



HELIOSTAT FIELD OPTIMIZATION AND DENSITY FLUX DISTRIBUTION OF PLANTA SOLAR 10 CENTRAL RECEIVER SYSTEM IN GHARDAIA REGION.

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ABSTRACT

In this work, heliostat field optimization and solar receiver density flux distribution study are carried out. The same parameters of the PS10 power plant (Andalusia, Spain) heliostat field in spiral arrangement are applied in the region of Ghardaïa, Algeria. In this respect, a complete mathematical model to calculate the yearly weighted and unweighted optical efficiency considering cosine losses, shadowing-blocking losses, atmospheric attenuation losses, interception losses and mirror reflectivity was developed firstly. The unweighted optical efficiency of the PS10 central receiver system was used to validate the mathematical model. Secondly, to optimize the heliostat field, the maximization of the weighted annual optical efficiency is used as an objective function. The results show that the yearly weighted efficiency and the yearly energy intercepted at the surface receiver in Ghardaia region are higher by 0.2% and 28.59% respectively compared to PS10 at Sanlúcar de Mayor. In addition, the density flux distribution on the surface receiver show that an aiming point strategy must be adopted to distribute the flux uniformly.

Keywords: aiming point strategy; PS10 power plant; solar receiver density flux distribution; weighted and unweighted optical efficiency; yearly intercepted energy.

