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Modelling and development of the experimental installation for an investigation of the thermal hydrological properties of heat exchangers for smart systems.

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Nowadays heat exchanging systems are used particularly in every area: utility services, cars[1], aircraft[2], chemistry, factories, space systems[3], etc. But deep studying and most of articles on heat exchangers were mostly date previous century. New materials, technologies and design allow to increase the efficiency of a device, reduce heat and energy loss and to do optimization research of heat exchangers.

Our goal is to do a modelling for different types of geometry (different material, tubes geometry, section's separation) of tube and shell heat exchangers to verify the most efficient case and compare it to the model, create an experimental installation for testing designed heat exchanger and get results from real-life device.

We have developed several models of possible design of heat exchanger. There is going to be compared efficiency of heat exchangers with twisted tubes inside it to classical tube's geometry. Because of the swirling of the flow and better heat transfer in the first case the efficiency is expected to be higher. Also the case with sections inside the shell is going to be tested. Different routes of a flow can be created and that is why various cases can be tested. Interesting result can be obtained in designing of a sequence of pipes and common sections, where the flow is mixed and then go through tubes again.

We have created a scheme of our installation for an air-liquid case (pic. 1). In the nearest future this installation will be completely done. We are going to test on it heat exchanger with twisted tubes inside it and compare the results to theoretical and our modelling ones.

Looking future, this experimental installation is a nice place for different research, for example, in heat exchange systems for electric cars, novel smart heat supply systems, and also certification of various types of heat exchangers for clarifying thermal hydrological properties.

References

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Pic. 1. Scheme of an experimental installation of heat exchanger (Energy Systems Lab, Skoltech).