Simulation of Laminar Flow by the Boundary Element Method in Straight of a Rod Bundle in Ducts

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In many thermal-flow problems, straight ducts with multi-fill are used. The heat exchangers are an example of the use of straight and multi-filled pipes (rod bundle in ducts). The paper presents the method algorithm of boundary elements (BEM) method of laminar flow simulations in straight ducts with rod bundle, regardless of the shape of the duct cross-section. The verification of the boundary elements method was performed by comparing the results of BEM calculations with a known analytical solution in a circular duct with circular central rod bundle in ducts. The publication presents graphical results of the laminar flow simulation calculations in a duct with a regular octagon cross section with round fillings, and the function of the Poiseuille number and Coriolis and Boussinesq coefficients were determined depending on the geometrical parameters of the duct. Figure 1 shows an example of a velocity field for a regular octagon shaped duct with seventeen rods inside the channel, while in the figure 2, dependence of the Poiseuille number and the Coriolis and Boussinesq coefficients for this example.

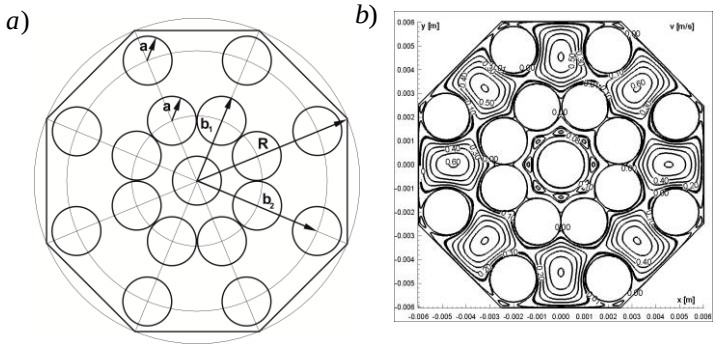

FIGURE 1. A regular octagon shaped duct with seventeen rods inside the pipe: (a) geometry, (b) velocity field

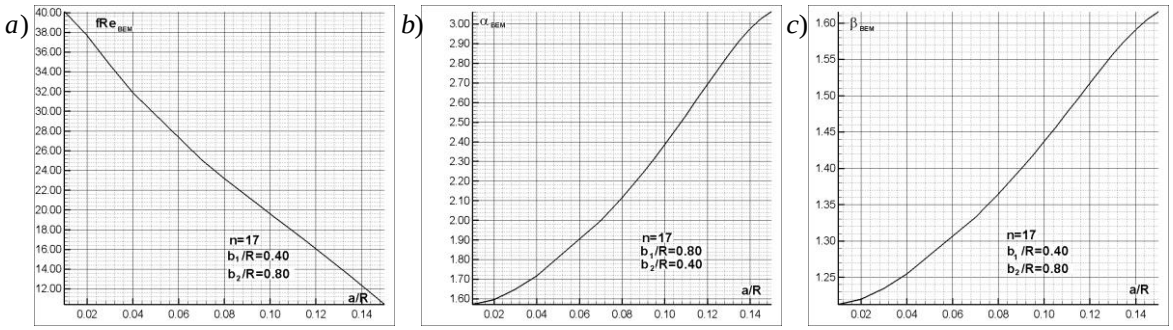

FIGURE 2. Poiseuille number and Coriolis and Boussinesq coefficients in a regular octagon shaped duct with seventeen rods inside the pipe: (a) Poiseuille number, (b) Coriolis coefficient, (c) Boussinesq coefficients

ACKNOWLEDGMENTS

This work was performed within the framework of Grant No. S/WBIIS/4/2014 of Bialystok University of Technology and financed by the Ministry of Science and Higher Education of the Republic of Poland.