

Project ESto 'Energy Storage'

Public Results



Cell selection criteria

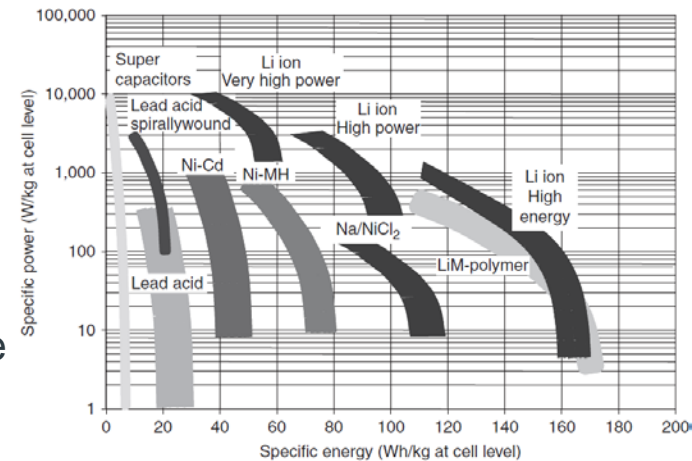
Battery Market research:

- Literature study
- Contacted 160 battery cell suppliers world wide

Battery system and cell requirements

- System requirements are defined for hybrid, plug-in and full electric passenger cars and busses.
- System requirements translated to battery selection criteria

First cell selection based on the selection criteria and the feedback received from the cell suppliers



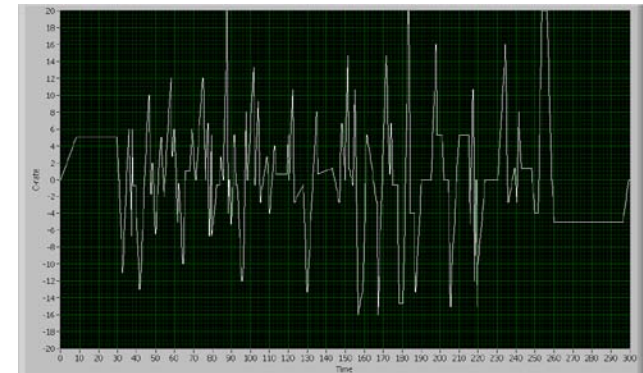
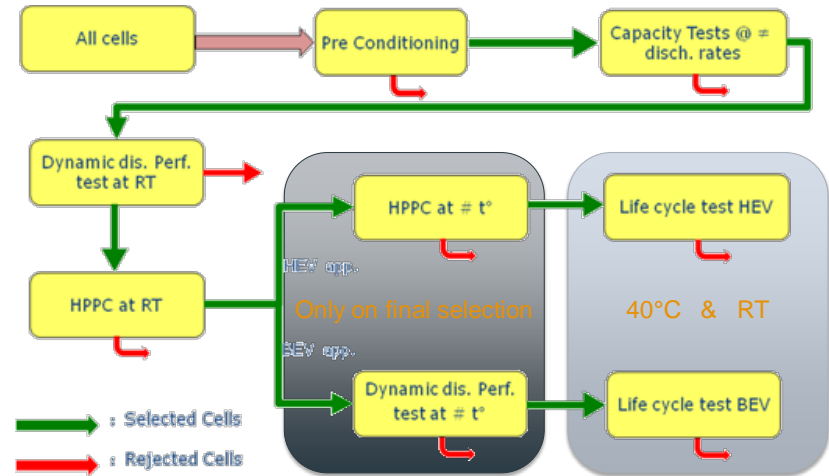
Cell testing and selecting

Specific test plan developed for fast characterisation of Li-ion batteries for automotive application

Recommendations to the IEC and ISO standardisation committee were made



Realistic life cycle test regime developed based on real life drive cycle (Mol)



System architecture (BMS: Master/Slave)

