is used to control the startup and shutdown of the auxiliary heater. An outlet temperature of 70-75 °C can be achieved at solar radiation range of 800-900 W/m² and flow rate of 0.12 kg/s. The average thermal efficiency of a solar collector is approximately 37%. © 2012 IOP Publishing Ltd.

Indexed keywords

Engineering controlled terms

Mechanical engineering; Plant shutdowns; Research; Solar dryers; Solar radiation; Sun

Engineering uncontrolled terms

Absorber plates; Auxiliary heater; Bottom surfaces; Channel depth; Double-pass solar collector; Drying systems; Energy research; Longitudinal fin; Malaysia; Outlet temperature; Radiation condition; Solar assisted; Thermal efficiency

Engineering main heading

Solar collectors

Corresponding authors

Corresponding
author

M.S.M. Azmi

Affiliation

School of Applied Physics, Faculty of Science and Technology, Universiti Kebangsaan
Malaysia, 43600 UKM Bangi, Selangor Darul Ehsan, Malaysia

Email address

syah_0602@yahoo.co.uk

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