

A VALIDATED ANALYTICAL MODEL FOR FLOW IN SOLAR CHIMNEY

T. Chitsomboon

School of Mechanical Engineering, Institute of Engineering, Suranaree University of Technology

Abstract

Solar chimney has been proposed as a device to economically generate electricity from solar energy in large scale. A new analytical model for predicting the performances of the solar chimney is herein proposed. The model is different in significant ways from the models proposed in the literature in that, it considers interactions of flow in the greenhouse and flow in the chimney through the small, but significant, pressure difference traditionally ignored in literature. Also, solar heat flux is accounted for naturally rather than assuming a predetermined increase of air temperature. The analytical prediction is supported by the numerical prediction using the full, quasi-one-dimensional Euler's equations. Results of the numerical and analytical model predictions compared very well with each other, qualitatively as well as quantitatively, suggesting the validity and usefulness of the analytical model.

Published in International Journal of Renewable Energy Engineering, 2001.