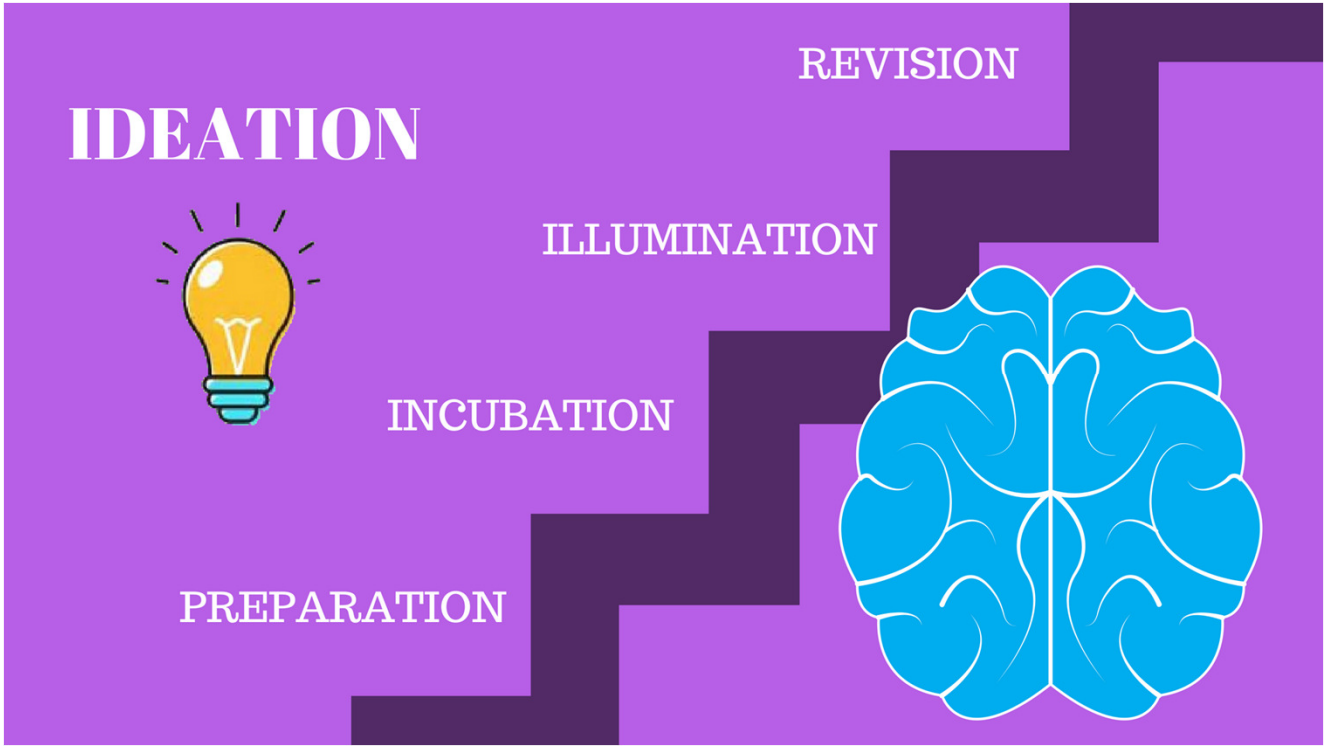
IDEA MANAGEMENT– MHMSPL



BY TEAM MHMBPL

REMOTE BATTERY MONITORING SYSTEM

BACKGROUND

- MHMBPL has 18 SV and 5 main stations and all have been provided with sufficient number of battery banks to ensure uninterrupted power supply for the state of the art equipment and infrastructure.
- To ensure battery health and as per guidelines laid in IMS manuals, presently battery bank maintenance activity is being carried out on monthly basis by physically visiting these stations and checking each individual cell's voltage, temperature , electrolyte level etc.
- Considering the large number of cells in each bank and being spread across the huge geography, it poses a logistical and manpower constraint to effectively ensure healthiness of each cell.

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- Presently, there is no means to remotely monitor the batteries.
- The avg cost of a 100 Ah tubular VRLA battery is Rs 10,000 and once a cell is damaged, it also affects the performance of other cells connected in series and hence degrading the overall performance of the battery bank.
- This can lead to costly downtimes and pose a risk to the safety of the pipeline and its stakeholders.
- Hence, a low cost IOT based remote battery monitoring system is proposed which can remotely monitor critical battery parameters like voltage, temperature and current and transmit the data to the cloud allowing access of battery health data to the maintenance teams without the need of physically travelling to and checking each cell's voltage.
- A prototype for the battery monitoring system has been designed and developed at MRS to evaluate the feasibility of the idea. The total cost of the prototype including all spare parts and equipment was Rs 5000.

