International Journal of Electrical and Electronics Engineers
Vol. No. 9, Issue No. 01, January-June 2017
ISSN (O) 2321-2055
ISSN (P) 2321-2045

BATTERY MANAGEMENT SYSTEM IN ELECTRIC VEHICLE

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ABSTRACT

A battery management system (BMS) is an electronic regulator that monitors and controls the charging and discharging of rechargeable batteries. It is simply battery monitoring, keeping a check on the key operational parameters during charging and discharging such as voltages, currents and the battery internal and ambient temperature. The monitoring circuits would normally provide inputs to protection devices which would generate alarms or disconnect the battery from the load or charger should any of the parameters become out of limits.

Keywords: Arm Processing, Battery cell monitoring, Temperature-Voltage Controlling.

I. INTRODUCTION

Electrification in the vehicle (electrified transportation) is the most viable way to achieve clean and efficient transportation that is crucial to the sustainable development of the whole world. In the near future, electric vehicles (EVs) including hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), and pure battery electric vehicles (BEVs) will dominate the clean vehicle Market. By 2020, it is expected that more than half of new vehicle sales will likely be EV models. The key and the enabling technology to this revolutionary change is battery.

Electric vehicles (EVs) are powered by a large number of battery cells, requiring an effective battery management system (BMS) to maintain the battery cells in an operational condition while providing the necessary power efficiently.

Battery management systems (BMS) make decisions on charge/discharge rates on the basis of load demands, cell voltage, current, and temperature measurements, and estimated battery SOC, capacity, impedance, etc

II. PROPOSED METHODOLOGY

Energy and environmental issues have long been challenges facing the world's automotive industry. For facing these problems, the grim energy and environmental situation around the world has accelerated to the new energy vehicle development.

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In the nineteenth century, **William Morrison's** design with a capacity for passenger is often considered the first real and practical electric car. In the early 1990s, it had lots of advantages over their competitors when the many Motor Vehicle Company starts building their own electric car. Professor **William Edward Ayrton** and **John Perry** were distinguished the First electric car in England.

Why Need BMS (Battery Management System) in Electric vehicle:

Batteries used in EVs should not be overcharged or over-discharged to avoid damaging the battery, shortening the battery life, and causing fire or explosions.

The battery management system (BMS), with the functions of battery modeling, battery state estimation, battery balancing, etc., is one of the key points to protect the battery and optimize the utilization of the battery in EVs.

Electric car battery is an important role in electric car to keep going on the road, thus the electric car battery pack needs to be secure from damage because of uneven temperature. Depending on the electrochemical used in battery, the optimum range is different, but the ideal optimum temperature of electric car battery is 45°C in order to keep the performance and life for the battery.

State-of-Charge Determination:

One feature of the BMS is to keep track of the state of charge (SOC) of the battery. The SOC could signal the user and control the charging and discharging process.

There are three methods of determining SOC:

1) Through direct measurement: To measure the SOC directly, one could simply use a voltmeter because the battery voltage decreases more or less linearly during the discharging cycle of the battery.
2) Through coulomb counting: In the coulomb-counting method, the current going into or coming out of a battery is integrated to produce the relative value of its charge.
3) Through the combination of the two techniques: In addition, the two methods could be combined. The voltmeter could be used to monitor the battery voltage and calibrate the SOC when the actual charge approaches either end. Meanwhile, the battery current could be integrated to determine the relative charge going into and coming out of the battery.

The SOC refers to the remaining capacity (*Q*rem) as a percentage of the maximum available capacity:

$$SOC = \frac{Qrem}{Qmax} \times 100\%$$

III. SYSTEM DESIGN

Here going to see about various type of methods of system architectures and Algorithm to achieve this project's specification. we are going to discuss proposed system architecture it's Benefit and Algorithm for battery management system implementation with the help of microcontroller.

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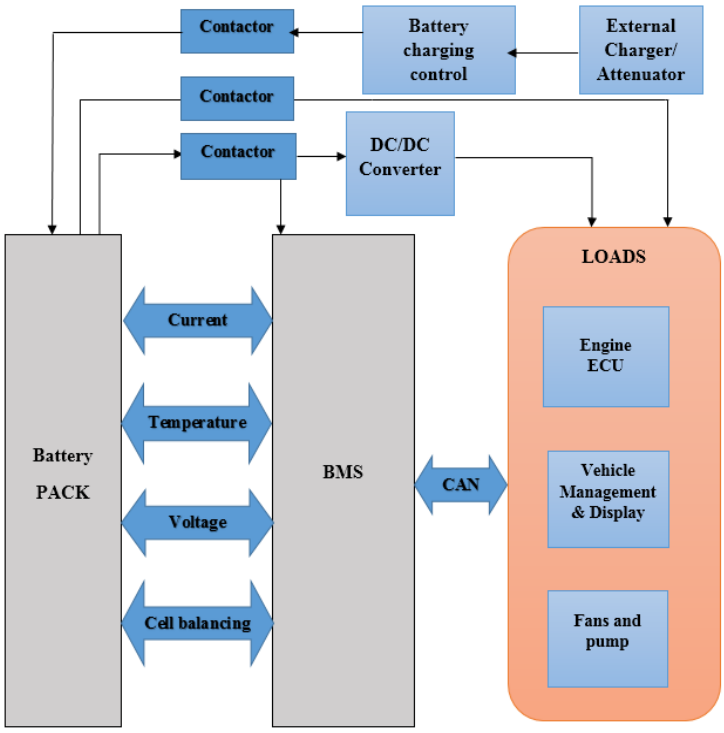

Fig: Basic block diagram of BMS

In the vehicle there are basically used CAN controller for the operation of different parts. But in my project I am not using CAN bus.

