Analysis of the Increase in the Efficiency of Air-cooled Heat Exchangers due to the Intensification of Heat Exchange

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**Introduction**. The wide use of air-cooled heat exchangers in comparison with other cooling systems is explained by their simplicity and reliability. The issues of improving the heat transfer processes in such heat exchangers play a huge role in terms of increasing the cooling efficiency. The increase in the heat exchange surface area and the reduction in the size of the heat exchangers allows you to significantly save material and financial resources [1]. There are several basic methods for increasing the heat transfer coefficients of heat carriers in air-cooled heat exchangers, and, accordingly, increasing the heat transfer coefficient [2]. For example, the finning of pipes or the intensification of heat exchange with the help of pipe inserts. Both methods consist in changing the trajectory of a heat transfer fluid and increasing the turbulence of the flow, which leads to an increase in the Reynolds number and the efficiency of heat transfer [3].

**Purpose**. The study is carried out with different types of "low" fins (tubes with individual fins) and "high" fins (tubes with common fins in the form of a single plate), as well as with the use of pipe inserts in order to analyze changes in heat transfer coefficients and flow rates of air and cooled heat transfer fluid, depending on the types of fins and pipe inserts and their geometry. As a result of the analysis, the optimal geometric parameters of the ribs and pipe inserts should be determined.

**Methods and materials**. The application software is the Xchanger Suite program, the Xace module provided by HTRI to ITMO University, and the thermal properties generator VMG Thermo. The type of air-cooled heat exchanger is forced draught air. In the pipe space, the TP22 oil is used as a heat transfer fluid, the thermophysical fluid properties of which are generated using VMG Thermo. Next, different types of fins and pipe inserts are selected to evaluate the changes in various thermodynamic parameters.

**Results**. The result of the study is an optimally selected geometry of heat exchange intensifiers based on the analysis, which allows reducing the dimensions of the air-cooled heat exchanger, while providing the necessary heat load, the heat exchange surface reserve coefficient and heat transfer coefficients.

**Keywords**: air-cooled heat exchanger, energy efficiency, heat transfer intensification, heat transfer

References

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