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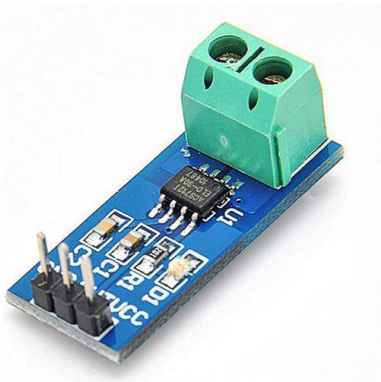
Components of the system

1. Sensors to acquire data: Voltage sensors, current sensors and temperature probes are deployed to acquire the physical parameters of each cell.
   a) Resistor divider network coupled with a diode for reverse current protection and a capacitor for reverse polarity protection is used to sense the battery voltage.

   b) DS18B20 temperature sensor is used to measure surface temperature of batteries (Range of -55 °C to + 125 °C) and uses one-wire communication protocol to transmit the temperature.

   c) Hall effect based current sensor ACS712 (Range of -5A to +5A) is used to measure the load current.



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2. Arduino Mega is a low cost yet powerful microcontroller based on the Atmega2560 with 54 Digital I/O pins, 16 Analog pins, a USB connection, a 16 MHz crystal oscillator, and powered by a AC/DC adaptor or a 12V battery consuming less than 1W. The analog pins of the Arduino board are interfaced with all the sensors to acquire the battery health parameters. Then suitable noise cancellation filters are applied to filter noise present in the acquired analog signals. The filtered analog signals are then transmitted to the NodeMCU board via serial communication to further transmission to the cloud.

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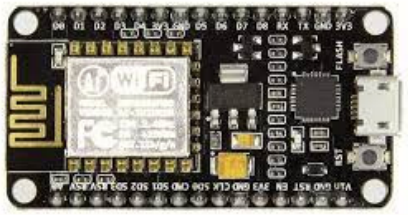
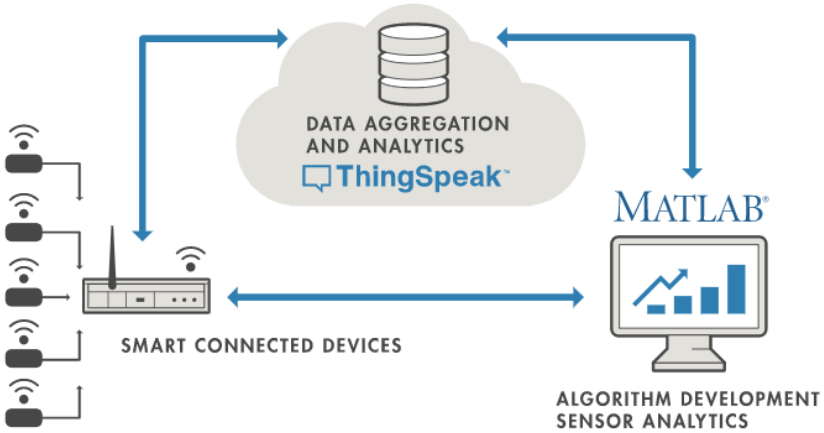
3. NodeMCU is an open source firmware for prototyping board designs and has WiFi capabilities allowing it to connect to a locally available modem and transmit the data to the cloud. The Arduino sends the sensor data to the NodeMCU which further transmits it to the ThingSpeak cloud server.



4. ThingSpeak is an IoT analytics platform service from MATLAB which allows the user to aggregate, visualize and analyze live data streams in the cloud. The NodeMCU transmits the data to the ThingSpeak cloud from where it can be visualized directly on the dashboard or downloaded in excel format for offline analysis.



