

twinBATT

Digitalization of battery development testing: approaches from the twinBATT cluster

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AccCellBaTOD

digibatt

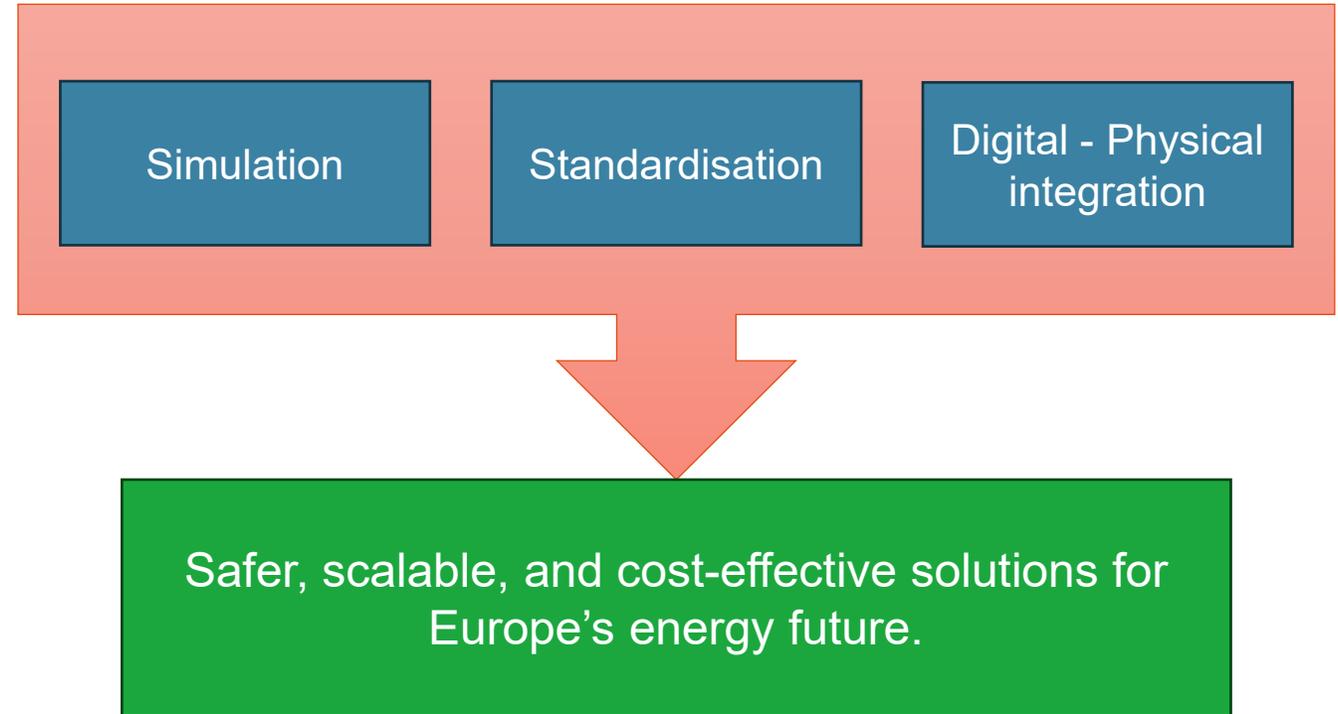
FASTEST

THOR

Introducing twinBATT



The twinBATT cluster



Driving Innovation in Battery Development

Advanced digital tools + physical testing
= reduced costs & faster development

Predict battery behaviour with simulation & modelling for accuracy and safety

Early-stage validation for reliable battery systems

Modular designs and shared methodologies for EU-wide standards

Boosting visibility and collaboration across Europe

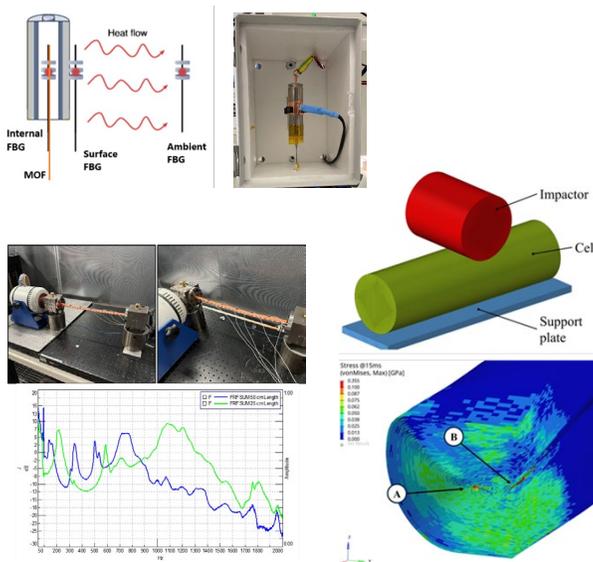


FASTEST combines **multi-scale virtual simulations** with **physical testing** in a hybrid platform. This integration reduces costs and accelerates development by enabling smart Design of Experiments (DoE) and virtualized benches.



