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ELECTRICAL VEHICLE BATTERY MONITOR WITH STATIC COOLING SYSTEM

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ABSTRACT- With improving vehicle efficiency, thermal systems are increasingly important for effective and efficient heavy- and light-duty vehicle design. Developing flexible and cost-effective tools to understand vehicle thermal trade-offs at the system level is critical to designing advanced electrified traction drive systems and their associated thermal controls. When operating, the air conditioning (A/C) system is the largest auxiliary load on a conventional vehicle. A/C loads account for more than 5% of the fuel used annually for light-duty vehicles in the United States . Climate control loads can have an even larger impact on hybrid electric vehicle, plug-in hybrid electric vehicle, and all-electric vehicle (EV) performance. Hybrid EVs have 22% lower fuel economy with the A/C on . For all-electric vehicles, the effect of the climate control system can be even more severe. Due to the Heating the passenger compartment in EVs is challenging due of the relative scarcity of waste heat.
As a result, the efficiency and range of the car are dramatically decreased. Cooling the cabin can consume a signifi cant amount of the battery's energy.According to Mitsubishi, the MiEV's range can be decreased by up to 68% for heating and 46% for cooling on the Japan 10-15 cycle.
For the Ford Focus EV running on the Urban Dynamometer Driving Schedule cycle, the Advanced Powertrain Re search Facility at Argonne National Laboratory has recorded 59.3% and 53.7% losses in range due to maximum h eating and maximum cooling, respectively.

I. INTRODUCTION

With improving vehicle efficiency, thermal systems are increasingly important for effective and efficient heavy- and light-duty vehicle design. Developing flexible and cost-effective tools to understand vehicle thermal trade-offs at the system level is critical to designing advanced electrified traction drive systems and their associated thermal controls. When operating, the air conditioning (A/C) system is the largest auxiliary load on a conventional vehicle. A/C loads account for more than 5% of the fuel used annually for light-duty vehicles in the United States . Climate control loads can have an even larger impact on hybrid electric vehicle, plug-in hybrid electric vehicle, and all-electric vehicle (EV) performance. Hybrid EVs have 22% lower fuel economy with the A/C on . For all-electric vehicles, the effect of the climate control system can be even more severe. Due to the relative shortage of waste heat, heating the passenger cabin in EVs is difficult. Cooling the cabin can take a high portion of the energy available in the battery, significantly reducing vehicle efficiency and range. Mitsubishi reports that the range of the i-MiEV can be reduced by as much as 68% for heating and

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46% for cooling on the Japan 10-15 cycle . The Advanced Powertrain Research Facility at Argonne National Laboratory has reported 59.3% and 53.7% reductions in range due to maximum heating and maximum cooling, respectively, for the Ford Focus EV operating on the Urban Dynamometer Driving Schedule cycle . In addition to these climate control impacts, electric-drive vehicles (EDVs) may have additional cooling requirements for the batteries, power electronics, and electric machines that make up the electric traction drive system. Therefore, different heating techniques and more effective cooling techniques are required for EVs in comparison to vehicles powered by internal combustion engines. These techniques frequently entail operating the TEC system in surface cooling mode to provide adequate cabin heating. The thermal management system may become more complex if, in some cutting-edge concepts, the conventional surface cooling based thermal management is complemented with a refrigerant-based cooling

II. METHODOLOGY

Recognising the different failure types is the initial step in comprehending the dependability of EV batte ries.The performance of the batteries is checked to verify it meets expectations, and any design flaws are found using the proper testing techniques once the failure types have been recognised and analysed.Additionally, it aid s in ensuring that the batteries' security complies with all applicable laws.A lifetime prediction model is crucial for enhancing battery dependability.

A. Mechanical Design Structure

The LM78XX series of three-terminal positive regulators is available in the TO-220 package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut-down, and safe operating area protection. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components for adjustable voltages and currents.

