REPORT ON CHARGING AND DISCHARGING OF THE BATTERY

Abstract

At any given time, discharging or charging is taking place inside a battery. Charged ions composed of sulphate and hydrogen make up the electrolyte solution. The hydrogen ions have a positive charge, while the sulphate ions have a negative charge. When an electrical load (starting motor, headlight, etc.) is applied to a battery's terminals, the sulphuric acid breaks down, and the resulting sulphate ions move to the negative plates, where they react with the active material, releasing their negative charge by ionisation. The battery will either discharge or produce electrical energy as a result of this.DC current is created by an excess electron flow from the negative side of the battery, through the electrical device, and back to the positive side of the battery. The electrons travel back through the cells and re-attach themselves to the positive plates once they reach the positive battery terminal. The discharge process continues until the battery is completely depleted and chemical energy is no longer available. The chemical process that occurred during discharge is reversed when a battery is charged. The electrical energy that is utilised to charge a battery is transformed to chemical energy and stored within the battery. The voltage produced by battery chargers, such as alternators and generators, is higher than the battery's open circuit voltage.The battery may overheat if the charging current exceeds the normal absorption rate, causing the electrolyte solution to bubble and release dangerous hydrogen gas.

Objectives

- To analyse the charging and discharging circuits seperately
- To integrate both the models to obtain the graphs for voltage, current, SOC for the circuit.

High Level Requirements

Id	High Level Requirements	status
HLR1	To analyse and build the circuit	Implemented
HLR2	Provide external source for charging circuit	Implemented

HLR3	Integration of charging and discharging circuits	Implemented

Low Level Requirements

Id	Low Level Requirements	status
LLR1	To give the required gate pulse to the mosfet	Implemented
LLR2	The SOC should decrease during discharging period and increase during charging period	Implemented
LLR3	To obtain required graph for SOC, current and voltage	Implemented

SWOT analysis

Strength:

- Demonstrates the process of battery loosing voltage and gaining voltage / energy.
- It is used in automotive applications and home applications to keep a track on battery charge and discharge.
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    - Efficiency of the battery can be increased by analysing.

Weakness:

- Complexity in circuit.

Opportunities:

- It is used in automotive applications and home applications to keep a track on battery charge and discharge.

Threat:

- Malfunctioning of one single component can ruin the whole circutry.

4W's and 1H

What:

A circuit that demonstrates the variation of voltage , current and SOC during charging and discharging of the battery

When:

To track the voltage, SOC and current of a battery during charge and discharge period.

Who:

Reasearchers, Automotive industrialists.

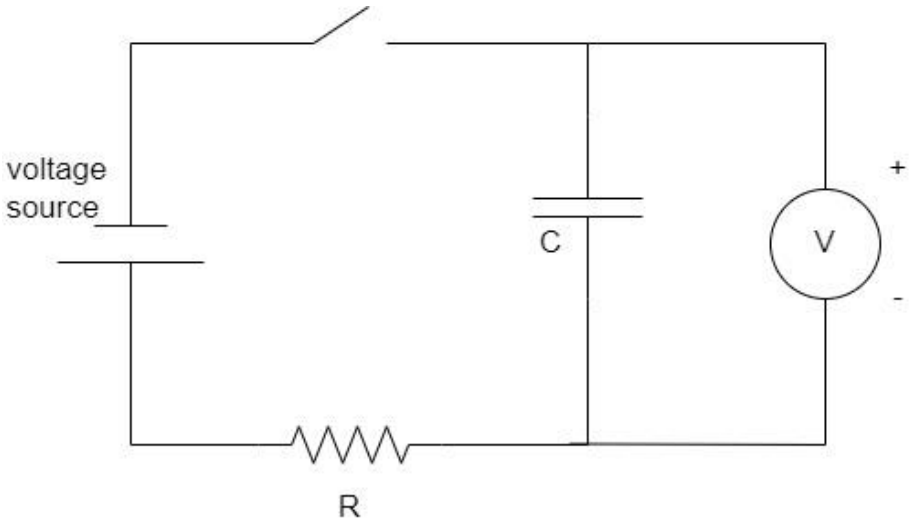
Where:

Automotive sector, Industries, for students to understand the logic of battery charge and discharge

