INTEGRATED CONTROL STRATEGY OF BATTERY PREHEATING AND SELF-HEATING FOR NEW ENERGY VEHICLES

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Abstract: *At low temperature, the charging and discharging performance of battery is greatly reduced, and its life is seriously affected, which directly limits the development of new energy vehicles. In this paper, based on the study of the current low-temperature heating methods, the advantages and disadvantages of each method are compared, and a battery charging preheating and discharge self-heating integration heating structure is proposed, and the automation is realized through the sensor elements and control circuit, so as to solve the dilemma of new energy vehicles in low temperature.*
Key words: *new energy vehicles; Battery thermal management; Automatic control.*

1. Charging preheating system at low temperature

The battery pack heats each battery cell at low temperature through a resistor. When the external power supply is connected, the pre heating starts, and the heat generated by the current through the resistance is transferred to the battery to achieve the purpose of heating. A temperature sensor is placed at a specific position. When the battery temperature is lower than the minimum preset temperature T1, the temperature sensor transmits the signal to the controller, and the preheating circuit starts to work. When the battery temperature is higher than the maximum preset temperature T2, the preheating is stopped.

2. Discharge self-heating system at low temperature

A temperature sensor is placed at a specific position of the battery pack. When the temperature of the battery pack drops to the minimum preset temperature T3 of the sensor, the sensor transmits the signal to the controller, which is connected to the self-heating circuit to start self-heating. The self-heating system uses the battery pack itself to provide electric energy for the resistor (the resistor here is the resistor working during charging preheating), so that the resistor generates heat, and then heats the battery pack; When the battery pack is heated up, the working performance is improved, and the discharged electric energy is increased, then the resistance sheet can generate more heat; When the temperature of the battery pack is higher than the maximum preset temperature T4 of the sensor, the sensor will send this signal to the controller to disconnect the self-heating circuit, and the self-heating ends.

3. Structural improvement

Considering that the cells close to the outside of the battery pack are more likely to have adverse heat exchange due to the low ambient temperature, the solution of this paper is to improve the thermal power of the outermost resistor, and then compensate for the heat loss caused by the low ambient temperature, so as to maintain the consistency and uniformity of the battery pack temperature.

Whether it is preheating or self heating process, in order to make the temperature of the cells in the battery consistent and improve the temperature uniformity of the battery, this paper designs and installs the soaking aluminum plate with holes on the two sides of the single battery which does not contact the resistance sheet to meet the demand of temperature uniformity.