3D NUMERICAL STUDY OF FLOW IN A SOLAR CHIMNEY POWER PLANT SYSTEM

T. TAYEBI and M. DJEZZAR

Energetic Physics Laboratory, Department of Physics, Faculty of Sciences, Constantine University 1, Aïn El Bey Road, Constantine, 25000, Algeria.

ABSTRACT. Heat transfer process and fluid flow in a Solar Chimney Power Plant System used for natural ventilation are investigated numerically. Using the Spanish prototype plant as simulation object. Choosing calculative model and setting boundary conditions in calculation are introduced. Boussinesq model was adopted for natural convection, Discrete Ordinate radiation model (DO) was employed for radiation. The main factors that influence on the performance of the SCPPS have been simulated. The effects on the flow field of the SCPPS which caused by solar radiation intensity have been analyzed. The calculated results are approximately equivalent to the relative experimental data of the prototype. It shows the dependability of the simulative results and the validity of the simulation methods. It can be concluded that the pressure throughout system is negative value; the temperature difference between the inlet and outlet of collector, as well as the air velocity in the collector of the system, is increase with the increase of solar radiation intensity.

KEYWORDS: *Solar chimney power plant; Numerical simulation; solar radiation intensity; Flow characteristics.*