PsiControl Mechatronics

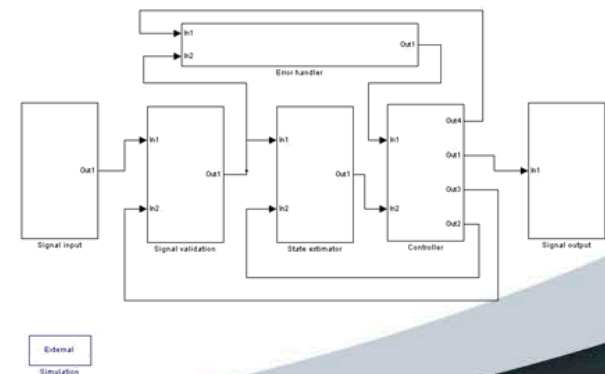
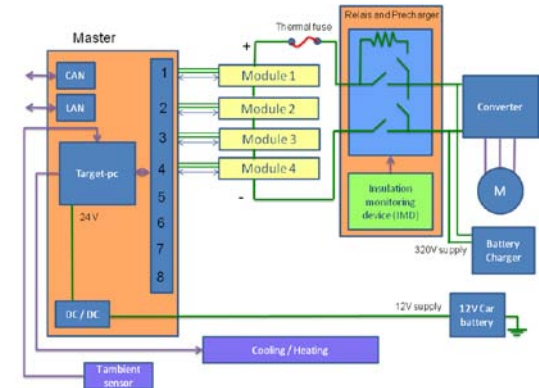
- Developed a slave-pcb for voltage, temperature and current measurements, combined active/passive balancing and CAN communication to the master controller

Triphase

- Developed CAN communication on their rapid prototyping platform which acts as the master controller

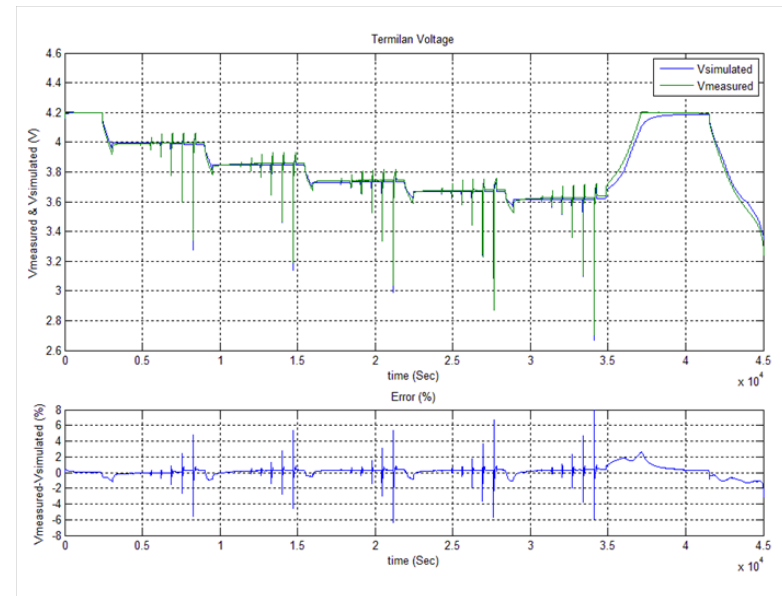
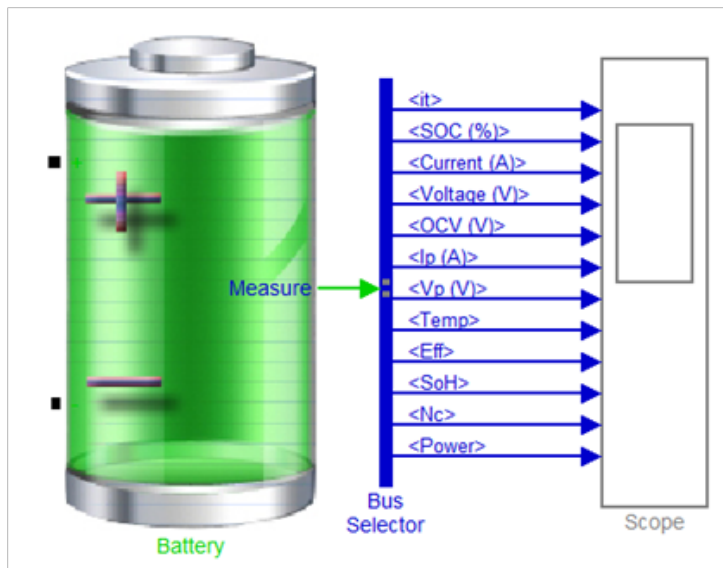
Flanders' DRIVE

