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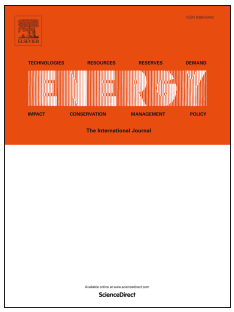

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# High-performance self-powered wireless sensor node driven by a flexible thermoelectric generator

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## Abstract

As industrial environments expand and become more automated, wireless sensor networks are attracting attention as an essential technology for efficient operation and safety. A wireless sensor node (WSN), self-powered by an energy harvester, can significantly reduce maintenance costs as well as the manpower costs associated with the replacement of batteries. Among the many studies on energy harvesting technologies for self-powered WSNs, however, the harvested power has been too low to be practically used in industrial environments. In this work, we demonstrate a self-powered WSN driven by a flexible thermoelectric generator (f-TEG) with a significantly improved degree of practicality. We developed a large-area f-TEG which can be wrapped around heat pipes with various diameters, improving their usability and scalability. A study was conducted to optimize the performance of the f-TEG for a particular WSN application, and an f-TEG fabricated with an area of 140×113 $mm^2$ harvested 272 mW of energy from a heat pipe at a temperature of 70℃. We also tested a complete self-powered WSN system capable of the remote monitoring of the heat pipe temperature, ambient temperature, humidity, $CO_2$ and volatile organic compound concentrations via LoRa