Ministry of Higher Education and Scientific Research
University of Biskra
Faculty of Science and Technology
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Practical work $N^{\circ} - 2$

Battery and stack modeling

1 Manipulation 1
Battery modeling in Matlab Simulink

Create the assembly and visualize all curves (simulation time 280000 s).
(Simulation time 20000 s- variable- step- Ode15s).

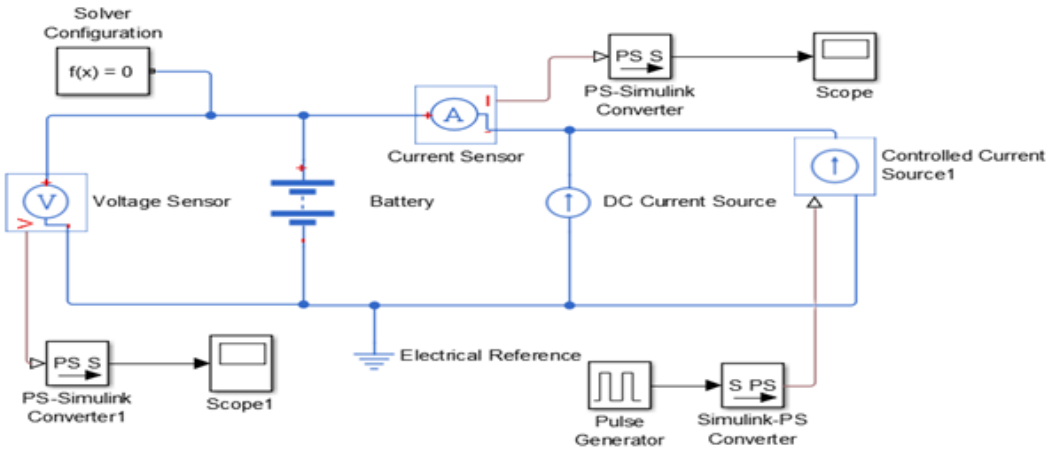

Figure 1: Battery modeling in Matlab Simulink.

Table 1: Battery parameters.

Nominal voltage	Ampere-hour rating	Initial charge	Voltage V1	Charge Q1	Resistance R1
6 V	4.5 hrA	4.5 hrA	4.57 V	2.75 hrA	25mhom.

Table 2: Pulse generator parameters.

Amplitude	period	pulse width
-0.5	3600 s	30%

1.1 Questions

① What is the goal of each party?

② How does this block work?

③ What did you visualize with the oscilloscope?

④ Interpret and conclude the results ?

2 Equivalent electrical model of a battery

(Simulation time 100 s- variable- step- Ode15s)
Demonstrate the model shown in figure 2 ?

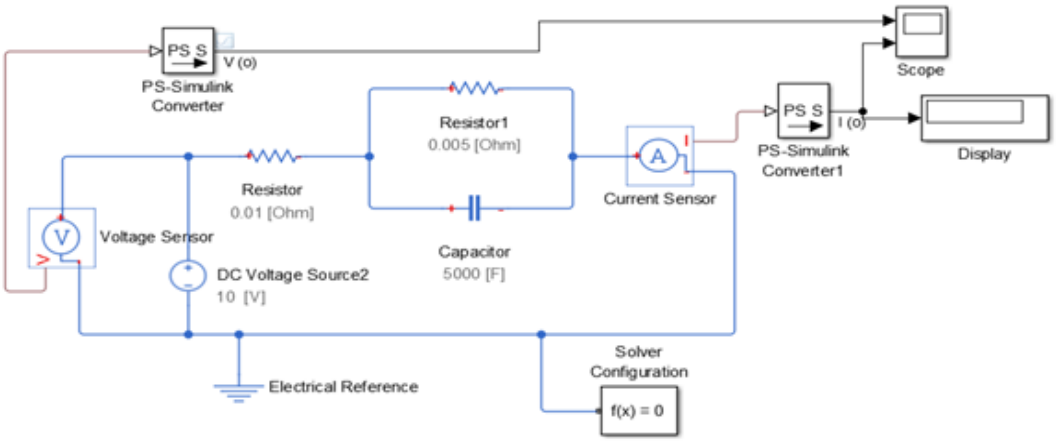

Figure 2: Equivalent electrical model of a battery in Matlab Simulink.