- Designed the battery pack architecture and developed the BMS software controlling all functional and safety features



Simulation model development

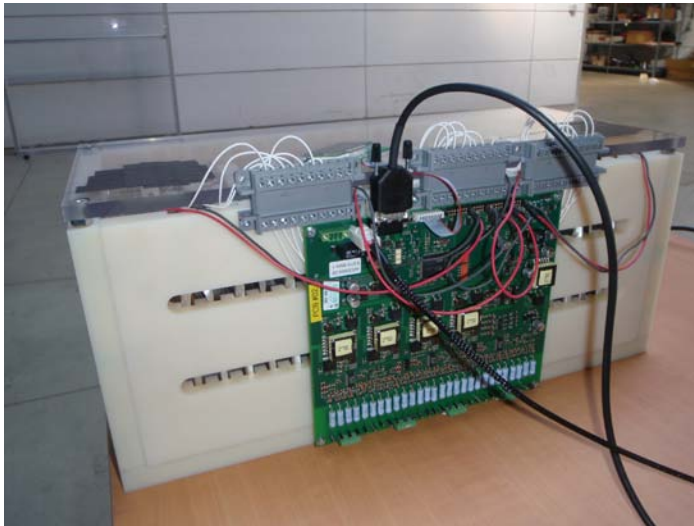
Battery cell and pack simulation model developed for Matlab / Simulink environment



Development of a universal battery pack

Pack and BMS hardware:

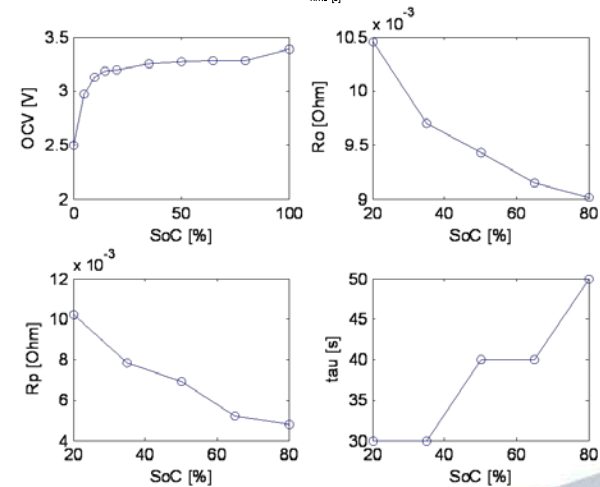
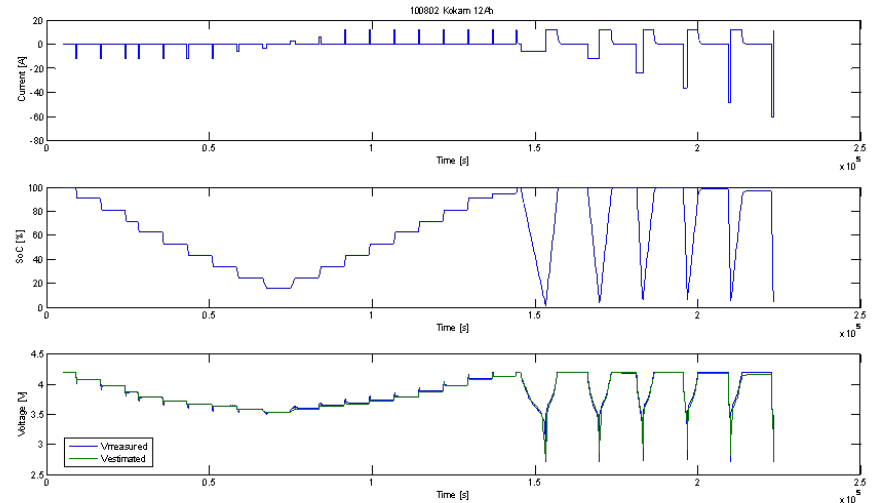
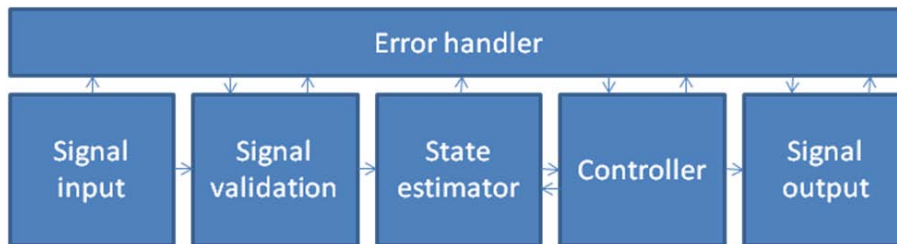
- Low resistance cell interconnections
- Battery housing with slave board connections
- Master box with contactors and pre-charge circuit, real time PC with CAN and other I/O's



