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Innovations in Battery Management System of Electric Vehicles

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ABSTRACT: The biggest issue faced by the current generation budget E-vehicles like Electric Bike and Scooters are overcharging and improper charging levels. Studies show that charging the batteries to 100% level cause much faster degradation of the cells. In order to overcome this Electronic system can be used to set the charging levels according to the user input. This will prevent overcharging of the battery and overheating. Adjusting the power input levels according to the battery charge percentage.

Studies show that charging the batteries at rapid speed over a longer period of time affects the health of the batteries. So adjusting the power level according to battery can be done. In this project we are planning to simulate the Battery Management System i.e. BMS using Arduino and ESP Node-MCU.

KEYWORDS: Battery Management System, Arduino, E-Vehicles, Node-MCU

I. INTRODUCTION

Battery Management System alias BMS is an electronic system which is responsible for the health and other factors of a rechargeable battery pack in an E-vehicle. It monitors various parameters such as charge time, discharge time, temperature, etc. which can affect the lifespan of a battery pack.^[1]

It is used by various Vehicle manufacturing companies to keep a check at the battery and help the user communicate with the system to ensure better performance and efficiency.

Battery Management system alias BMS is stated to be the heart of any E-Vehicle. It is responsible for the control of various equipment alongside the Battery pack of the vehicle. These battery packs are charged by chargers at stations or at home using specified rated chargers. The BMS is responsible for charging the battery pack at optimum voltage and temperature in order to ensure safe charging. Different vehicles have different BMS according to the type and mode of the vehicle. The BMS constantly monitors the health and the capacity of the battery pack. Battery Management system comprises of a logic board to which a code is burned according to the vehicle type and need of the manufacturer/user.^[2]

II. OBJECTIVE OF PROJECT

The main objective of this research paper is to provide a solution to the current problem that is there in front of us that the current electric vehicles have that is of battery pack life and optimal performance out of it. Due to different fast charging methods and improper care of the battery pack due to avoidance of electric parameters such as State of Health (SoH) and State of Charge (SoC) the life of the battery pack is affected badly which results in poor performance over the long period of time.

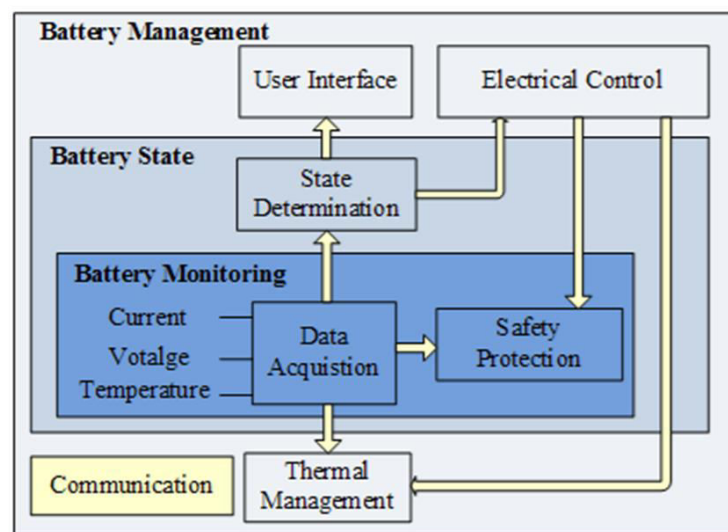
The solution we are providing results in keeping a proper check at the electrical parameters which will give proper feedback and solutions to the parameters that are constantly being monitored and checked by the different sensors on the BMS.

III. LITERATURE SURVEY

In today's world as the e-vehicles are increasing and each company is racing to be the top contender for the best E-vehicle. To accomplish this the spine of their research is the development in BMS. These developments result in better

and more efficient performance of the vehicle which results in better sales. The main aim is to achieve a system that monitors and controls different parameters and provide an overall performance.

The BMS performs the tasks by integrating one or more of the functions, such as sampling the voltages of the battery cells and the temperatures in the battery module, sampling the voltage of the battery, sampling the current of the battery, as well as cells balancing and determining the state of charge (SOC). But all these companies are focusing on enhancing the performance of the vehicle resulting in neglectation of the battery pack health. The cell deterioration and corrosion are factors that are affecting the battery pack and cell.



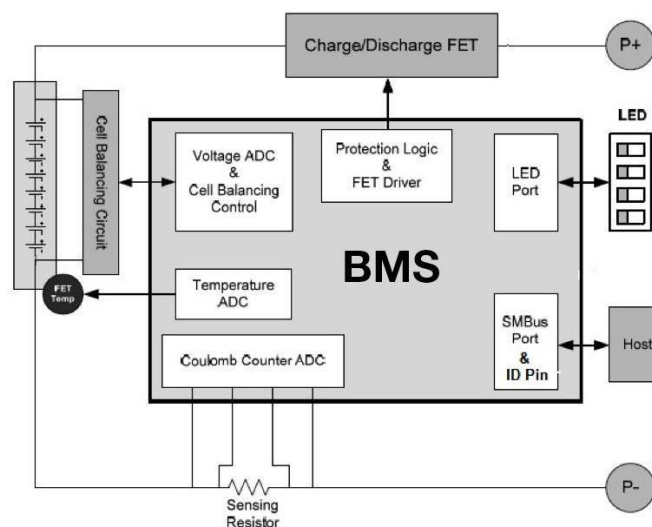
The Battery management has 4 major components- the FET, Logic Board, Sensors and the Ports.