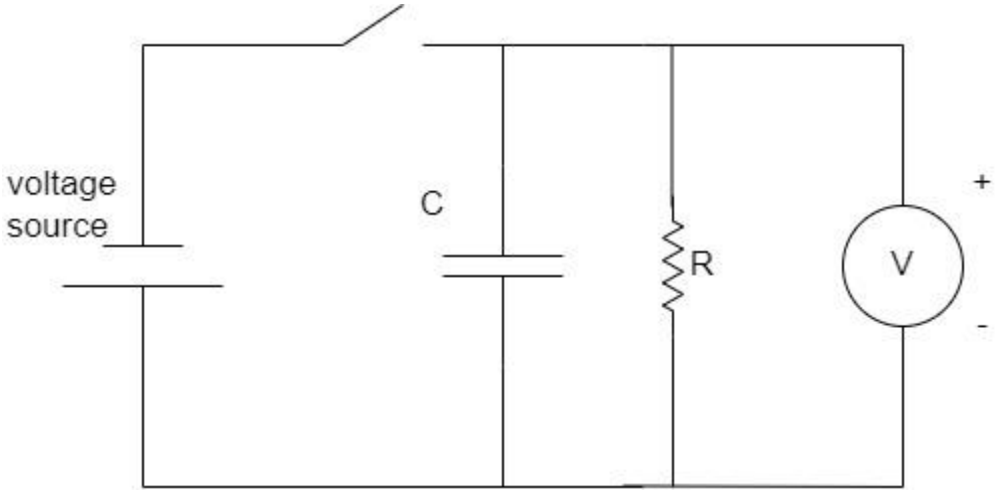
How:

