FEATURES OF THE FLOW AND HEAT TRANSFER OF CYLINDERS WITH THE SURFACE, SHAPED WITH SPIRAL GROOVES, IN THE TRANSVERSE AIR FLOW

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Aim. The investigating of the hydraulic resistance and the average heat transfer in the case of cross-flow the air near of circular cylinders with spiral grooves of different steps on the outer surface of the cylinders.

Results of work. Studies have confirmed the previously performed conclusion that the deepening on the heat exchange surface allows intensification of heat exchange at relatively low pressure losses. The experiments were carried out in the Reynolds number range of 2000 <Re <17000. When the spiral groove (with a width of 3 mm and a depth of 1.8 mm) is formed on the outer surface of the cylinder (22 mm in diameter), the conditions of the wrapping of the right and left halves are significantly different. As a result of this asymmetry, an additional component of speed, which accelerates the laminar-turbulent transition, affects the separation of the boundary layer, resulting in not only the intensification of heat transfer, but also the reduction of the hydraulic resistance of the heat-exchange surface.

Conclusions.

1. The spiral grooves provoke the asymmetry of the flow near of cylinders. In the track behind the cylinder with grooves, there are regular vortices that were absent in the track behind a smooth cylinder. They can cause additional turbulence of the stern vortical zone, which provides for the intensification of heat exchange enhancening.

2. Depending on the size of the step of grooves 10 mm, 20 mm, 40 mm, the Euler numbers for different types of cylinders were reduced by 5.9%, 9.9%, 18.3% compared to the smooth cylinder.

3. Depending on the size of the step of the grooves 10 mm, 20 mm, 40 mm, the Nusselt numbers for the corresponding types of cylinders increased by 65.05%, 24.06%, 27.9% compared to the smooth cylinder.

4. The Reynolds analogue factor after the formation of spiral grooves on the surface of cylinders increased not only due to the intensification of heat transfer, but also due to the reduction of pressure losses.