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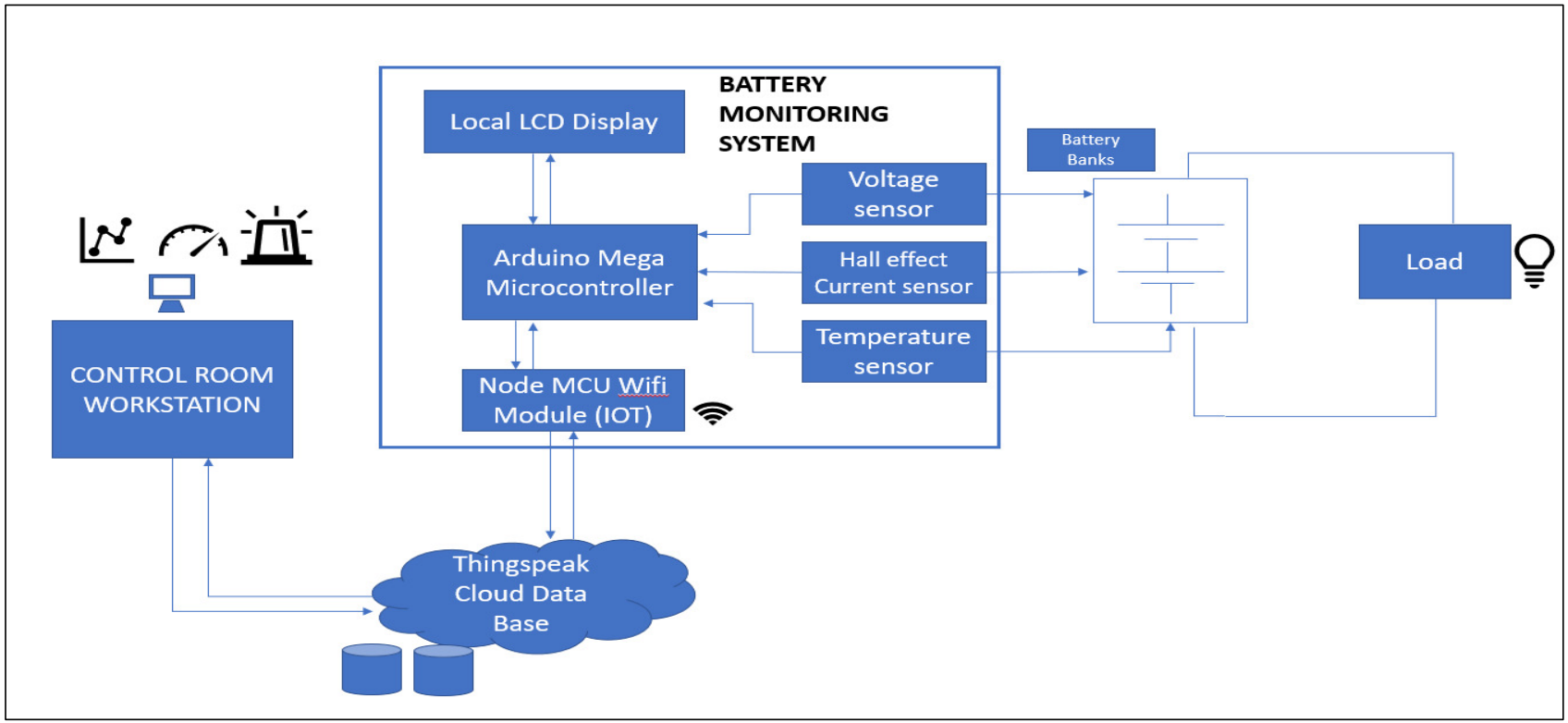
SYSTEM BLOCK DIAGRAM



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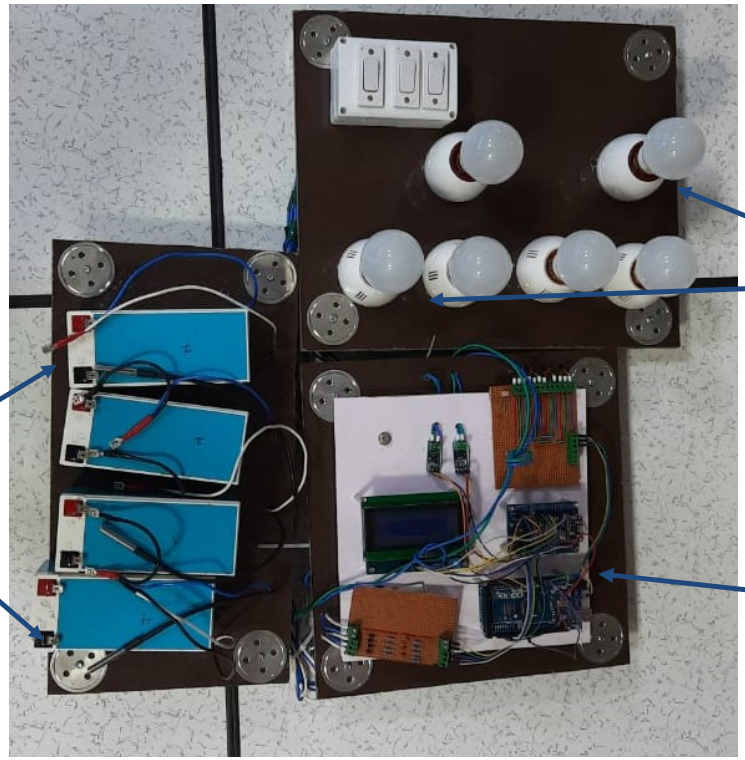
Prototype developed at MHMBPL MRS