3 Stack-battery modeling

Hebrid and electric vehicles include a high-voltage battery pack that consists of separate modules and cells arranged in series and parallel. A cell is the smallest packaged form, a battery can handle, and is typically on the order of one to six volts. A module consists of several cells commonly connected in either series or parallel. A battery pack is then created by connecting modules together, also either in series or parallel.

What Is C Rate In Battery

In explaining batteries, the discharge current is often described as a C-rate in order to standardize battery capacity, which is usually very diverse between batteries. A C-rate is a measurement of the rate at which a battery is discharged comparable to its full capacity. A 1C rate indicates that the discharge current will discharge the whole battery in 1 hour.

3.1 Questions

① Discuss the different c rates and discharges of a battery ?

Table 3: Batterie Lithioum-ion parameters.

Nominal voltage (V)	Rated capacity (Ah)	Initial state-of-charge (%)	R
3.7	12.5 Ah	100 (%)	1.3 ohm

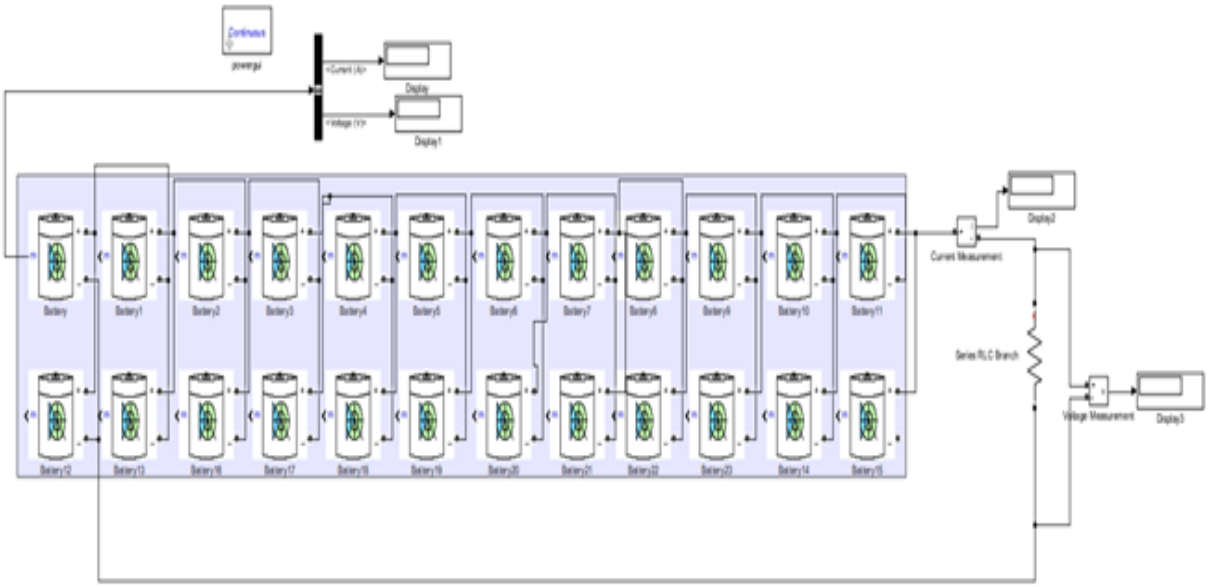

Figure 3: Stack-battery model.

C rate for different hours

C Ratings	Time
30 C rate	2 minutes
20 C rate	3 minutes
10 C rate	6 minutes
5 C rate	12 minutes
2 C rate	30 minutes
1 C rate	1 hour
0.5 C rate or C/2	2 hours
0.2 C rate or C/5	5 hours
0.1 C rate or C/10	10 hours
0.05 C rate or C/20	20 hours

Figure 4: C rate for different hours.