



High Performance at Hitachi Astemo

Innovative e-drive testing solutions from a single source



SUCCESS STORY

HITACHI



AVL E-Motor T5™ consisting of a dynamometer, battery emulator, conditioning systems and e-power analyzer.

THE CHALLENGE

In recent years, vehicle electrification has seen remarkable progress, due in part to environmental regulations on zero-emission vehicles. Hitachi Astemo promoted the development of electric powertrain systems using motors, inverters, and lithium-ion batteries to reduce CO₂ emissions. Today Hitachi Astemo is advancing electric technologies for cars in an effort to find solutions to environmental problems such as global warming and air pollution.

This makes it all the more important to find a partner who has both extensive component knowledge and an overall view of the system. When Hitachi Astemo – a major Tier 1 automotive supplier specializing in drive control systems, engine management and electronic drives – needed a powerful electric motor testbed, they turned to AVL.

XEV cars become more and more powerful, which is an advantage for high technology suppliers like Hitachi Astemo.

“This demands strong inverter technology up to 800V with high power density, but it is a challenge to find the right testing equipment which can handle this power at speed.” added Stefan Eichhorst, Technical Manager & Team Leader Inverter.

THE SOLUTION

AVL Electric Motor Testbeds function as complete development, testing, verification and validation environments for electric drives and are used for determining and analyzing electrical, mechanical and thermal characteristics. Functionality, reliability and endurance tests as well as cold start performance measurements are implemented under real operation conditions.

The innovative testbed concept allows the implementation in different performance and speed classes and also offers the possibility to functionally expand the testbed at a later point – from software and measurement-technology extensions to a climate chamber module. This makes the AVL test system a future-proof investment.

The brought interdisciplinary work between AVL and Hitachi Astemo enables the smooth transition from conventional powertrains to electromobility. At the same time it is advancing the whole related tool chain and workflow to the next level.

“After intensive, concentrated work, Hitachi Astemo decided to choose AVL as a strategic partner to expand the testing capabilities,” explains Tim Clark, President of Hitachi Astemo Europe.

THE RESULT

Hitachi Automotive Systems (now Hitachi Astemo) developed and commissioned together with partner AVL the most advanced E-Motor test bench available in Europe in 2016. In 2019 Hitachi Automotive Systems (now Hitachi Astemo*) and AVL jointly announce they will raise the level once again and commission globally two more of the most powerful test benches in July.

The powerful, tailor-made electric motor testbed for Hitachi Astemo was commissioned at the Oberding site near Munich. It is used in the inverter/e-motor test network and as a verification and validation environment for a wide variety of electric motor types. Among other things, the testbed has a climatic chamber, in which temperatures from $-40\text{ }^{\circ}\text{C}$ to $+150\text{ }^{\circ}\text{C}$ can be simulated, and a speed range of up to 20,000 revolutions per minute. Currently, the system is already equipped to efficiently meet future requirements and to test systems with up to 400 kW, 600A and 1,000 V.

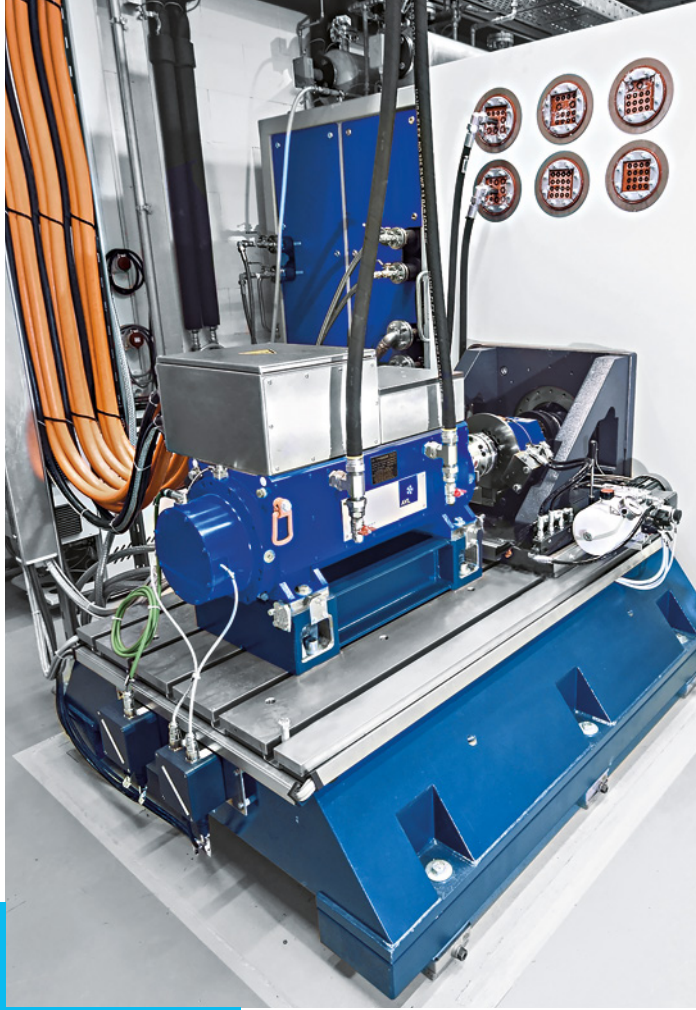
A joint workshop with experts from Hitachi Astemo and AVL was the base for this tailored solution concept. The e-motor testbed plus the powerful CAMEO calibration software offer a complete solution for testing and validation of e-drive systems. With CAMEO, Hitachi Astemo can optimize the torque in e-drive systems, enhance their model-based calibration of hybrid powertrains and automatically perform inverter calibration of electrified systems.



**CONVINCING FACTOR WAS THE ADVANCED
AUTOMATION AND POWER CAPABILITY DELIVERED
BY AVL AND THE GOOD COLLABORATION ON
FURTHER ENHANCEMENT OF THE AUTOMATION.**

Stefan Eichhorst,
Technical Manager & Team Leader Inverter

*On January 1, 2021, the four automotive parts manufacturers of Hitachi Automotive Systems, Keihin Corporation, Showa Corporation, and Nissin Kogyo Co., Ltd. merged to form Hitachi Astemo, Ltd.



One of the high-speed e-motor test systems at Hitachi Astemo in Oberding, Germany.

THE ADDED VALUE OF AVL E-MOTOR TS™

AVL's modern e-motor test systems are built to validate e-motors with different types (e.g. PMSM, ASM), speeds and torques as well as voltage and current levels. Due to the high level of expertise, AVL can support in design issues and also for application know-how needed for the validation process. Thanks to the optimized toolchain of the AVL hard- and software, the duration of the design and validation process can be reduced significantly and tests can be executed in an early development phase (frontloading). This minimizes the risk of design changes in a later stage of the development process.

- Time reduction of the e-drive development process due to the optimized test systems and toolchain
- Cost reduction thanks to advanced testing methodology
- High-performance dyno: 20.000 rpm and 1.000 Nm (and optimized mechanics)
- Improve results in less time for calibration tasks using online modeling and optimization of CAMEO 4™

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