

Dynamic state assessment of the steam micro-turbines with a capacity of 3 kW at operation in CHP ORC system

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Summary:

In recent years, with the development of renewable energy sources and distributed cogeneration, more and more popular are systems allow simultaneous generation of heat and electricity in a small scale. One of such technology is the micro CHP ORC system. In the ORC systems, thermal energy extracted from the fuel can be converted into electricity using a steam micro-turbine. Due to the small dimensions, high speeds and a range of operational requirements, micro-turbines are the most advanced component of the micro CHP ORC system.

The article discusses the experimental investigation of the dynamic properties of two alternative variants of steam micro-turbines with a nominal power of 3 kW. Micro-turbines differed solution of the flow system - one of which had 4, and the other only 1 radial stage.

The presented research was conducted in the micro CHP laboratory at IMP PAN in Gdansk. Tested micro-turbines are designed according to the requirements resulting from the characteristics of the realized thermodynamic cycle and a low boiling medium. These tests were carried out with the parameters close to the target operating conditions. These measurements were intended to verify correct operation of the turbo-generator, the evaluation of the dynamic state and the early detection of possible defects. Also the effect of the working environment on durability and reliability of the micro-turbine's components was assessed.