Testing virtual batteries connected to physical equipment via a (HiL) hardware in the loop setup

1 DIGITAL-PHYSICAL INTEGRATION

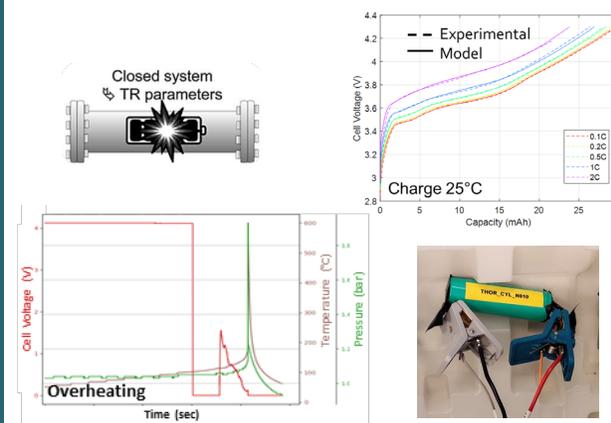


Development and optimization of performance and degradation models on cell level, damage model for wiring harness, and development of a multi-domain system level.



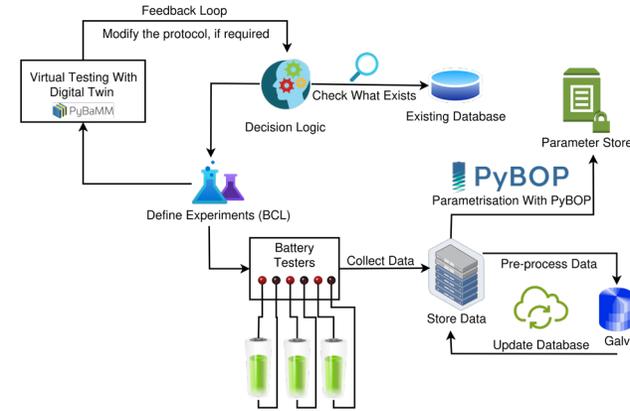
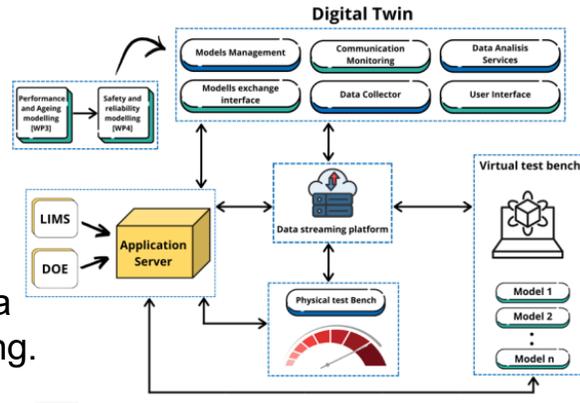
Designing smart experimental campaign by using high-fidelity physics-based models and sensitivity analysis.

Reduced Order Models using AI machine-learning algorithms





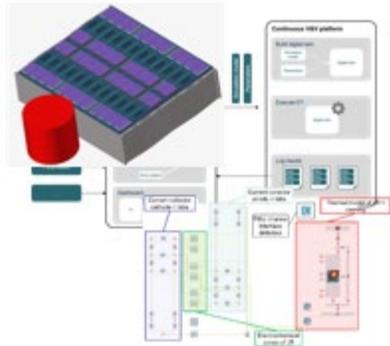
Digital Twin architecture for battery systems, managing data and enabling predictive modeling. This helps substitute critical physical tests with accurate simulations, improving safety and reliability.



