World Academy of Science, Engineering and Technology
International Journal of Aerospace and Mechanical Engineering
Vol:9, No:11, 2015

# Designing an Exhaust Gas Energy Recovery Module Following Measurements Performed under Real Operating Conditions

**Authors :** Jerzy Merkisz, Pawel Fuc, Piotr Lijewski, Andrzej Ziolkowski, Pawel Czarkowski

**Abstract :** The paper presents preliminary results of the development of an automotive exhaust gas energy recovery module. The aim of the performed analyses was to select the geometry of the heat exchanger that would ensure the highest possible transfer of heat at minimum heat flow losses. The starting point for the analyses was a straight portion of a pipe, from which the exhaust system of the tested vehicle was made. The design of the heat exchanger had a cylindrical cross-section, was 300 mm long and was fitted with a diffuser and a confusor. The model works were performed for the mentioned geometry utilizing the finite volume method based on the Ansys CFX v12.1 and v14 software. This method consisted in dividing of the system into small control volumes for which the exhaust gas velocity and pressure calculations were performed using the Navier-Stockes equations. The heat exchange in the system was modeled based on the enthalpy balance. The temperature growth resulting from the acting viscosity was not taken into account. The heat transfer on the fluid/solid boundary in the wall layer with the turbulent flow was done based on an arbitrarily adopted dimensionless temperature. The boundary conditions adopted in the analyses included the convective condition of heat transfer on the outer surface of the heat exchanger and the mass flow and temperature of the exhaust gas at the inlet. The mass flow and temperature of the exhaust gas were assumed based on the measurements performed in actual traffic using portable PEMS analyzers. The research object was a passenger vehicle fitted with a 1.9 dm3 85 kW diesel engine. The tests were performed in city traffic conditions.

**Keywords :** waste heat recovery, heat exchanger, CFD simulation, pems
**Conference Title :** ICAMAME 2015 : International Conference on Aerospace, Mechanical, Automotive and Materials Engineering
**Conference Location :** Kyoto, Japan
**Conference Dates :** November 12-13, 2015