Abstract 16 – Paper ID: 082

Modeling and Simulation of a Dual-Battery System for Thermal Runaway Prevention in Electric Vehicles

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Abstract

Burning of carbon-based fuels causes environmental pollution. To avoid this environmental threat, the best replacement available is electric vehicles. The electric vehicles make use of lithium-ion batteries, which can store more energy in less volume. The major problem with lithium-ion batteries is that at high-temperature conditions, thermal runaway comes into action and causes the risk of explosion of the electric vehicles. To prevent the explosion of the batteries, they should be operated in the safe temperature range. This paper introduces a methodology to sort out this issue by a dual battery system that activate only one battery at a time, which has a lower temperature than the threshold, and keeping another battery in idle condition, which has a temperature higher than the threshold. By using this methodology chances of thermal runaway can be reduced by limiting the maximum operating temperature to 45°C.

Keywords: Lithium-ion batteries, electric vehicles, dual-battery system, operating temperature

ISBN: 978-81-989164-2-6; DOI: 10.21467/abstracts.8.1