Battery Thermal Management System of Future Electric Vehicles with Loop Thermosyphon

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ABSTRACT

This work reports the experimental results of the thermal management of a Li-ion battery system designed for a future hybrid and electric vehicles. Specially, the present thermal management system has adopted a loop thermosyphon cooling method for high efficiency cooling. In the present study, the experimental results show that the present loop thermosyphon system is able to transfer the entire dissipated heat and each cell temperature is maintained under 50℃ when each cell of battery give off 50 watt of heat.

I. INTRODUCTION

The life costs of electric vehicles (EV) and hybrid electric vehicles (HEV) depend extremely on power storage systems such as batteries. The performance of battery pack system directly affects the power of vehicles and fuel economy, because the battery pack cost and life time also affect the vehicle cost and reliability, any parameter that affects the battery pack must be optimized. Hence, battery module temperature uniformity is one such parameter and the optimum operating range is different. We then carried out the experimental study with loop thermosyphon cooling system in battery thermal management system.

2. EXPERIMENTS

The experimental apparatus, illustrated in Fig. 1, mainly consists of the main TLT assembly, the cooling system

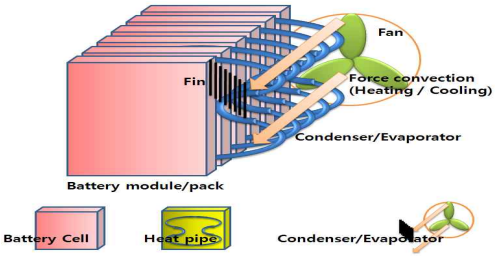

Fig. 1 Heat Pipe Battery Cooling System.

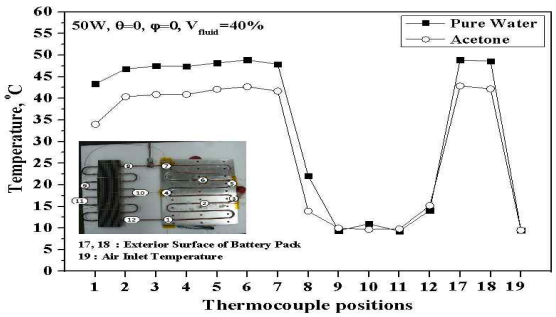

Fig. 2 Temperature Profile of Battery Cooling System.

in the condenser section with horizontal state. The physical characteristics of the main TLT assembly used in the study are divided into three parts: the evaporation section with the thermosyphon's evaporators, the long smooth transporting sections, and the finned condensers.

The both sections were made from a copper pipe of 3.2 mm O.D. Fig. 1 shows the dimensions of the current system. A one section inserted and jointed between two rectangular cell plates and the other section was connected with air cooling channel. The loop system was tested under pressure and vacuum for leaks.

Fig. 2 shows that the system is working under critical temperature (55°C with 50 W) to make the optimum working conditions. In the Fig. 2, the battery thermal management system can be applicable for a future battery pack of electric vehicles

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