

PROPOSAL OF THE HEAT EXCHANGERS FOR MICRO-ORC MODULE DRIVEN BY DOMESTIC GAS BOILER

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ABSTRACT

Technical development is strictly connected with the energy utilization. It is observed that demand for energy is increasing every year, therefore in parallel to the technological discoveries, new better ways of energy usage are looked for and investigated. New directions in the field of distributed energy generation are also considered as a support for the operation of the centralized system. Therefore, dispersed generation systems are proposed and developed. Moreover, the current approach to the electric energy production is a kind of prosumer one, in which the system user can be the energy consumer and also its seller to the power grid.

In accordance with the micro-CHP potential analysis of the European market the distributed systems can be divided in three groups namely: systems with internal combustion (reciprocating gas engine, gas turbine), systems with external combustion (Stirling engine, steam engine, ORC) and fuel cells. Taking into account these technologies and their development, the ORC system seems to be promising among various micro-CHP domestic units (electrical power production below 10 kWe). However practical realization of the ORC cycle in a micro-scale is a kind of technical challenge. The system is equipped with various constituent devices such as the heat source (boiler), expansion device (volumetric engine or vapour microturbine) and heat exchangers. Each of them should be of high performance so that the system as a whole should work efficiently. This is the reason why novel constructions of recuperators or heat transfer enhancement mechanisms are looked for in relation to the evaporator, condenser or regenerator.

In the present paper the own constructions of compact heat exchangers with microjets^{1,2} and with minichannels (plate³ and cylindrical⁴ constructions) are proposed. They were designed for the purpose of domestic ORC system investigations and for other dispersed energy generation technologies. One of them (the microjets heat exchanger) is a patented design. The features of mentioned above heat exchangers are discussed together with the flow and thermal characteristics of their prototypes. As a summary, an experimental studies of the authors domestic ORC unit equipped with prototype minichannels heat exchangers are also presented. Very good thermal performance of this system was proved.

References:

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