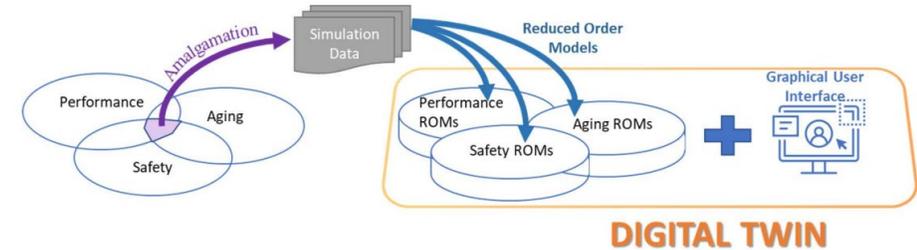
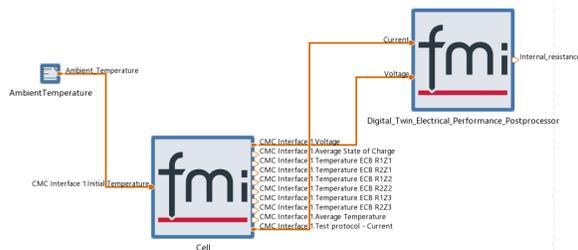
Digital twin framework combining standard ontologies with robust data harvesting capabilities, simulation and automated testing workflows with active learning.

End-to-end model development and deployment

2 DIGITAL TWIN TECHNOLOGY



Models developed on battery cell, component and system level are transferred to digital twins and made available via linked data management platform.



Digital Twin of battery cell, module and pack

Real-time prediction of battery performances, aging, safety



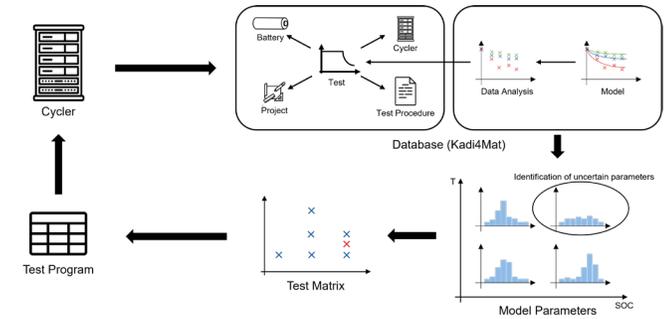


FASTEST strengthens early-stage validation through **robust DoE strategies** and **physics-based models**, ensuring safer and more reliable battery designs before physical prototypes are built.



Rapid and automated data sharing and workflows cut down on human bottlenecks in the testing pipeline.

Reduced time to go from an initial model to a parameterised digital twin.

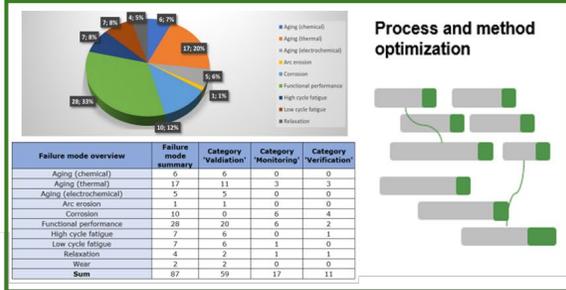


3 FRONT-LOADING & VALIDATION

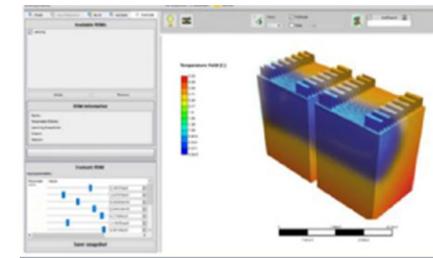


Battery development process

Development time ~24 Months



Time reduction potential >30%



GUI example 1

User friendly Digital Twin with Graphical User Interfaces to simulate many battery behaviors, playing on internal design and usage conditions.

Tool to refine the limits for better performances, longer and safer use.

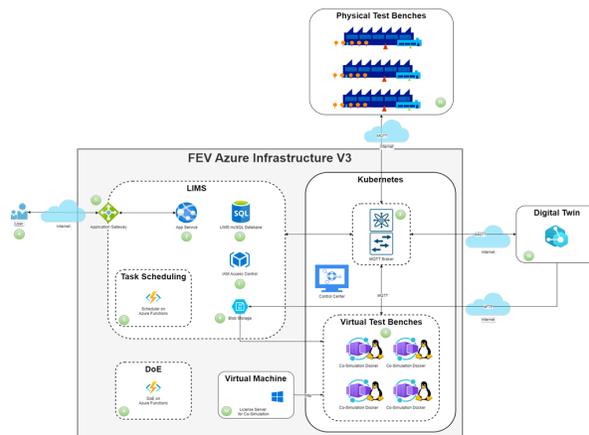
Battery development process optimization for an optimal application of test time reduction via digital twin application.

