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Title of the thesis: „Enhancement of thermal processes in the heat exchangers by modification of the active surface shapes "

Summary

The aim of this thesis is to experimentally and numerically investigate the effects of using vortex generators on the heat and flow processes during the heating of a flat plate. The purpose of using vortex generators is to change the flow character in the boundary layer from laminar to turbulent, which should result in increased heat transfer coefficients and intensification of heat exchange processes.

The dissertation begins with a literature review aimed at identifying the limitations of current research methods for analysing heat and flow processes. This section describes the objective, thesis and scope of work required to achieve the objectives of the dissertation.

The next chapter provides a background to the theoretical principles related to the subject matter of the dissertation. The section covers various topics such as the different types of boundary layer flow along a flat surface, heat conduction in the boundary layer and methods of improving heat exchange in heat exchangers.

Chapter *Vortex generators* summarises the main information from the literature review on the use of vortex generators to improve heat exchange processes. Based on the literature review, the geometry of vortex generators has been determined.

The fourth chapter focuses on experimental analysis. The first part of the chapter describes the design and construction of a laboratory set-up called the „Air Tunnel" which was used to carry out the experimental studies. The second part of the chapter presents the analysis of the experimental results for air flow rates of 0,9 m/s and 3,16 m/s. The results of the experimental studies have been used to select the geometries of the vortex generators that most effectively enhance the heat exchange processes.

In the next chapter, the geometry, mesh and models used in the numerical analysis have been introduced. The results obtained from the experimental and numerical calculations are compared. For the turbulence models analysed, a model was selected to perform numerical analyses of the heat and flow processes occurring on a heated surface equipped with turbulence generators.

The last chapter presents the summary and conclusions with a discussion of the numerical and experimental results.

Agnieszka Ochman