Simulate, Automate, Qualify

Battery testing

All types of test beds: cell, module & pack

ENORISE has been building battery test benches for over 15 years, when electric vehicles were just starting to take off. Since then, ENORISE has produced over 300 test benches. Large test centers with dozens of test beds benefit from ENORISE test bed solutions - cells, modules and packs - and in particular from the MORPHEE® Next integrated test center management and automation solution. MORPHEE® Next is a suite of tools - MORPHEE® for automation, FLEX-LAB for test center and test bench data management, and UNIPLOT® for data visualization and analysis. While the early 2020s saw the construction of large-scale test centers, the challenge of the coming years will increasingly be to optimize these centers, with ever more advanced automation and center management, thanks to solutions such as MORPHEE® Next.

Battery Cell Benches

These benches have voltages up to 10 V with currents reaching recently for some OEMs >1000A. They include climatic chambers fitting multiple UUTs and often Electro impedance spectroscopy measurements. Special care is taken in this type of bench for optimizing the test field layout to minimize the total footprint of the set-ups as well as the length of the expensive copper cables.

Cells:

- up to 24 channels depending on the device
- From 0 up to 10 V / up to 1000 A for each channel
- Climatic chambers -40°C to +90 °C
- Current nominal continuous: up to 1000 A
- Current parallelization: up to 6 channels
- 1 MORPHEE® Ausy for the power unit for controlling up to 32 channels

Battery Module Benches

With voltages up to 200 V and currents up to 600 A, a module is usually a combination of multiple cells. These modules have sometimes there dedicated BMS and are becoming more and more liquid cooled.

Modules:

- up to 16 channels depending on the device
- Voltage: From 0 up to 300 V
- A climatic chamber: -40°C to +90 °C
- Fire protection: Fire + smoke detection + CO_2 extinguishing system + smoke exhaust
- Current nominal continuous: 600 A
- Current parallelization up to 4 channels
- 1 MORPHEE® Ausy for up to 16 channels

Battery Pack Benches

With voltages and currents up to 1200, also know as the battery system that Is combining multiple modules and sometimes multiple packs also known as string packs. Battery packs need big walk-in chambers to be easily installed, these chambers can sometimes take-up to 8 packs at the same time depending on the configuration. The category is certainly the most complex as it could have multiple BMSs as well as multiple cooling circuits. Special care is taken in this type of bench in regards of the safety concept and the safety rating of the hardware used.

Packs:

- Charge/discharge cabinet, up to 1200 kW, output voltage: 20- 1200V, output current: +/- 2400 A
- Fully integrated solution with all safety components
- Climatic chambers: Available in different sizes, including Walk-in Chamber. -40°C to 90°C
- Safety solution includes a sensor system, an extinguishing system, fire flap
- Cooling system: eCoolCon from ENORISE
- MORPHEE® Ausy: control of up to 8 packs

Multi-instance functionality thanks to MORPHEE® AUTOMATION SYSTEM

Heavy duty Pack testing

Up to 8 HV battery equipped with 1,2 MW energy system

- High power energy systems: Dynamic high power energy system up to 1,2 MW, flexible power profiles for up to 8 test specimens with a mass of 8T in continuous operation.
- Mobile free field system: Mobile, modular test field. Designed for relocation on demand.
- Fully automated with MORPHEE®
  - In the same test bench , the 4 specimens tested independently thanks to the multi-instance functionality
  - Expert test possible with access to the BMS and simulation mode
- Dynamic temperature and climate control
  - High-end temperature or climate chamber 1 for simulated environmental conditions from -40°C to +80°C, with a temperature change from ±0,3K up to ±1K (per minute)

Batterycraft

The ENORISE Batterycraft was developed to respond to the battery testing needs for the automotive industry. It consists of the ENORISE standard in terms of safety, accuracy, performance, and efficiency. These high-end devices offer a wide range of highly accurate and dynamic sink/source devices with integrated safety systems and performance level D. They feature many options such as high flexibility to parallelize and serials channels by software, isolation monitoring and cable resistance compensation.

ENORISE offers a very flexible and open solutions that is compatible with all major hardware components available on the market. This means we can adapt to existing equipment and refurbish test cell into e-mobility application, this also means that we always look for the best solutions to fit the need of our customer even if it is not in our standard range of products.

