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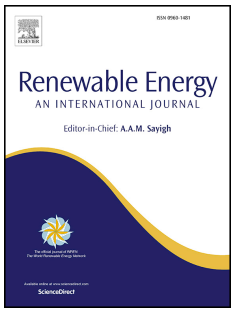

1D model for the energy yield calculation of natural convection solar air collectors

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1D model for the energy yield calculation of natural convection solar air collectors

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Abstract

A one dimensional model has been developed and presented to calculate the seasonal energy yield of solar air collectors. This model takes into account local meteorological conditions, the effects of geometrical configuration, materials used as well as the orientation of a solar air collector system. It can provide the temporal variation of the operating temperatures, heat transfer rates and ultimately the energy yield of the system for the duration of a whole heating season. The model is used to conduct a parametric investigation of the system efficiency, assessing the effects of wall-glass spacing, wall thickness, solar-absorbing surface material and orientation. The energy yield of a reference system installed in a "hot" or a "cold" climate is examined and discussed. It was found that the efficiency of the collector was more sensitive to the material of the solar-absorbing surface than any other parameter examined. Moreover, it was found that although in cold climates the daily efficiency of the system was lower, because of the the extended heating season, the seasonal energy yield of the system was comparable to hotter climates.

Keywords: Solar thermal systems, solar air collector, Trombe wall, natural convection, thermal modelling, seasonal energy yield.

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