Research interest May 2017

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My research interest is in thermal analysis of energy conversion systems by using the numerical tools of Computational Fluid Dynamics (CFD) and by utilizing the experimental means for the following research topics.

My first project is about studying the flow characteristics of airflow inside a refrigerated container. Absence of food refrigeration causes several changes in food structure and accelerates food deterioration. The process of creating adequate conditions for slowing down these changes can be divided into two categories: efficient ventilation of air within the storage space and cooling to achieve the desired temperature. Ceiling-slot-ventilated enclosures are commonly used in transport refrigeration systems where the cold air is supplied into the enclosure by a turbulent air jet. The information on this paper focuses on such ventilation system with high injection velocities of air. The aim of this research work is to carry out a numerical analysis on conjugated heat transfer inside a refrigerated container with heat conductive walls, and to analyze the effect of the container shape factor (*L/H*), the inlet air slot width $\left(l_6 / W\right)$, and the Reynolds number of supplied cold air (Re) on the temperature distribution effectiveness. The frigorific container is modeled as rectangular cavity and the conductive walls are set as opaque. For this study, the height $\left(H = 2.5\ \mathrm{m}\right)$ and the width $\left(W = 2.46\ \mathrm{m}\right)$ dimensions of the container are kept constant but the container length assumes values of $L = 6.13\ \mathrm{m},\ 8.33\ \mathrm{m},\ 13.3\ \mathrm{m}$ sequentially. In addition, two different slot sizes which have common acceptance in industrial applications is studied. For half-sized slot, the injection is called half-span injection; Case $1\left(l_6 / W = 0.5\right)$, the injection slot has the dimensions of $123\mathrm{cm} \times 9.7\mathrm{cm}$, and the corresponding suction slot is $123\mathrm{cm} \times 23.4\mathrm{cm}$. For full-sized slot, full-span injection takes place at the evaporator outlet; Case $2\left(l_6 / W = 1.0\right)$, the slot dimensions for injection and suction are respectively $246\mathrm{cm} \times 9.7\mathrm{cm}$, and $246\mathrm{cm} \times 23.4\mathrm{cm}$. The construction material for the conductive walls is composed of a layer of polyurethane foam (70mm) sandwiched between two layers of very thin (0.5mm) sheet metal of steel. Velocities of supplied cold air are set as a function of the Reynolds number (Re) between 2×10^4 and 2×10^5.

My second project involves determination of thermal efficiency of flat plate collector essentially used in dwellings of northern Cyprus region. An experimental test set-up has been constructed and built. This set-up has special features like the collector angle and the level of the storage tank can be varied so that the functional dependence of thermal efficiency on the incident angle of solar ray can be analyzed. The data has to be taken in such a way that hourly as well as daily averaged efficiencies can be determined.

In my third project, using the same solar energy experimental test set-up, an experimental performance comparison of two types collectors will be carried out. The conventional flat plate solar collector will be compared with the vacuum tube collector working at the same environmental conditions.