The FET stand for Field Effect transistors that are use in the circuit for connection and isolation.

Logic board is where all the program is stored and the data is computed here for giving output and provide optimal result.

There are different type sensors that are connected to the BMS for receiving different data for different parameters. These sensors are chosen according to the use and rating.

There are various input and output ports for communication and peripheral connection. These ports are different for different logic board.



IV. PROBLEM STATEMENT

Literature review concluded that there is no indigenous method or solution for maintaining the peak optimum performance of the Battery pack in the Electric Vehicle. We hence propose a way to develop an indigenous method at small scale which then will be researched and worked upon in the near future to be developed in accordance to the electric vehicles.

V. RESEARCH METHODOLOGY

Battery management system is required to control several parameters related to the functioning of the electric vehicle like charging and discharging rate. BMS not only controls but also is responsible for data communication and data processing, for providing better functioning of the battery pack. BMS also helps to indicate the SoH (State of Health) and SoC (State of charge), which are indicators for the capability of the battery pack. BMS acts as a monitoring device to monitor the health of each cell individually in-order to keep the cell healthy and provide prolong life. BMS monitors the rate of charge and discharge to keep a close check on the efficiency and provide instructions to maintain it or improve it.

FUNCTIONS OF BATTERY MANAGEMENT SYSTEM

Monitor

A BMS may monitor the state of the battery as represented by various items, such as:

- Voltage
- Temperature
- Current
- SoH and SoC

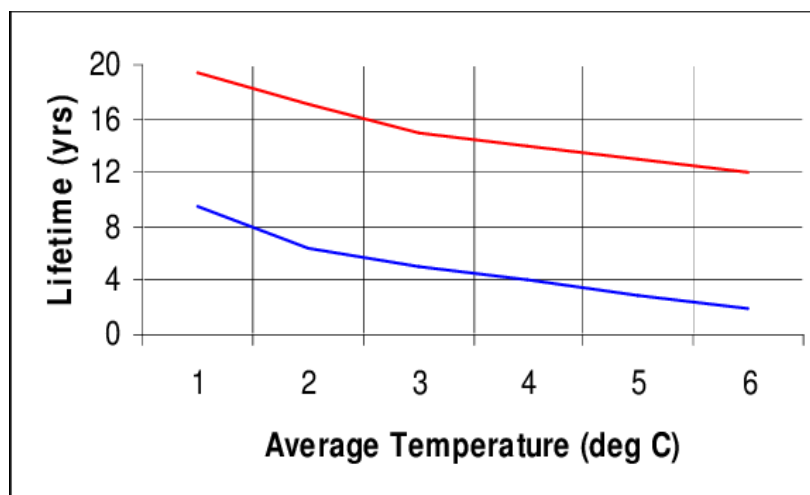
Protection

A BMS may protect its battery by preventing it from operating outside its safe operating area, such as:

- Over-current (may be different in charging and discharging modes)
- Over-voltage (during charging), especially important for lead-acid and Li-ion cells
- Under-voltage (during discharging)
- Over-temperature

It also connects the battery pack to the load circuit for delivering optimal power and provide instructions on the feedbacks computed.

It also helps and computation of several other factors like Charge [Ah] delivered or stored, total energy delivered since first use, total operating time since first use, total number of cycles, etc.



Battery Management System in Use

- TATA FICOSA AUTOMOTIVE SYSTEMS
- NXP BATTERY MANAGEMENT SYSTEM (VOLKSWAGEN GROUP)
- HELA BATTERY MANAGEMENT SYSTEM (MARUTI LIMITED)
- HYUNDAI MOBIS SYSTEM

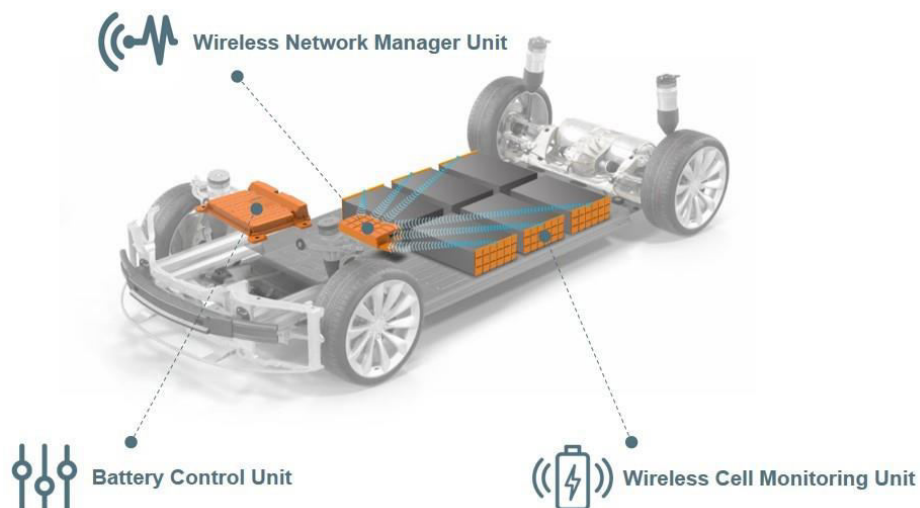
THESE ARE SOME OF THE BMS THAT ARE CURRENTLY IN USE IN THE INDUSTRY. THESE ARE USED BY RESPECTIVE MANUFACTURING COMPANIES TO MONITOR AND CONTROL THE FUNCTIONING OF THEIR E-VEHICLES AND ITS BATTERY PACK.

