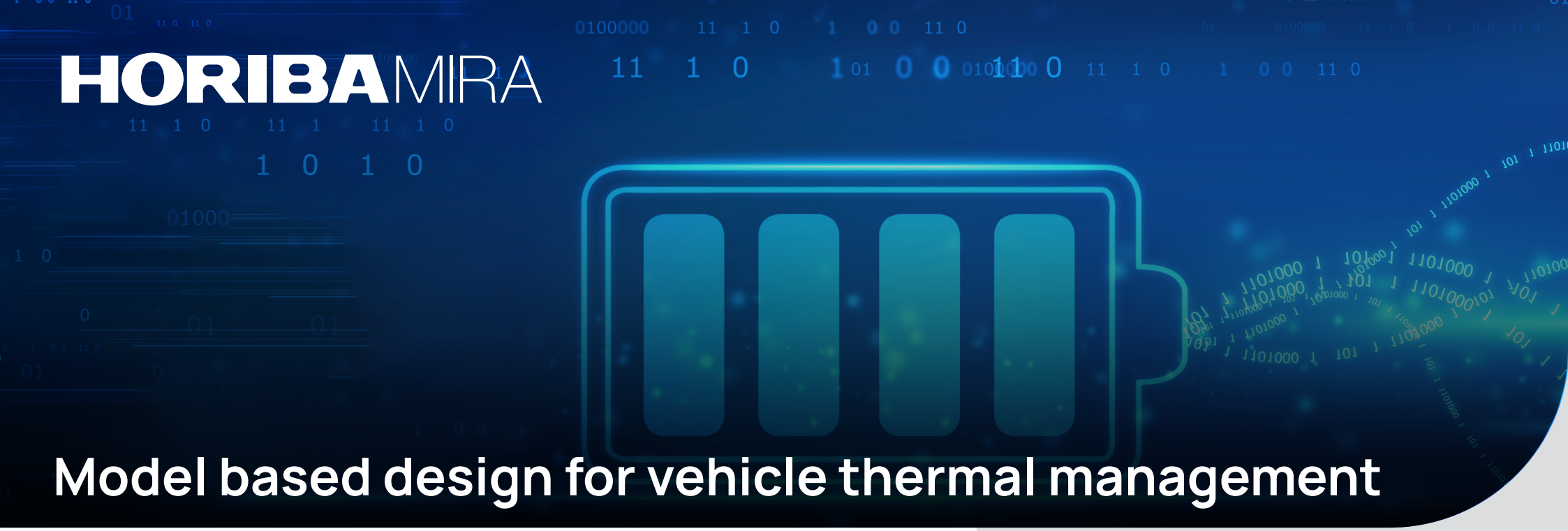
HORIBA MIRA



Model based design for vehicle thermal management

Case study overview

When an established automotive OEM from East Asia began work on its first electric vehicle project, it called in HORIBA MIRA to assist with the development of its holistic vehicle thermal management system (VTMS).

The customer required an independent external partner that could provide a complete design and development service. HORIBA MIRA's expertise in this field helped to de-risk the project, with a 'right first time' approach that minimised the time and budget required.

Engineering team deployed: Seven consultants at HORIBA MIRA's UK facility.

Thermal system development, thermal controls, 1D modelling (GT-Suite), 3D modelling (TaiTherm), CFD modelling (Fluent)

Passenger car BEV

UK and China

> Using a model-based approach allowed the performance to be understood early on in the project, without waiting for physical parts to be tested. It also provided the customer with a reliable model that they could carry forward.

Ben Gale, Solution Leader for Automotive Energy Efficiency
HORIBA MIRA

Approach

With limited experience in electric vehicle development, the customer called upon HORIBA MIRA to help define a series of system and attribute targets for the thermal management of the powertrain and cabin of a new battery electric vehicle (BEV) platform. These included pulldown and warmup times, along with battery and powertrain temperatures.

A model-based approach was then employed, using a mixture of 1D and 3D simulation to architect the system layout size, the components, and ensure the targets would be met. In parallel to this, HORIBA MIRA developed the high-level control logic for the complete thermal system ready for the OEM to embed in its vehicle control system.

HORIBA MIRA's expertise ensured that the correct targets were set and that the model-based development process was carried out efficiently. The core development was fulfilled in-house by HORIBA MIRA, including a virtual design verification plan (DVP) that showed that the system would meet its targets. This was subsequently verified by third-party testing in the customer's home market.

Successes and benefits

HORIBA MIRA successfully managed the thermal development programme from target setting through a virtual DVP. Notable benefits included:

- ✓ A **model-based approach**, allied to HORIBA MIRA's wealth of experience in this area, facilitated fast, efficient, and accurate development of the thermal system that gave a customer new to this market confidence to deploy the solution in their vehicle and helped them to get to market on-time
- ✓ Simulation-led development **dramatically reduced the risks** for an OEM branching into this market for the first time
- ✓ Engaging HORIBA MIRA as an **external partner** on the electric vehicle project enabled the customer's in-house engineers to pursue other projects on the existing vehicle line up **without diverting** resources, meaning that both current and future platforms could be developed in parallel
- ✓ The project provided the customer with **ownership of a reliable, correlated "white-box" model** for further development on this and future projects, meaning the customer was not dependent on a Tier 1 to make further modifications as the control solution developed

Deliverables

- ✓ Attribute led vehicle / system targets
- ✓ Model based system design
- ✓ High level thermal control logic
- ✓ Support during 'in-territory validation'

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