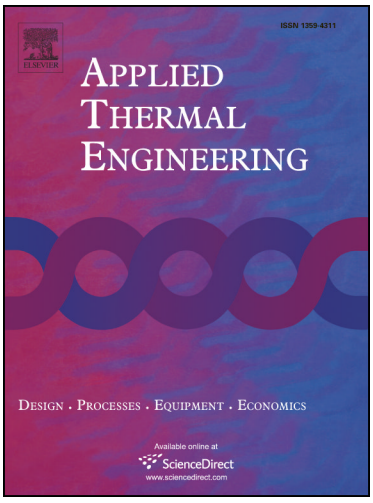

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Theoretical Analysis and Design Optimization of Thermoelectric Generator

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Abstract

Advantages of thermoelectric generators, such as no-moving parts, high stability, low noise and flexibly changeable volume, make them essential in power supply engineering. However, low generation power and large thickness restrict their usages. Purpose of the paper is to study influences of the common parameters, including working temperature, area-to-length ratio of n/p type semiconductors and thickness of electrical conducting plate, on performance of thermoelectric unit using theoretical and numerical methods. Based on the analysis, thermoelectric components can be redesigned to obtain optimal power output and efficiency of the generator. The new designed thermoelectric unit is composed of n/p type semiconductors in a cuboid shape made of functionally-graded materials, and upper/left/right electrical conducting plates with optimal thickness. The proposed generator has minimized thickness, high efficiency and enhanced power output. Therefore, volume and cost of the generator can be notably reduced, making it suitable for applications in special occasions, such as low-grade heat sources, narrow working spaces and large rated power output.

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