Features:-

- Output Current up to 1 A
- Output Voltages: 5, 6, 8, 9, 10, 12, 15, 18, 24 V
- Thermal Overload Protection
- Short-Circuit Protection
- Output Transistor Safe Operating Area Protection

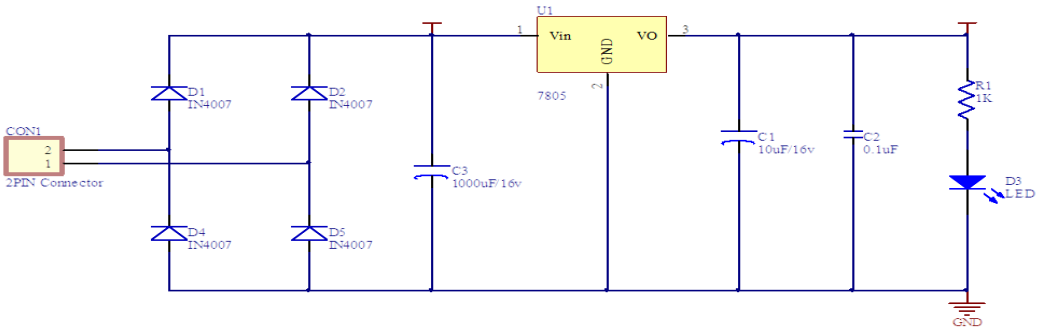

Fig.1- Power Supply

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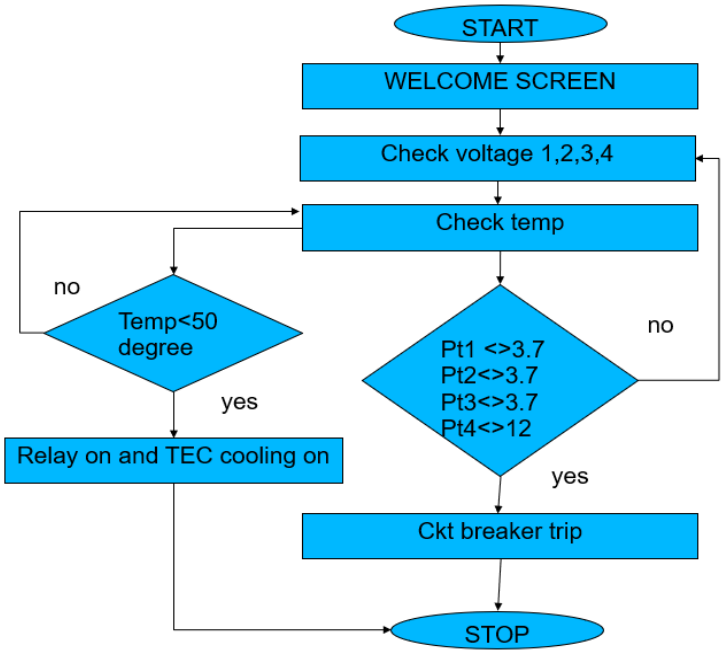

Fig.2- flowchart

B. Software requirement:-

1)*Arduino ide:*-The Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++.[3] It is used to write and upload programs to Arduino compatible boards, but also, with the help of third-party cores, other vendor development boards

2)*Proteus 8:*-Proteus 8 is one of the tools needed for circuit design and simulation, including:
Application Framework – A single application integrated with ISIS, ARES and 3D Viewer is displayed in a tabbed module. Switch between tabs on a single monitor. Or drag and drop tags to display them in a separate window

c. Hardware Implementation
The various tools and equipment required for construction of a PCB are given below: -

- Solder kit consist of:-
- Soldering iron.
- Soldering wire.
- Flux
- Tweezers
- Cutter

d) Multi-meter (Measuring instrument)

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1) Voltage sensor: Voltage Sensor is a precise low cost sensor for measuring voltage. It is based on principle of resistive voltage divider design. It can make the red terminal connector input voltage to 5 times smaller. Arduino analog input voltages up to 5V, the voltage detection module input voltage not greater than 5Vx5=25V (if using 3.3V systems, input voltage not greater than 3.3Vx5=16.5V).
Arduino AVR chips have 10-bit AD, so this module simulates a resolution of 0.00489V (5V/1023), so the minimum voltage of input voltage detection module is 0.00489Vx5=0.02445V.

