Two-phase evaporative battery thermal management technology for EVs/HEVs

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Abstract

Electric vehicle’s motor draws power from battery to meet its power demand in different road profiles. Battery high-discharged currents are causes of warming battery’s cells. The temperature of 40 °C and above reduces battery’s life span. The rationale of fuzzy controlled evaporative battery thermal management system (EC-BTMS) development from this study is to control the battery temperature in the range of 20–40 °C both in charging/discharging modes. The proposed system has been developed with estimating the total cooling loads and thermal behavior of the battery cells. A fuzzy controlling system has been introduced with the EC-BTMS to control the electro-compressor and the expansion valve based on the response of battery temperature sensors. A battery pack of 8.8 kWh equipped EV has been operated with 60 km/h on 0 % gradient and 40 km/h on 5 % gradient in IITM campus while 130 km/h on 0 % gradient and 20 km/h on 3.67 % gradient in Malaysia International Formula circuit to study the battery temperature profile and percentage of battery power saving. Comparison has been made on the performances of EC-BTMS with air cooling battery thermal management system (AC-BTMS) by using same vehicle. Result shows that EC-BTMS can save energy 17.49 % more than AC-BTMS 1 and 22.36 % more than AC-BTMS 2. © 2017, The Korean Society of Automotive Engineers and Springer-Verlag GmbH Germany.

Keyword Index

- Fuzzy controlled expansion valve
- Energy efficient
- Battery controlled electro-compressor
- Fuzzy battery

Indexed keywords

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