ABSTRAK

Energy harvesting merupakan proses pengumpulan dan konversi energi dari lingkungan sekitar menjadi energi yang dapat digunakan, dengan *Thermoelectric Generator* (TEG) sebagai teknologi utama yang memanfaatkan perbedaan suhu untuk menghasilkan listrik berdasarkan efek *Seebeck*. Penelitian ini mengkaji tentang perancangan alat pemanen energi menggunakan *thermoelectric generator SP1848-27145 SA* dengan memanfaatkan panas knalpot motor *Honda beat street* 110cc sebagai sumber panas. Metode penelitian dalam studi ini adalah eksperimental. Pengujian dilakukan selama pada waktu pagi (08:02–08:30), siang (12:08-12:36), sore (16:02-16:30), dan malam hari (20:22-20:50), dengan setiap pengujian berlangsung selama 30 menit, dalam dua kondisi: kondisi mesin menyala saat motor diam dan kondisi mesin menyala saat motor bergerak. Hasil penelitian menunjukkan bahwa perbedaan suhu (ΔT) tertinggi terjadi pada kondisi mesin menyala saat motor bergerak di waktu siang hari rentang waktu 12:08-12:36 (33,68°C), sedangkan tegangan (V_{TEG}) dan arus keluaran TEG (I_{TEG}) tertinggi tercatat pada kondisi mesin menyala saat motor bergerak di siang hari rentang waktu 12:08-12:36, masing-masing sebesar 2,56 V dan 326 mA. Efisiensi TEG tertinggi sebesar 5,59% pada kondisi mesin menyala saat motor bergerak di pagi hari rentang waktu 08:02-08:30. Alat pemanen energi terdiri dari rangkaian elektrik TEG, modul *step-up*, *power bank* 500mAh sebagai media penyimpanan daya, serta plat besi sebagai *heat sink* dan aluminium desain sirip sebagai *cold sink*. *Koefisien Seebeck* tertinggi terjadi pada kondisi mesin menyala saat motor bergerak di waktu pagi hari (08:02-08:30) sebesar 0,0942 V/K. nilai efisiensi tergantung pada perbedaan suhu dan tegangan yang dihasilkan. Pengisian *power bank* 500 mAh terbesar terjadi pada siang hari pada rentang waktu 12:08-12:36 kondisi mesin menyala saat motor bergerak, dengan baterai terisi 12% dalam waktu 26 menit pada arus pengisian rata-rata 115 mA. Perbedaan suhu antara *heatsink* dan *coldsink* mempengaruhi kinerja alat pemanen energi.

Kata Kunci : *Thermoelectric Generator, Power Bank, Knalpot Motor*

ABSTRACT

Energy harvesting is the process of collecting and converting energy from the surrounding environment into usable energy, with the Thermoelectric Generator (TEG) being a key technology that utilizes temperature differences to generate electricity based on the Seebeck effect. This study examines the design of an energy harvesting device using the SP1848-27145 SA thermoelectric generator, utilizing exhaust Honda beat street 110 cc heat from a motorcycle as the heat source. The research method used is experimental. Testing was conducted at different times of the day: morning (08:02–08:30), noon (12:08–12:36), afternoon (16:02–16:30), and evening (20:22–20:50), each lasting 30 minutes, under two conditions: with the engine running while the motorcycle was stationary and with the engine running while the motorcycle was moving. The results showed that the highest temperature difference (ΔT) occurred under the engine running while the motorcycle was moving during noon (12:08-12:36), reaching 33.68°C, while the highest output voltage (V_{TEG}) and current (I_{TEG}) were recorded at 2.56 V and 326 mA, respectively, during the same period. The highest TEG efficiency was 5.59%, achieved with the engine running while the motorcycle was moving during the morning (08:02-08:30). The energy harvesting device consists of a TEG electrical circuit, a step-up module, a 500mAh power bank for energy storage, and a steel plate as the heat sink and an aluminum fin design as the cold sink. The highest Seebeck coefficient occurred with the engine running while the motorcycle was moving during the morning (08:02-08:30), with a value of 0.0942 V/K. Efficiency is dependent on the temperature difference and the voltage generated. The largest charge of the 500 mAh power bank occurred during noon (12:08-12:36) with the engine running while the motorcycle was moving, with the battery charged 12% in 26 minutes at an average charging current of 115 mA. The temperature difference between the heat sink and the cold sink affects the performance of the energy harvesting device.

Keywords: Thermoelectric Generator, Power Bank, Motorcycle Exhaust