Acta Scientific COMPUTER SCIENCES

Volume 2 Issue 9 September 2020

Short Communication

Theory of Heat Transfer in a Turbulated Flow for a Flat Channel with Symmetrical Turbulators on Both Sides of the Channels

Lobanov IE*

Department of Computer Science, Russia

***Corresponding Author:** Lobanov IE, Department of Computer Science, Russia.

Received: July 06, 2020

Published: August 19, 2020

Widespread use in modern heat exchangers and apparatus received heat exchangers, where the channels have a cross-section, different from the round tubes, in a particular case, flat channels, where heat is not produced by means of a full surface to be washed. The thermal loading of a flat channel can be asymmetric, since the heat flows on different surfaces can be unequal, namely: flat channels with one-way heating or with two-way heating with unequal heat flows. In order to ensure the compactness of heat exchange devices and heat exchange apparatuses, heat transfer intensification is used, which in flat channels is achievable by two main methods: the development of the heat exchange surface and turbulence of the flow in the channels. There may be a combined use of the above methods of intensification of heat transfer [1]. In this case, the task of determining local values of intensification of heat exchange and hydraulic resistance in a plane channel with a double-symmetric turbulence on the basis of theoretic based on the solution of Reynolds equations using factored finite-volume method that is lockable with manturovskiy transfer model shear stresses, and energy equations for multi-scale intersecting structured grids. The adequacy of the application of the above-mentioned method is based on the fact that earlier this method allowed to calculate the coefficients of hydraulic resistance and heat transfer in straight round pipes with arbitrary shapes of annular turbulators, for example, obtained by knurling, i.e. for round pipes with diaphragms [2,3]. For important cases of the investigated range of regime and geometrical parameters determining the flow and heat exchange (h/DE = 0,0560,102; t/DE = 0,282,04; Re = 5.1032.104; Pr = 0.72), previously studied experimentally [1], current lines were constructed for flat channels with symmetrically arranged bilateral turbulators on their surfaces. It is possible to optimize the process of heat transfer intensification in flat channels with double symmetrical projections, as well as to control the heat transfer intensification directly from the results of calculations based on this developed model. With regard to the intensification of heat transfer, other things being equal, the reduction of flat channels with double symmetrically arranged protrusions is realized in relation to round pipes with similar protrusions, since a smaller increase in heat transfer is realized with a greater increase in hydraulic resistance. The calculation method revealed that the relative hydroresistance for channels with protrusions is always greater than for channels without protrusions, however, the relative heat exchange for channels with protrusions can be greater than for channels without protrusions, so with intensified heat transfer, a more rational redistribution of the heat head along the cross section of the channel is obtained. The theoretical method implemented in this work, based on the solution of Reynolds equations by means of the factorized finite-volume method, closed with the help of the Menter model of shear stress transfer, and the solution of the energy equation on a multiscale intersecting structured grid, allowed to calculate the coefficients of hydraulic resistance and heat transfer in a flat channel with almost arbitrary forms symmetrically arranged double flow turbulators with permissible accuracy. In practical terms, the method allows to improve the weight and size, power, hydraulic, temperature, etc. indicators of heat exchangers and heat exchangers of modern aviation and rocket and space production.

Bibliography

1. Kalinin EK., *et al*. “Effective heat transfer surfaces”. M: Energoatomizdat (1998): 408.

2. Dreitzer GA., *et al*. “Calculation of convective heat transfer in a pipe with previously arranged surface flow turbulators”. *Thermophysics of High Temperatures* 43.2 (2005): 223-230.

3. Lobanov IE and EK Kalinin. "Theoretical research, comparison with experiment of current lines and components of kinetic energy of turbulent pulsations in vortex structures in pipes with turbulators". *Branch Aspects of Technical Sciences* 12 (2011): 4-15.