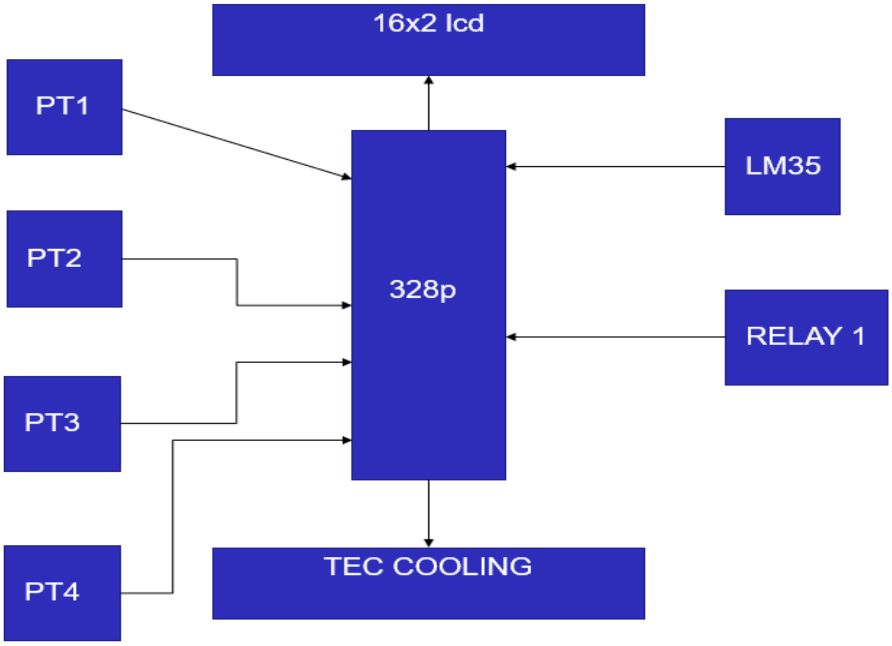

Fig.3 -Block diagram

In block diagram we interfacing the PT1,PT2,PT3,PT4 is connected to 328p microcontroller system lcd also interface in this diagram TEC is used for cooling for battery and itson off though the relay .

2) LM35: The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1/4 °C at room temperature and ±3/4°C over a full -55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 mA from its supply, it has very low self-heating, less than 0.1°C in still air*3) Wind and generator DC Motor*:

4) TEC: Wakefield-Vette's Peltier, thermoelectric coolers can meet the requirement of higher current and large cooling. It is often applied to experimental, scientific and biomedical instruments, laboratory equipment, industry and electrical equipment and consumables. The ambient temperature can arrive 100C, long-term working temperature is recommended to be below 90C. Features: All products are RoHS and REACH compliant, SGS ISO9001 verified Thermoelectric module material are UL certification Standard Wire is 150mm Thermoelectric module moisture protection standard is sealed by white RTV silicone, but also support select other moisture protection style, Such as translucent silicone, black epoxy.

III. CONCLUSIONS

The creation of heat in contemporary stationary battery systems that has negative impacts and poses risks because of poor management is a well-known phenomenon.
The conventional way of stationary BTM is air cooling, however extensive research into the optimisation and effectiveness of this technology was not identified in the scientific literature.In instance, despite the fact that both techniques are currently in use, academic literature lacks studies comparing the effectiveness of active and passive air cooling as well as lifetime cost comparisons.The advancement of technological standards and active air cooling research in the future may result in more efficient cooling

REFERENCES

[1] EC, "Regulation (EC) No 443/2009 to define the modalities for reaching the 2020 target to reduce CO2 emissions from new passenger cars," Official Journal of the European Communities, vol. L 269, no. September 2009, pp. 1–15, 2009
[2] F. T. Wagner, B. Lakshmanan, and M. F. Mathias, "Electrochemistry and the future of the automobile," Journal of Physical Chemistry Letters, 2010.
[3] L. Guzzella, A. Sciarretta et al., Vehicle propulsion systems. Springer, 2007, vol. 1.
[4] L. Ianniciello, P. H. Biwolé, and P. Achard, "Electric vehicles batteries thermal management systems employing phase change materials," Journal of Power Sources, vol. 378, no. October 2017, pp. 383–403, 2018. [Online]. Available: https://doi.org/10.1016/j.jpowsour.2017.12.071
[5] F. Saidani, F. X. Hutter, R. G. Scurtu, W. Braunwarth, and J. N. Burghartz, "Lithium-ion battery models: A comparative study and a model-based powerline communication," Advances in Radio Science, vol. 15, pp. 83–91, 2017.
[6] Q. Zhang, C. Li, and Y. Wu, "Analysis of Research and Development Trend of the Battery Technology in Electric Vehicle with the Perspective of Patent," Energy Procedia, vol. 105, pp. 4274–4280, 2017. [Online]. Available: http://dx.doi.org/10.1016/j.egypro.2017.03.918
[7] M. Decker, T. Fleischer, J. Schippl, and N. Weinberger, ZukünftigeThemen der Innovations- und Technikanalyse.
[8] B. Frieske, M. Kloetzke, and F. Mauser, "Trends in Vehicle Concept and Key Technology Development for Hybrid and Battery Electric Vehicles," pp. 1–12, 2013.