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MOTION LAW OF A PSEUDO-EQUATORIAL SOLAR THERMAL COLLECTOR FOR SPECIAL WORKING REQUIREMENTS

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Abstract

A comparative analysis is drawn on the energetic responses numerically simulated for Brasov, Romania location, delivered by two mono-axial pseudo-equatorial STCs (solar thermal collectors): a flat plate STC and a STC with heat pipes; the two systems are destined for future implementation on Transilvania University Campus. Accordingly, two tracking programs are considered for the diurnal motion: a) of 1h constant duration steps, for school courses interval (September-June) and b) 1-step program for the summer vacation (July-August). For September-June two contradictory requirements meet: 1. a small diurnal angular stroke is needed to protect the mechanical structure of the tracked STC and 2. A large diurnal angular stroke is needed to receive an important amount of the available *global* solar radiation. The optimized annual tracking law along with the correspondent energetic responses and the STCs temperature variation are attained by numerically simulation. The STCs efficiencies, tracking efficiencies and stagnation temperatures are compared on ideal clear and estimated cloudy sky conditions. The results indicate that the tracking law for September-June consisting of: (annual) elevation angle $\gamma^* = 30°$ and 1h constant step program for the diurnal motion covering $\Delta\beta^* = 90°$($\beta^* = +45°$… $\beta^* = -45°$) delivers approximately with 20% higher energetic gain than the fix tilted STC and also ensures safe mechanical tracking; for the school summer holiday: an (annual) elevation angle $\gamma^* = 30°$, 1-step tracking program covering $\Delta\beta^* = 120°$ ($\beta^* = +60°$… $\beta^* = -60°$) for the flat plate STC and $\Delta\beta^* = 150°$ ($\beta^* = +75°$…$\beta^* = -75°$) for the STC with heat pipes, ensure the necessary safe thermal and tracking conditions.

Key words: energetic response, global solar radiation, STC efficiency, temperature, tracking efficiency

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