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Performance Evaluation of a Small Microturbine Cogeneration Functional Model

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Abstract : The paper focuses on the potential methods of increasing the performance of a microturbine by combining additional elements available for utilization in a cogeneration plant. The activity is carried out within the framework of a project aiming to develop, manufacture and test a microturbine functional model with high potential in energetic industry utilization. The main goal of the analysis is to determine the parameters of the fluid flow passing through each section of the turbine, based on limited data available in literature for the focus output power range or provided by experimental studies, starting from a reference cycle, and considering different cycle options, including simple, intercooled and recuperated options, in order to optimize a small cogeneration plant operation. The studied configurations operate under the same initial thermodynamic conditions and are based on a series of assumptions, in terms of individual performance of the components, pressure/velocity losses, compression ratios, and efficiencies. The thermodynamic analysis evaluates the expected performance of the microturbine cycle, while providing a series of input data and limitations to be included in the development of the experimental plan. To simplify the calculations and to allow a clear estimation of the effect of heat transfer between fluids, the working fluid for all the thermodynamic evolutions is, initially, air, the combustion being modelled by simple heat addition to the system. The theoretical results, along with preliminary experimental results are presented, aiming for a correlation in terms of microturbine performance.

Keywords : cogeneration, microturbine, performance, thermodynamic analysis
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