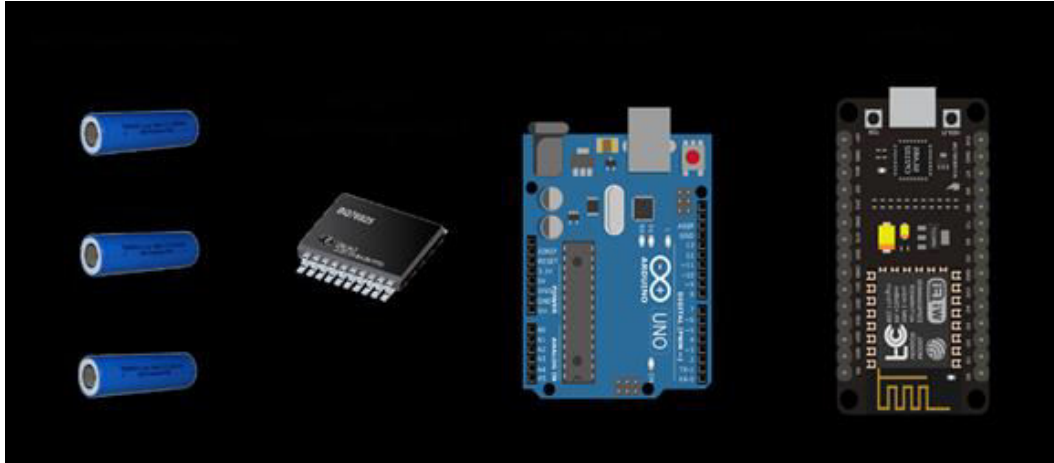
VI. PROPOSED DESIGN

Arduino IDE can be used to develop such system at a small scale for study purpose. The components required to develop such system are Arduino UNO, Node MCU ESP8266, BQ76925 Battery Management IC. These make a basic circuit when connected to a battery pack to simulate a Battery Management System. The BMS IC measures the input current, Voltage and temperature with help of the sensors connected to it. FET's present on it can be fully controlled by the user. A Program is developed which helps the user to input the values according to his need and perform the same tasks at hand. These make a basic circuit when connected to a battery pack to simulate a Battery Management System. The BMS IC measures the input current, Voltage and temperature with help of the sensors connected to it. FET's present on it can be fully controlled by the user. A Program is developed which helps the user to input the values according to his need and perform the same tasks at hand.

The NODE MCU has a wifi card which also helps to communicate with the server system for proper management of the data that is processed by the Battery Management IC. The data is then displayed on the system for giving proper feedback and solutions to the user

Adjusting the power input levels according to the battery charge percentage. Studies show that charging the batteries at rapid speed over a longer period of time effects the health of the batteries. So adjusting the power level according to battery can be done. Dividing the battery pack into two segment will result in much efficient and much faster charging of the battery. Charging the two battery packs simultaneously will result in faster charging and since the battery is now divided into two small batteries maintain the temperature will also be easier.





V. CONCLUSION

With use of Arduino IDE and BMS we can control the parameters such as battery charge limit and disconnect the supply when fully charged in order to increase the life of the battery pack. This will also result in much more efficient functioning of the electric vehicle in the future models. We can regularly keep a check on the different electrical parameters of the battery and provide adequate solutions according to the data processed by the logic board. This also helps in maintaining the optimum battery performance of the electric vehicle. This project helps to increase the battery performance and results in longer life of it as all the necessary parameters are regularly monitor and the data is processed and adequate is feedback is provided.

REFERENCES

- [1] <https://ieeexplore.ieee.org/document/6176637>
- [2] https://www.researchgate.net/publication/268049973_Battery_Management_Systems_in_Electric_and_Hybrid_Vehicles
- [3] <https://www.renesas.com/in/en/document/whp/battery-management-system-tutorial?language=en#:~:text=A%20FET%20driver%20functional%20block,between%20the%20load%20and%20charger.&text=The%20voltage%20level%20at%20CHMON,if%20a%20load%20is%20present.>
- [4] Battery Management Systems in Electric and Hybrid .pdf
- [5] <https://tataautocomp.com/tataficsa/product/bms-battery-management-system/>
- [6] <https://media.nxp.com/news-releases/news-release-details/volkswagen-adopts-nxp-battery-management-solutions-its-meb>
- [7] <https://en.mobis.co.kr/products/P0012/index.do>



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