Description:

External charger is connected to the battery by contactor and it is control by battery control unit. Loads like ECU engine and controller are connected to the battery by DC/DC converter to give sufficient supply required to that by using contactor. BMS control the current, temperature and voltage in each cell in the battery.

Cell: The basic electrochemical unit used to generate electrical energy from stored chemical energy or to store electrical energy in the form of chemical energy. A cell consists of two electrodes in a container filled with an electrolyte.

Battery:

Two or more cells connected in an appropriate series/parallel arrangement to obtain the required operating voltage and capacity for a certain load. The term battery is also frequently used for single cells. This terminology will also be adopted in this thesis, except where a distinction between cells and batteries is needed. A good example is a battery pack, which consists of several cells connected in series and/or parallel.

Loads on vehicle battery:

Different type of loads connected in vehicles, which are connected to the battery by direct connection or else by using contactor and DC to DC converter as per their compatibility.

- ECU
- Motors
- Pumps
- Fans

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- Displays

Cell balancing:

Cell balancing is a method of compensating weaker cells by equalizing the charge on all cells in the chain to extend the overall battery life.

In chains of multi-cell batteries, small differences between the cells due to production tolerances or operating conditions tend to be magnified with each charge-discharge cycle.

Connection of battery pack to the battery monitoring ic (ISL94212)

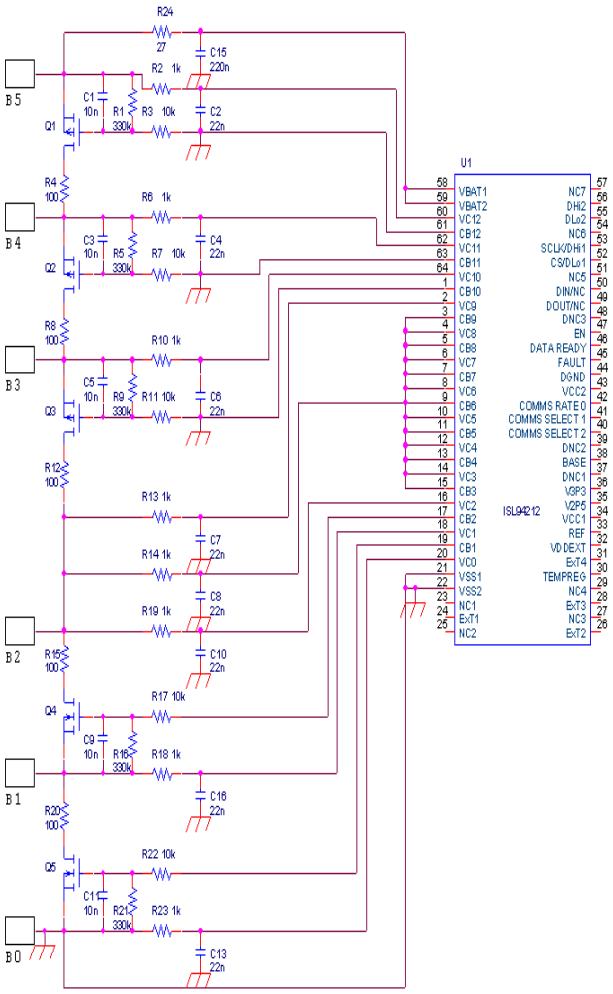

Fig: connection of battery pack and monitoring Ic

ISL94212:

The ISL94212 Li-ion battery manager IC supervises up to 12 series connected cells. The part provides accurate monitoring, cell balancing and extensive system diagnostics functions.

The ISL94212 communicates to a host microcontroller via an SPI interface and to other ISL94212 devices using a robust, proprietary, two-wire Daisy Chain system.

The ISL94212 is offered in a 64 Ld TQFP package and is specified for an operational temperature range of -40°C to +85°C.

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IV. CONCLUSION

In this way, we are developing a system model for Battery Management System and controlling based on 3 parameters voltage, current and Temperature by using ARM7 development board and Battery monitoring Ic using embedded processing. This project makes it possible to build complex and effective products at a cheaper price. Application of the same for different types of hybrid vehicles and other battery using applications. The battery management system can be Used in automation industries, automotive industries etc.

ACKNOWLEDGEMENT:

It brings to a great pleasure in submitting with this paper with deep sense of attitude and profound respect towards a project **guide Prof. J H Shaikh** for his valuable guidance, timely support and inspiration in the completion of this dissertation entitled "**BATTERY MANAGEMENT SYSTEM**".

I am also grateful to our respective **HOD Dr. A A Patil** for giving the instructions which are always constructive.

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