ABSTRACT

Battery is an electrical storage and energy supply which its work is based on chemical reaction. Its work and reliability are affected by temperature. The increase of temperature can give several negative effects such as overcharging, short circuit, or explosion. This research is conducted to design battery thermal management system for monitoring the influence of temperature to battery performance, as well as for reducing its negative effects. For that purpose, a prototype which consists of parafin as phase change material (PCM) and a fan as heat distributor is build. The prototype is tested using an electric heater with 280 watt and implemented in 3-battery and 6-battery packs. A forced convection process is applied by using fan with 4100 RPM and 4500 RPM to distribute heat to environment. From the prototype testing, it is observed that the parafin melting point is 40℃. In case of battery test, we observed that the charging process takes about 5500 second and the lowest temperature is 30℃ when fan with 4100 rpm is applied. This is faster than the case of 4500 rpm kipas in which the charging process takes 6500 second and the lowest temperature is 27℃. On the other hand, the discharging process is relatively temperature independent. A modeling using MATLAB® shows the same tendency with final voltage of fully charged battery has under 0.5 volt lower than the experimental result. Statistically, it has perfect positive correlation value. The result of COMSOL® simulation shows that the cooling system reaches the temperature faster that the experiment for this system. This results indicates that the conduction and forced convection process still need to be optimize.

Keyword :Thermal management system, lithium ion, MATLAB®, COMSOL®