LITHUANIAN ENERGY INSTITUTE

ADMISSION TO PHD STUDIES FOR THE YEAR 2023

DOCTORAL RESEARCH TOPIC:

Research of solid materials for heat storage in heat recovery exchanger

RESEARCH FIELD:

Energetics and Power Engineering (T 006)

BRIEF DESCRIPTION OF RESEARCH TOPIC:

Thermal energy storage is one of the most widely used methods for energy efficiency, and sustainable energy development. This enables storage systems to be used both in building heating and ventilation, as well as in air conditioning or production processes. Analyzing regenerative heat exchangers with packed beds, it was found that the main effective characteristics of a packed-bed for low-temperature applications are: environmental friendliness, economic possibility, low heat losses, realization of full cycles, stability of the storage material, good heat transfer, high energy density. Studies show that, unfortunately, there is no general method that allows designing heat recovery regenerative systems with packed-bed storage, because they depend on many parameters: the choice of material, the amount of energy required to be accumulated, the scope of the system, temperature ranges, the duration of storage, the density of the material, operating conditions, economy, etc. Therefore, it is recommended that the values of different parameters be optimized depending on the desired result and operating conditions.

The aim of the work is to increase the efficiency of the packed-bed regenerative heat exchanger. To achieve the goal, the following tasks are solved:

1. To examine the applicability of storage materials according to purposes and temperatures in the building energy supply sector;
2. Create a thermo-aerodynamic analytical model of the packed-bed regenerative heat exchanger and its numerical model;
3. Perform experimental research on materials selected for the basis of models;
4. To prepare the design selection algorithm of the regenerative heat exchanger using solid elements in order to increase the efficiency of its operation.

The results obtained during the work would include the development of an analytical and numerical model using systematic analysis. The task of optimization between aerodynamic and thermal load indicators would be solved, the solid storage materials, their form, and the economic possibilities of producing and operating such systems would be selected that best correspond to the purpose of the work. The results of the work would allow more active development of regenerative systems. The results of the work are published in international journals, Clarivate Analytics Web of Science database, participation in international conferences.

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