

MODELLING OF THE AIRFLOW IN THE PASSENGER COACH

Izabela SARNA ^{a*}, Agnieszka PALMOWSKA ^b

^a MSc Eng.; Faculty of Energy and Environmental Engineering, The Silesian University of Technology, Konarskiego 18a, 44-100 Gliwice, Poland
E-mail address: izabela.m.sarna@gmail.com

^b PhD; Faculty of Energy and Environmental Engineering, The Silesian University of Technology, Konarskiego 18a, 44-100 Gliwice, Poland

Received: 7.08.2019; Revised: 30.09.2019; Accepted: 2.10.2019

Abstract

In this paper current requirements of HVAC designing (Heating, Ventilation and Air Conditioning) in railway vehicles have been presented. The data were based on railway standards [1, 2].

The aim of this study was to carry out the numerical calculation of airflow combined with heat exchange in a passenger coach. ANSYS CFX 12.1 software was used to carry out the simulation. Two cases of boundary conditions were considered, the first obtained from design calculations common for ordinary buildings and information included in standards and the second only based on the information included in standards. After analysing of the results, it was found that the distribution of air velocity in a coach was similar in both cases, average air velocity was 0.79 m/s. However, the distribution of air temperature was different. For case 1 the average indoor air temperature was 25.07°C and for case 2 was 23.53°C. The method of determining the heat solar gains had a great impact on the results. A further possibility of a model improvement was indicated for example human models will be introduced in coaches, in order to verify the conditions of their thermal comfort, and air recirculation.

Keywords: Airflow; Coach; CFD; Heat exchange; Ventilation.