World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Enhanced Efficiency of Thermoelectric Generator by Optimizing Mechanical and Electrical Structures

Authors : Kewen Li

Abstract : Much attention has been paid to the application of low temperature thermal resources, especially for power generation in recent years. Most of the current commercialized thermal, including geothermal, power-generation technologies convert thermal energy to electric energy indirectly, that is, making mechanical work before producing electricity. Technology using thermoelectric generator (TEG), however, can directly transform thermal energy into electricity by using Seebeck effect. TEG technology has many advantages such as compactness, quietness, and reliability because there are no moving parts. One of the big disadvantages of TEGs is the low efficiency from thermal to electric energy. For this reason, we redesigned and modified our previous 1 KW (at a temperature difference of around 120 °C) TEG system. The efficiency of the system was improved significantly, about 20% greater. Laboratory experiments have been conducted to measure the output power, including both open and net power, at different conditions: different modes of connections between TEG modules, different mechanical structures, different temperature differences between hot and cold sides. The cost of the TEG power generator has been reduced further because of the increased efficiency and is lower than that of photovoltaics (PV) in terms of equivalent energy generated. The TEG apparatus has been pilot tested and the data will be presented. This kind of TEG power system can be applied in many thermal and geothermal sites with low temperature resources, including oil fields where fossil and geothermal energies are co-produced.

Keywords : TEG, direct power generation, efficiency, thermoelectric effect
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020