Simulation of Initial Characteristics of Thermoelectric Modules in Generation Mode Realized in MATLAB Environment

Kaloyan Ivanov, Ivaylo Belovski and Anatoliy Aleksandrov

Department of Electrical Engineering and Electronics Prof. Assen Zlatarov University - Burgas, Bulgaria

e-mail: kaloqn_ivanov_93@abv.bg

GOAL OF THE STUDY
For the needs of the engineering practice concerning the development of thermoelectric generator systems, it is necessary to model and simulate the operation of the thermoelectric modules in generation mode. Thermoelectric modules generate electrical power directly proportional to the applied temperature difference (ΔT) between their two sides. The present work presents a simulator that calculates all main output characteristics of a thermoelectric module with its parameters set as input data in the system.

METHODOLOGY OF THE INVESTIGATION
With the help of the user application (TeGDS software), it is possible to simulate the operation of any randomly selected thermoelectric module, in the mode of generation of electromotive voltage, if the necessary input data for the simulation are available for it.

MAIN RESULTS FROM THE STUDY

The comparison of the results of the experimentally obtained data and those of the simulation shows a great concurrence of the data. Differences of the order of 10% are due to inaccuracies in the entered input data, errors in the experimental measurements and the inertia of the heat transfer.

A disadvantage of the simulation can be the unsatisfactory accuracy of the calculation of the results when the set temperature difference is lower.

The simulation model of a thermoelectric generator module is a means by which the user can easily calculate many basic parameters of TEM and of the semiconductor thermocouples. The results of the simulation are given in the form of conversion characteristics. Based on the obtained results, a suitable TEG module can be selected in the design of a thermoelectric generator system.

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