

MODELING AND NUMERICAL SIMULATION OF SOLAR CHIMNEY COLLECTOR

T. Tayebi^{1*}, M. Djezzar^{1*}

¹University Mentouri Constantine Algeria, Faculty of Exact Sciences, Department of Physics,
Energetic Physics Laboratory
Ain El bey Road, Constantine, 25000, Algeria
mdjezzar@yahoo.fr

Abstract: *The solar chimney Power plant system (SCPPS) is a simple solar thermal power plant that is capable of converting solar energy into thermal energy in the solar collector. In the second stage, the generated thermal energy is converted into kinetic energy in the chimney and ultimately into electric energy using a combination of a wind turbine and a generator. The purpose of this study is to conduct a more detailed numerical analysis of a collector of the SCPPS. A mathematical model based on the Navier–Stokes, continuity and energy equations was developed to describe the solar chimney power plant collector mechanism in detail. The governing equations were solved numerically using an iterative technique. The temperature, velocity and pressure distributions in the solar collector are illustrated for the city of ‘Adrar’ – Algeria – to examine the effect of varying ambient temperature and solar radiation on the flow in the collector. Reasonably good quantitative agreement was obtained between the experimental data of the Manzanares prototype and both the numerical results.*

Keyword: Solar chimney collector; Mathematical modeling; Numerical simulation; Southern Algeria.