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EXPERIMENTAL INVESTIGATION FOR EVALUATING THE PERFORMANCE OF PARABOLOIDAL REFLECTOR DISH CONCENTRATOR

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Abstract

Experimental investigation is performed to evaluate the thermal performance of a parabolic reflector concentrator using water as heat transfer medium. Experiments are performed on 16 m² paraboloidal solar dish reflector concentrated with a biaxial solar monitoring system. Readings are taken for a period of 25 days between 10.00am to 3.00pm. The variation in the sun intensity (I_{bn}) was order of 550 to 1000 W/m² during the experimentation. Radiation intensity was measured by using ASTM standards. The calculated system efficiency is a function of solar radiation, pressure, temperature and heat transfer to the circulating fluid. The optical efficiency is kept constant as 85%. The result shows that the thermal performance of the system is maximum (50.68%) at temperature 154.7°C and incident beam radiation of 666 W/m². Heat loss calculations were performed to analyse the effect of conductive, convective and radiative heat losses. It was observed that convection is the dominant mode of heat loss affecting the thermal efficiency significantly. Uncertainty analysis is performed to predict the uncertainty in the results. The overall uncertainty is 0.75%.

Key words: heat loss characterization, mathematical quantification, solar concentrator, thermal performance

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