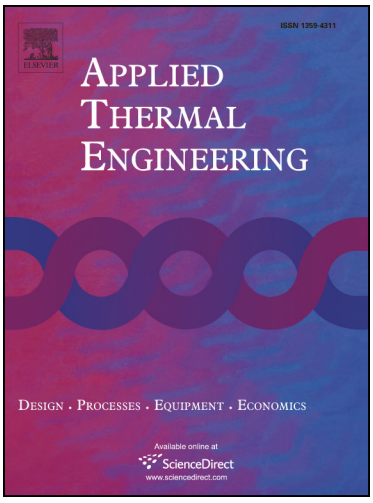

Optical and thermal investigation of a linear Fresnel collector with trapezoidal cavity receiver

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HIGHLIGHTS

- The peak instantaneous efficiency was calculated at 0.693
- The heat losses range from 181 to 986W/m for fluid temperatures 150-375°C
- The 7cm absorber losses less heat by 32.6% compared to the 14cm absorber

Abstract

Concentrating solar collectors are proven to be efficient solutions for heat production in the order of 150-400°C. These collectors utilize tracking reflective surfaces and employ line focus concentration. This paper deals with the optical and thermal investigation of a linear Fresnel collector with trapezoidal cavity receiver. The optical analysis was performed through the development of a ray-tracing model and showed the distribution of the solar radiation onto the absorber perimeter. The effect of the slope error is investigated parametrically. The peak instantaneous efficiency was calculated at 0.693, the concentration ratio was found 10.9 and the ground coverage 76.2%. The thermal analysis was performed through a CFD model. The simulation results showed that the absorber heat losses ranged from 181.2W/m to 986W/m, for inlet fluid temperatures from 150°C to 375°C, respectively. The heat losses from the receiver, absorber and glass cover were also calculated. Temperature distributions in the receiver components were extensively discussed.