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DEVELOPMENT OF NEW DESIGN AND MATHEMATICAL MODELING OF HEAT AND MASS TRANSFER HEAT EXCHANGER VENTILATION SYSTEMS ІЩА ENERGY HOUSES

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One of the areas related to energy and the creation of optimal microclimate in residential and public buildings is the energy environment for heating and cooling outside air ventilation systems in buildings. This can be used in heat pumps that use the energy of low potential soil or groundwater. In the summer time to cool and in winter for heating outside air can be used underground water wells. The process of cooling and heating outside air in the ventilation systems of buildings with using underground water wells is used the recuperative heat exchangers. This approach makes it possible not to use for cooling and heating outdoor air difficult and expensive air conditioning systems are usually made by foreign manufacturers who require for their operation considerable power consumption.

Regenerative heat exchanger type that can be used for cooling or heating the supply air in ventilation systems in their designs using bundles of tubes or chess corridor location. Such heat exchangers may have a large size and weight. There are ways to improve the overall dimensions characteristics of pipe heat exchanger is to use different types of fins.

However, heat exchanger with a developed surface of heat exchange have a large hydraulic resistance and require large capacity pumps or fans to pump heat transfer fluids. Additionally, the cost of manufacturing finned heat exchangers is significantly increased compared to heat exchangers without fins.Besides, developed heat exchange surface have a large hydraulic resistance and require large capacity pumps or fans to pump heat transfer fluids. In the paper we propose a new design of shell-and-tube heat exchanger with compact placement of small diameter pipes was carried out mathematical modeling. The proposed design of heat exchanger has the advantages over known constructions and can be used in ventilation systems energy-efficient home. This gives the opportunity to save considerably energy and economic

resources in developing such systems in compared with the constructions, which are made of smooth tubes. In the paper we propose a new design of shell-and-tube heat exchanger with compact placement of small diameter pipes and it was carried out mathematical modeling.

Numerical modeling of heat and mass transfer in shell-and-tube heat exchanger of new design is conducted using a CAD software ANSYS Fluent 14.0. There are received the local distribution of velocity field, pressure and temperature. The analysis of these distributions and comparison of new heat exchanger design with the characteristics of known designs of heat exchangers are performed. It is found that the weight and dimensions of the heat exchanger the proposed design significantly better, in comparison with characteristics of known designs of heat exchangers. Comparison of overall performance of heat exchangers new design with a compact arrangement of tubes and heat exchangers with corridor arrangement of tube is conducted. It is showed that at identical heat output the dimensions of the heat exchanger the advanced design is almost two times less, and its weight is 10-15% lower, which reduces the cost of the heat exchanger.