BatteryCraft 250 kW | 1,000 V | 1,000 A
BatteryCraft 250 kW | 1,200 V | 1,200 A

BatteryCraft 500 kW | 1,000 V | 1,000 A
BatteryCraft 500 kW | 1,200 V | 1,200 A

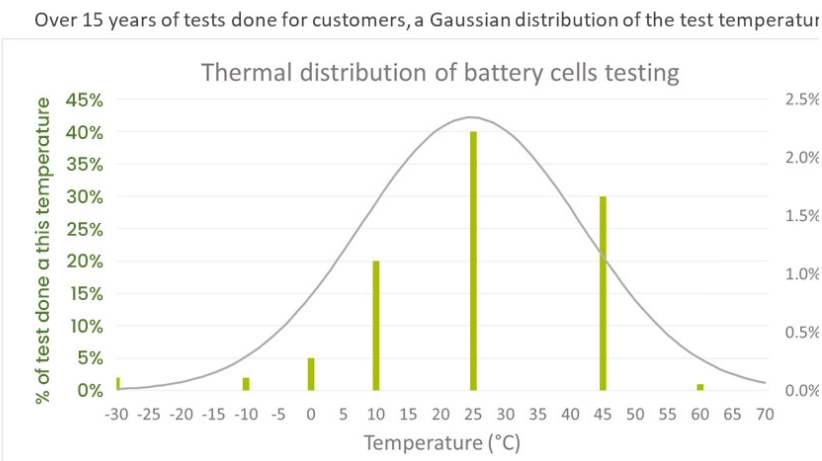
Sizing the center for today and the future

Precise determination of the type and volume of tests to be carried out at the launch of a new battery test center is necessary to cover all the necessary tests and avoid oversizing resources.

One common example is for the climatic chambers: We see on the gaussian distribution plotted below that more than 90% of tests are done at positive temperature. This means that in 90% of the time the more expensive extreme performance climatic chambers are not at all needed.

Having commissioned multiple turnkey battery test center projects worldwide, we have developed partners from suppliers to integrators that give us the ecosystem we need to play around with different configurations and size the equipment performances to the customer's real needs, avoiding overengineering components and unnecessary extra costs. Everything is considered from the workflow optimization to the real power needs, to the optimal electromechanical design, to the global efficiency of the test center.

Finally, ENORISE continues to virtualize testing through the innovative toul coupling and simulation tools giving you the possibility to run complex battery models in real time to be able to run much more scenarios by simulation and reduce the development time.



A robust process increasing the productivity of your test center

Large battery test centers require a high level of automation. For this reason, ENORISE synergizes the unique capabilities of FLEX-LAB, its test field management application, MORPHEE®, its automation system, and UNIPLOT™, its data visualization and analysis tool: this is MORPHEE® Next, a suite of integrated tools.

FLEX-LAB: plan

- Schedule your work: creation of project, work orders and assignment of resources & test tasks
- Monitor test cell and test field efficiency
- Centralize test results

MORPH

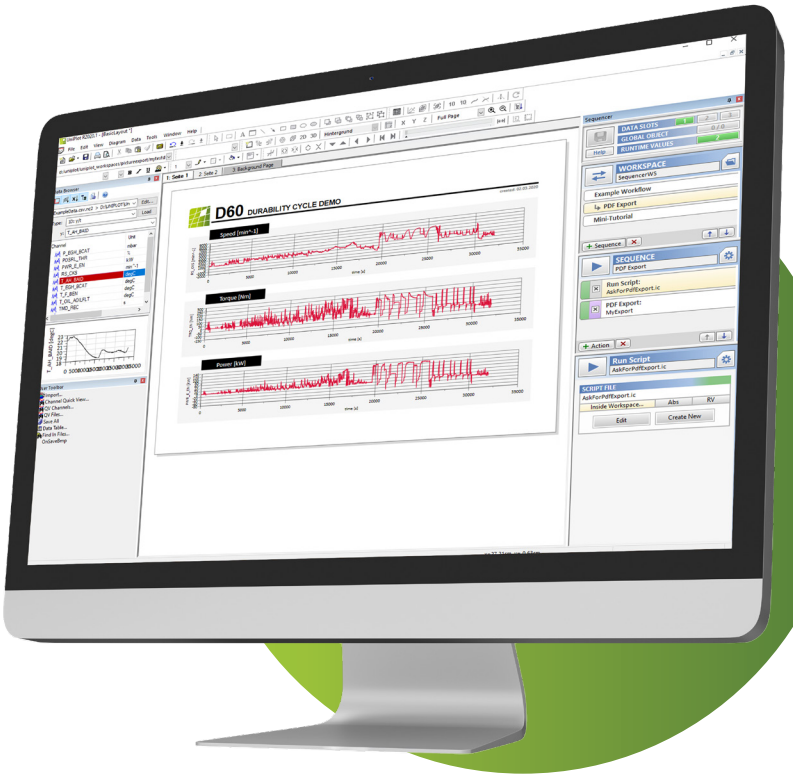
SCADA: control

- Connect to data base and retrieve work order information including all meta data and test configuration down to the device
- Start/pause/stop a test, and monitor all running test status

EE®Next

SCALE: execute

A battery test bench includes equipment such as the climatic chamber, the energy system and the coolant conditioning, as well as several units to be tested (packs, modules or cells). For each UUT, a MORPHEE® unit performs the test, using SCALE battery, the MORPHEE® application dedicated to battery testing. A Master Scale Battery controls the climate chamber, power system and coolant conditioning. All these MORPHEE® units run on a single PC.



UNIPLOT®: report

- From FLEX-LAB, Data import
- Template creation
- Analysis and Tools
- Export
- Your team focus on what matters

ENORISE

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Are you interested in innovative, pioneering software solutions?

Contact us!

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