Failure mode driven Verification and Validation plan Development tailored to respective physics of failure.





By developing a **holistic hybrid testing platform** and shared methodologies, FASTEST contributes to scalable and modular testing approaches that can support EU-wide standardisation.



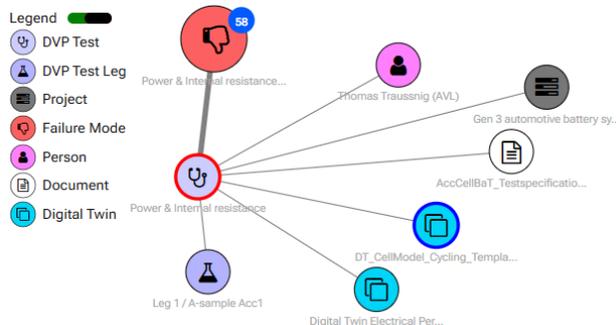
DigiBatt tools use BattINFO ontology to enhance data interoperability.



Collaboration with others on developing and promoting standard formats:

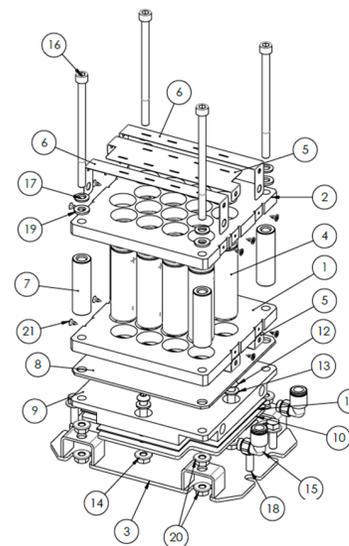
- the Linux Foundation - **Battery Data Format (BDF)**.
- Faraday Institution and Battery2030+ - **Battery Parameter Exchange format (BPX)**

4 STANDARDISATION & MODULARITY



A linked data management platform collects, integrates, semantically links and contextualizes data over the whole battery development testing

A confidence assessment algorithm allows the determination of test result reliability for testing activities at a glance



Harmonization of data format from electrical and abuse tests to allow data-driven analysis

New methodologies to calibrate and validate physics-based models



5

COLLABORATION & IMPACT

twinBATT cluster projects are actively participating in **joint dissemination and outreach**, sharing results and promoting visibility to accelerate adoption of advanced battery testing methods across Europe.

twinBATT activities include:

- Joint webinar for dissemination of results
- Contributing to international standards and ontologies
- Stakeholder analysis
- Joint papers to strengthen research results and increase impact from the cluster as a whole.

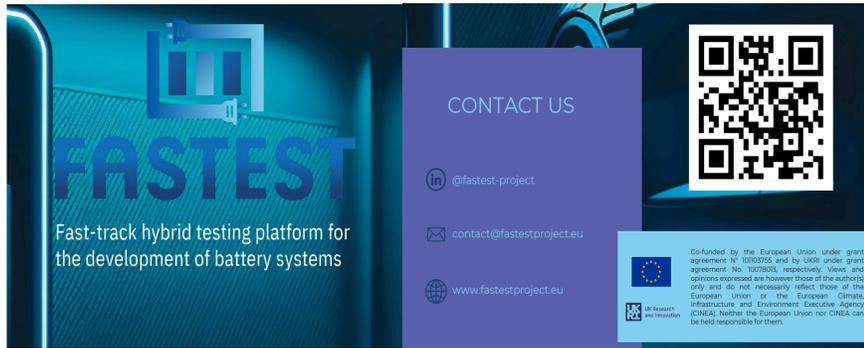


Advancing Battery Innovation: Insights from the twinBATT Cluster

May 5, 2025
9:00-10:30 AM (CET)
Online Event



Find out more



FASTEST
Fast-track hybrid testing platform for the development of battery systems

CONTACT US

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Please also visit our
twinBATT exhibition area!



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Innovative methodology for battery testing

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