Automotive

WEBINAR
EMULATING BATTERY CELLS FOR EFFECTIVE BMS TESTING AND DEVELOPMENT

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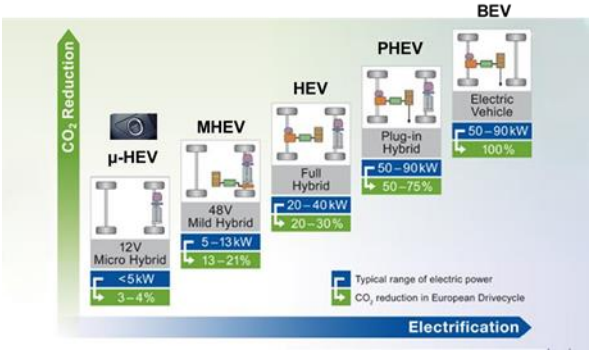
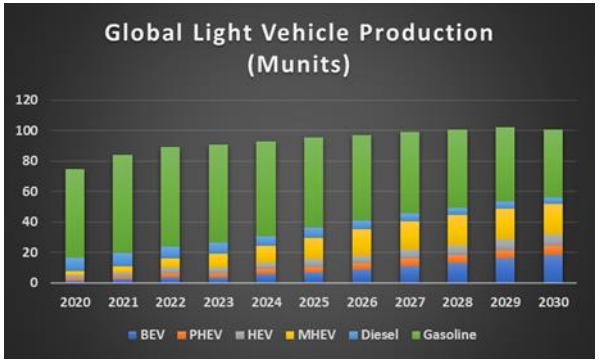
INTRODUCTION

- Global demand for electric vehicles continuously gains momentum, be it for fully electric, plug-in hybrid or mild hybrid vehicles. Moderate safety regulation (< 60V) and small additional costs make 48V mild hybrid electric vehicles (MHEV) an attractive alternative to other EV technologies.

- All these EV technologies have one thing in common; they require an intelligent battery management system (BMS) to maximize their power, range and efficiency.

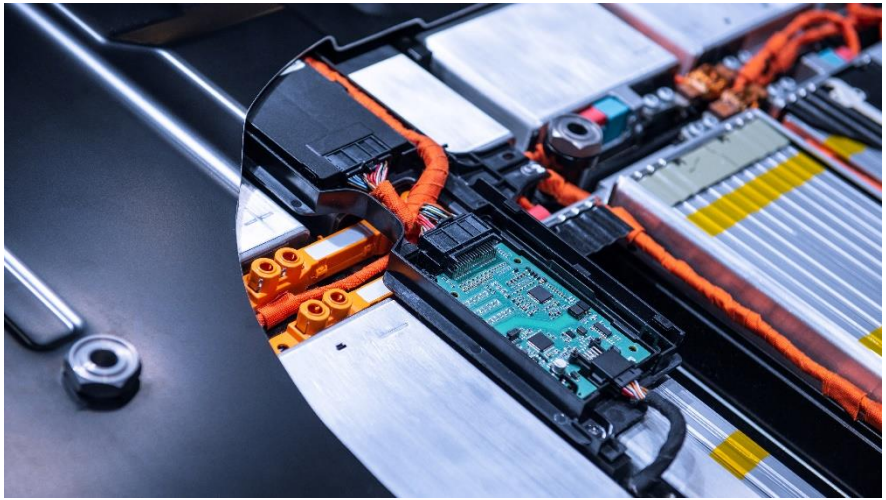




INTRODUCTION

- Automotive manufacturers continuously try to maximize the number and density of battery cells whilst maintaining galvanic isolation. This increases the necessity for optimal battery management.

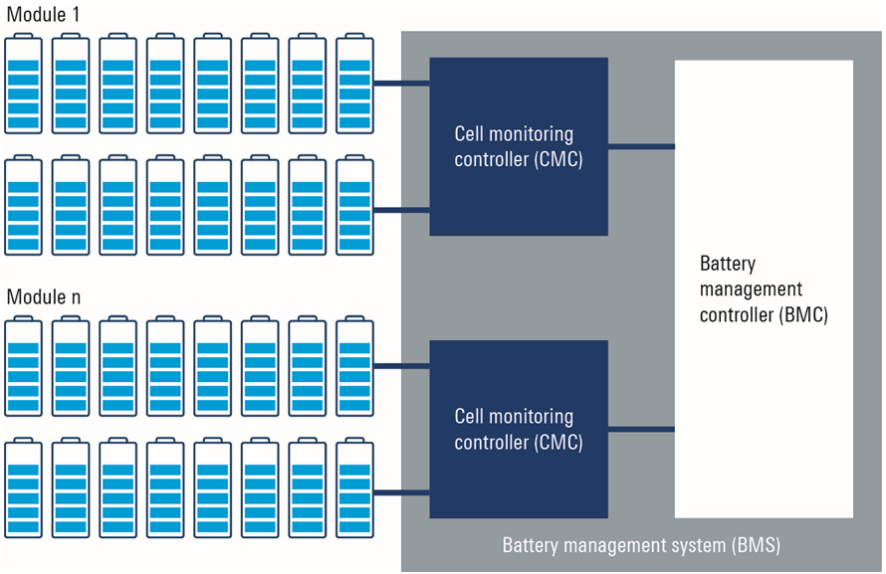
- BMS actively monitor, control and manage various battery cell parameters such as
  - voltage, current, thermal and energy management, cell balancing
  - state of charge (SOC) and state of health (SOH) of the battery cells



BMS ARCHITECTURE

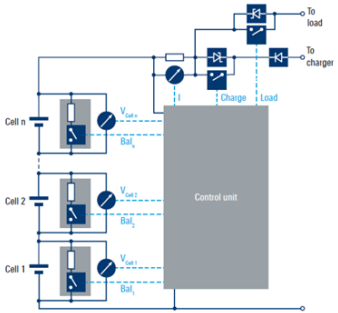
- A typical BMS consists of one or more Cell Monitoring Controllers (CMC) and a Battery Management Controller (BMC) depending on the voltage level of the battery pack.
  BMC and CMC are set up in a master & slave architecture.

- The voltage limitation of the CMC respectively the number of cells determine the number of required CMC (e.g. 14 cells per controller).



YOUR BMS TESTING CHALLENGES

- Optimal monitoring, controlling and managing of the battery cells is the greatest challenge in BMS development and validation.
- For example, overcharging and deep discharging reduces the lifetime of batteries, hence correct control by the BMC must be ensured:
  - Battery defects could lead to overheating of a battery and even cause a fire, therefore stress testing by emulating real-world conditions, including error scenarios such as overload and under-voltages and complex cell profiles should be conducted.
  - CMC suppliers need to characterize the controller and perform production tests with flexible cell emulation.
  - Conduct cell balancing testing: emulation of pre-defined State of Charge (SoC) for each single cell.
- To ensure the performance and safety, it is crucial to emulate the battery cells used in electric vehicles.



HV BATTERY ARCHITECTURE

400V (4P3S):

36 modules in series (12 cells/module)

- ► 36 x 4P3S = 4P108S
- ► 400V = 36 x 11.1V
- ► 200kW = 400V x 500A

800V (2P6S):

36 modules in series (12 cells/module)

- ► 36 x 2P6S = 2P216S
- ► 800V = 36 x 22.2V
- ► 200kW = 800V x 250A

►36 modules = 36 CMC