Development of a universal battery pack

BMS software:

- Individual battery cell model
- Characterization of cells on different Temperature, SoC and current
- Voltage prediction (FreedomCAR with improvements)
- SoC calculation (with Peukert coefficient)
- Safety functions
- Balancing control
- Information on vehicle-CAN
- Max charge current, max discharge current for inverter
- SoC, SoH



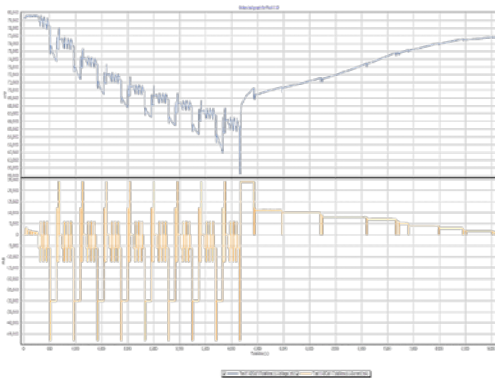
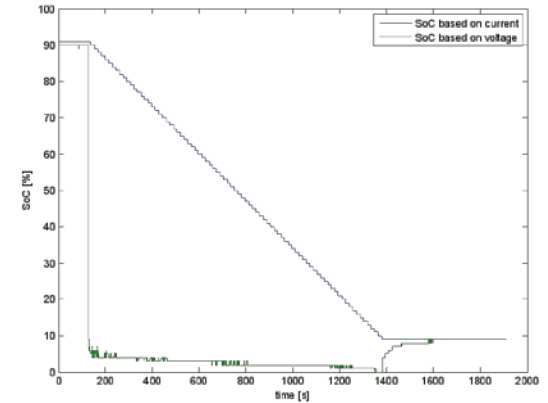
System and integration test

SoC verification (10A, 20A, 30A constant current)

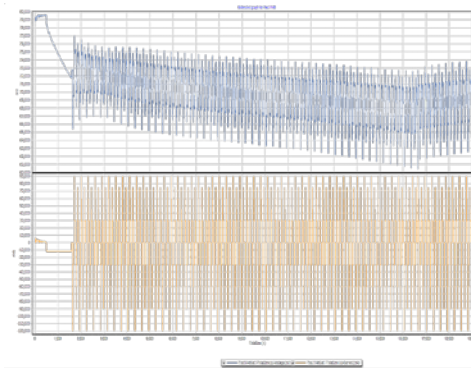
BEV profile (2 C charge, 4 C discharge)

HEV profile (7.5 C charge, 10 C discharge)

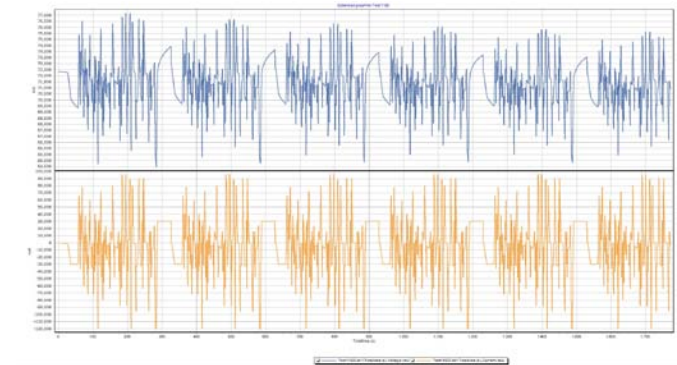
Profile based on Mol cycle (8 C charge, 10 C discharge)



BEV



HEV



Part of Mol cycle

- **Collective Research Project**

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