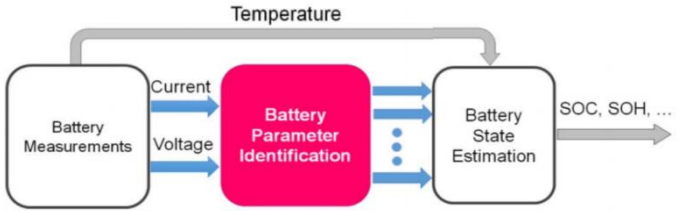
Automotive: EU – ALISE

Lithium-sulfur (Li-S) batteries are potentially extremely light, cheap, safe and environmentally friendly. Their behaviour is more complex than that of lithium ion. On a previous project, Cranfield developed the world's first algorithms for state of charge estimation in Lithium-Sulfur.

As part of a consortium including LEITAT (Spain), FICOSA (Spain), SEAT, OXIS Energy and other partners, Cranfield adapted modelling methods on the state of charge algorithms developed on the REVB project to a new hybrid-electric vehicle (HEV) platform. We collected characterization data from the batteries, and developed models that our industry partners were able to use to predict in-vehicle performance, and we provided key components of battery management algorithms.

Our work was key to our partners showing that Li-S batteries could power a hybrid electric vehicle subject to a realistic driving cycle, and also to demonstrate further that algorithms could be integrated within a real-time battery management system.



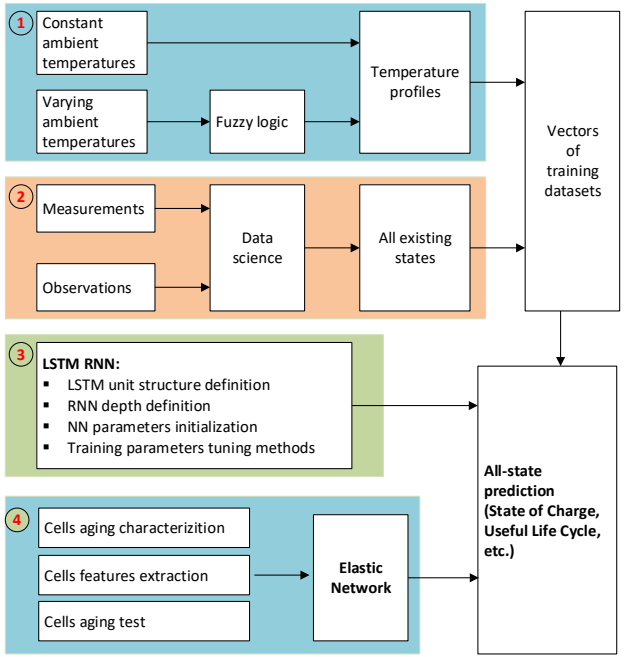
Characterizing Li-S batteries for State Estimation
Fotouhi et al 2018 doi: 10.1109/TPEL.2017.2740223

Automotive:
UK – LIS:FAB

Lithium-sulfur (Li-S) batteries are potentially extremely light, cheap, safe and environmentally friendly. Their behaviour is more complex than that of lithium ion. On a previous project, Cranfield developed the world's first algorithms for state of charge estimation in Lithium-Sulfur, vital to use these batteries in practice.

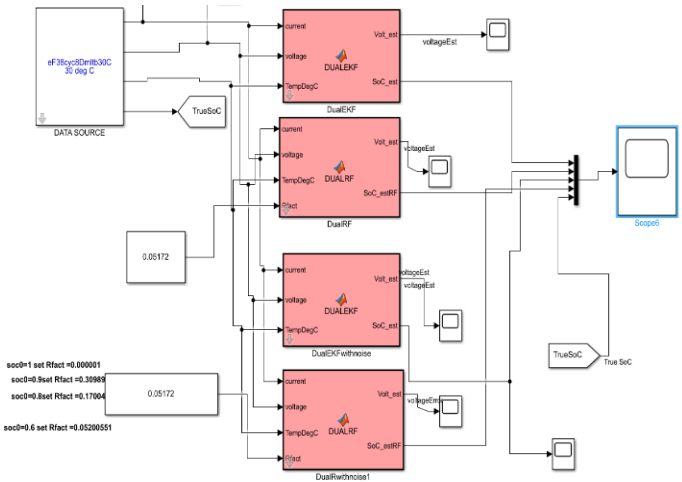
As part of a consortium including OXIS Energy and other partners, Cranfield has developed its algorithms to transition them to industry. We have collected extensive data to characterize batteries as they age and developed software tools to allow industrial practitioners to calibrate models and algorithms.

This project has enabled the techniques developed during earlier projects to transition effectively to industry, and it will also give us our first detailed insights into how batteries age, and how to adapt our algorithms to ageing.

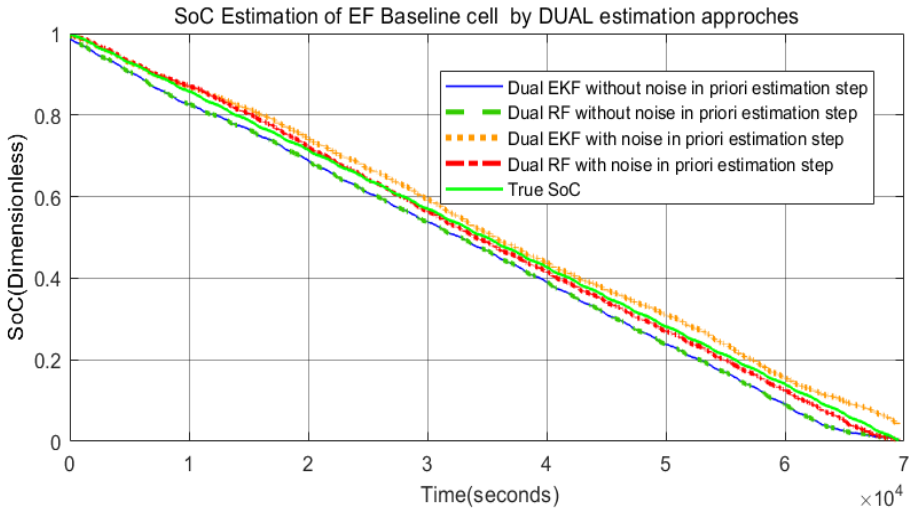


All-State Estimation in Lithium-Sulfur Cells using LSTM Recurrent Neural Networks
Z. Wang et al, 2020

Simulink model of Dual EKF for SoC estimation



Result of dual EKF based SoC of EF baseline cell to MLTB drive cycle



Automotive:
UK – ICP Li Batteries

Battery systems in electric vehicles need to be kept cool. If they get too hot, they can overheat resulting in shortened lifespans. Getting the design right is vital – if it goes wrong, the design will fail badly.

Cranfield is collaborating with Thermal Hazard Technologies and Imperial College on new apparatus and methods for characterizing batteries. Cranfield's role is to develop models and algorithms that can accurately estimate internal temperature in a non-invasive way. We are also conducting automotive-relevant case studies to demonstrate the effectiveness of the new equipment.