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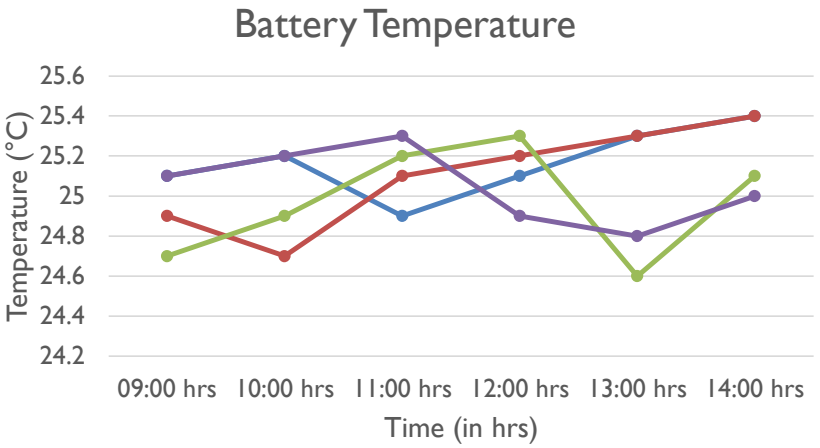

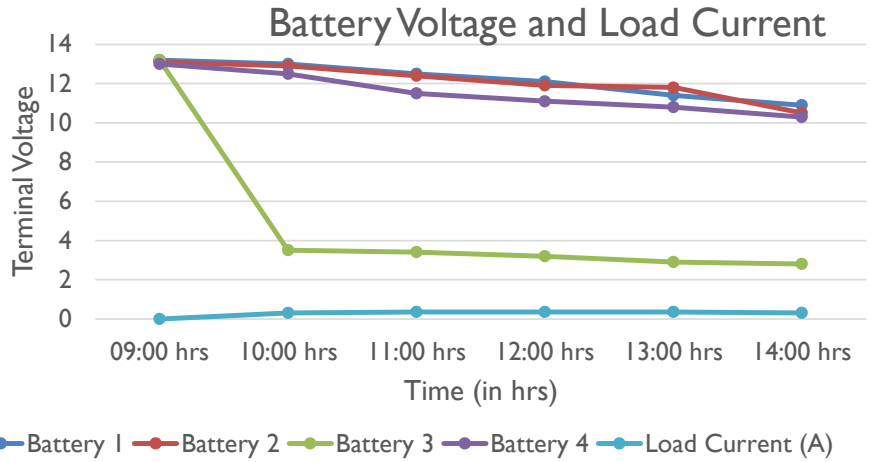

Tabular data and charts for prototype acquired from ThingSpeak webdashboard

	Battery 1	Battery 2	Battery 3	Battery 4	Load Current
09:00 hrs	13.2V , 25.1 °C	13.1V , 24.9 °C	13.2V , 24.7 °C	13.0V , 25.1 °C	0 A
10:00 hrs	13.0V , 25.2 °C	12.9V , 24.7 °C	3.5V , 24.9 °C	12.5V , 25.1 °C	0.3 A
11:00 hrs	12.5V , 24.9 °C	12.4V , 25.1 °C	3.4V , 25.2 °C	11.5V , 25.1 °C	0.35 A
12:00 hrs	12.1V , 25.1 °C	11.9V , 25.2 °C	3.2V , 25.3 °C	11.1V , 25.1 °C	0.35 A
13:00 hrs	11.4V , 25.3 °C	11.8V , 25.3 °C	2.9V , 24.6 °C	10.8V , 25.1 °C	0.35 A
14:00 hrs	10.9V , 25.4 °C	10.5V , 25.4 °C	2.8V , 25.1 °C	10.3V , 25.1 °C	0.3 A

THANKS.....