Using Matlab-Simulink

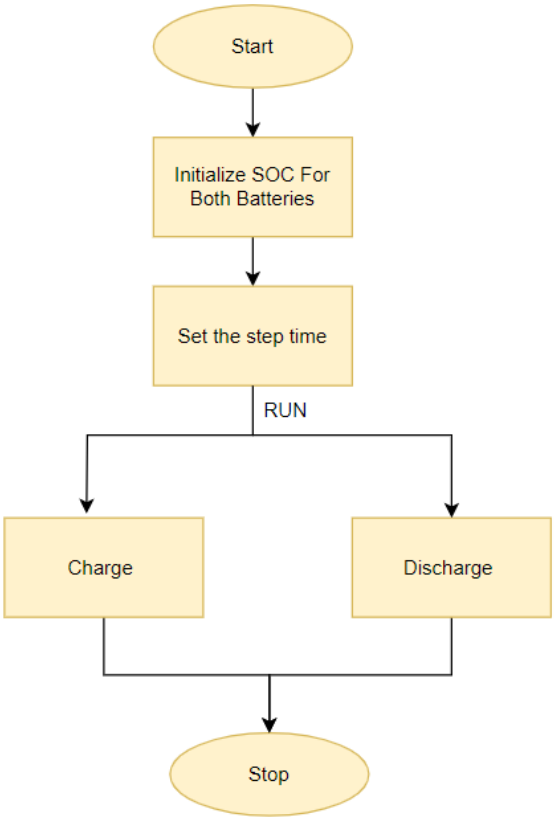
Circuit diagram for charging circuit



Circuit diagram for discharging circuit



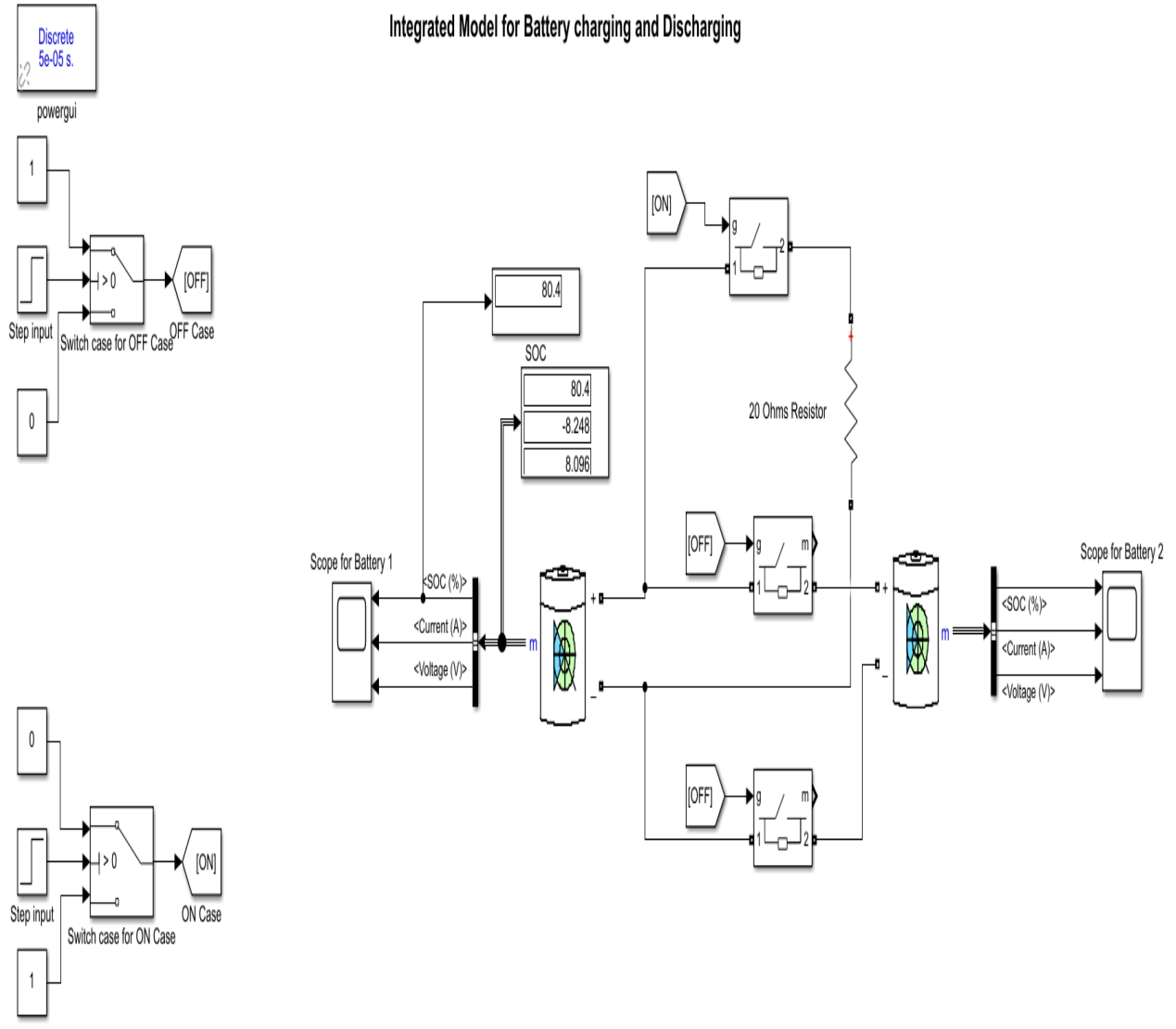
Flowchart



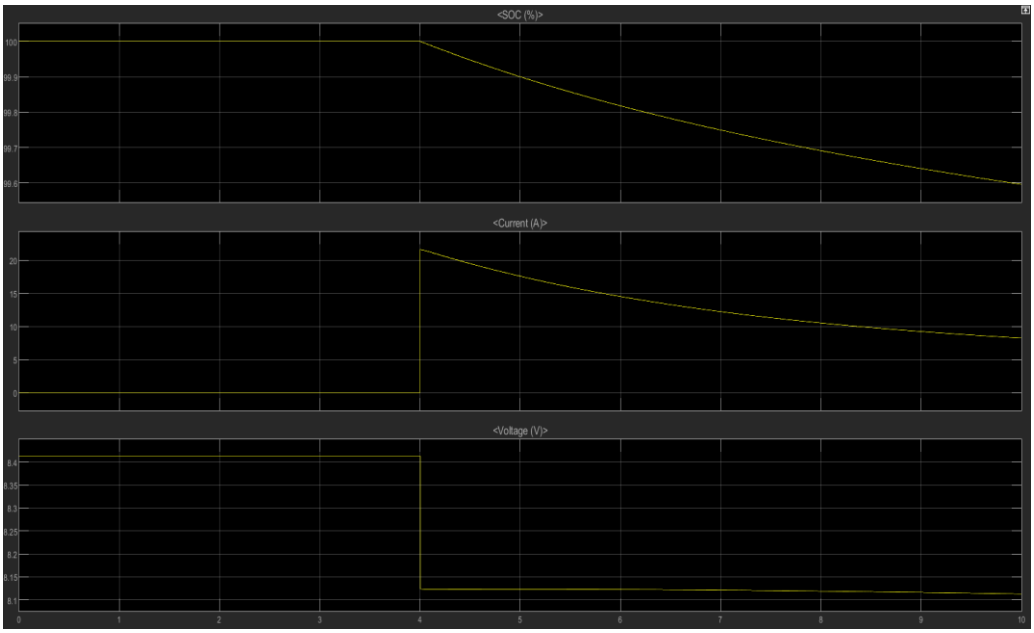
RESULTS

- Two batteries of 5.4Ah and 7.2V nominalvoltage are taken for charging and discharging.
- The step time is fixed to 4s. Initial SOC is fixed as 80% for charging battery and 100% for discharging battery.
- After the simulation, the SOC of charging battery increases to 80.4% and SOC of discharging battery decreases to 99.6%

The picture shows the simulated model of the system.



The discharging curves shows that the SOC, Current and voltage are decreasing



The charging curves shows that the SOC, current and votage are increasing