

Theoretical and Experimental Determination of a Velocity Profile under Turbulent Air Flow in Pipework

Mária Čarnogurská¹, Miroslav Příhoda², Marián Lázár¹

¹Department of Power Engineering, Faculty of Mechanical Engineering, Technical University of Košice, Vysokoškolská 4, 042 00 Košice, Slovak Republic. E-mail: maria.carnogurska@tuke.sk, marijan.lazar@tuke.sk

²Department of Thermal Engineering, Faculty of Metallurgy and Materials Engineering, VŠB – Technical University of Ostrava, 17. listopadu 15, 708 33 Ostrava-Poruba, Czech Republic. E-mail: miroslav.prihoda@vsb.cz

The paper experimentally and theoretically analyses the velocity profile of air in laboratory stand pipework. Flow velocities measured using a hot-wire anemometer and a vane anemometer were compared with the results of numerical simulation. The k-ε turbulence model was used in the numerical solution of flow rates and for determining the velocity profile using the ANSYS_CFX program. Using power law, this profile was described via an analytical function. Velocities determined by measuring with both instruments in the investigated place in the pipework showed lower values in comparison with the numerical solution. The cause of the difference in velocities was probably inaccurate stating of the volume flow of air through the ultrasonic anemometer. Measurements and simulation showed slight asymmetry in velocity which is related to an insufficiently large volume of the equalisation chamber and the mutual position of the input and output openings.

Keywords: Velocity profile, Hot-wire anemometer, Vane anemometer, Numerical simulation

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