

Made to measure

Data acquisition and engineering expertise are key tools when innovating for the electrified vehicle industry

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Ipetronik's technology has adapted to suit the changing requirements of the automotive industry

Vital for the validation of prototype vehicles, datalogging has become a fundamental part of development for the automotive industry. Ipetronik (and its IpeMeasure business unit) has established itself as an expert in automotive datalogging, and will celebrate its 30th anniversary in 2019. Excelling in the market has relied on a constant cycle of innovation, as well as an ability to adapt to the changing requirements of an evolving industry. The industry trend toward electrification has proved no different.

"The emergence of electric powertrain architecture – including BEVs, HEVs and PHEVs – has affected the datalogging requirements of our customers," explains Jörg Strothmann, CTO of Ipetronik. "The interplay between driving modes of combustion and electric engines, and combined driving modes, brake recuperation

and battery management systems takes overall ECU software programming to a higher level of complexity."

Such complexity increases the number of test scenarios typically required during vehicle validation, and calls for more on-road fleet testing prior to production – making datalogging all the more vital.

"In the past, the power source [the ICE] had a clear status – ignition on or off," adds Strothmann. "The situation has now changed fundamentally with the introduction of battery systems. In-vehicle bus network communication is always active, which demands more complex datalogging configurations and network logging functions to spot errors in internal ECU communication."



Moving with the times

To address these increasingly complex requirements, Ipetronik is continuously expanding the

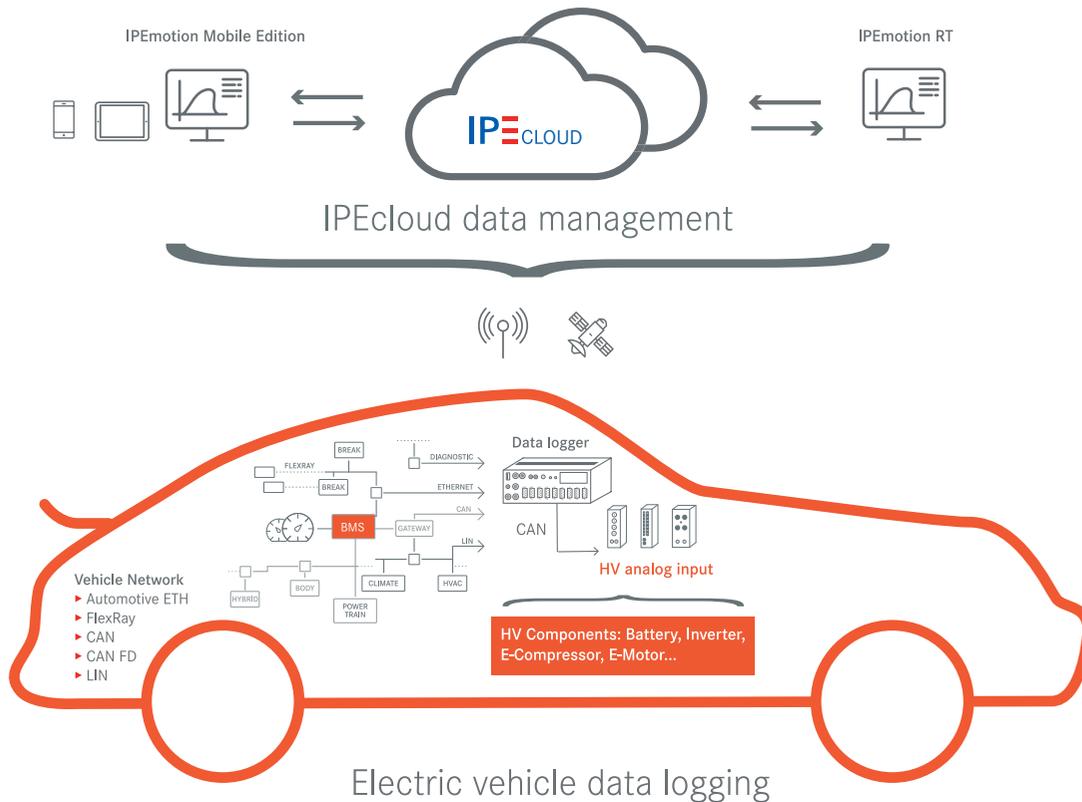
functionality of its loggers. Specific software functions have been added to operating systems, with trigger functions to capture data according to complex logical conditions. This makes it unnecessary to log all data – and avoids the associated time-consuming task of analyzing it – instead recording only that which is relevant.

IoT connectivity has also been added, enabling customers to access the logging system remotely, and making it possible to gather system health and status information about the vehicle. Remote commands can also be issued, triggering diagnostic jobs or obtaining detailed status information.

Ipetronik also ensures that its equipment is tough and reliable.

"The reliability of measurement operation, and the ruggedized hardware makes the equipment suitable for harsh environments," says Strothmann. "Extensive testing in winter and summer can be handled extremely well."

In addition to large-scale vehicle fleet and on-road testing, Ipetronik also continually



Electric vehicle data logging

innovates in terms of its engineering and test bench expertise, including development work for electrically driven high-voltage HVAC compressors for vehicle climate systems.

“As this system contributes significantly to range extension in EVs, our work in this area can be key to successful development,” explains Strothmann. “The e-compressor can also operate as a heat pump to save up to 20% energy within the battery system. Our design for an integrated HVAC and water-cooling system for electric vehicles, and building the associated test benches, contributes to overall development.”

Recently, Ipetronik introduced a dedicated high-voltage shunt system – HV CCS Shunt. Developed by the company’s engineering department, this unit monitors the current flow between the charging post and the vehicle. Combined with the datalogging system, network communication within the vehicle and the charging infrastructure can be recorded. The system is based on the CCS standard connector, and covers standard 230V AC charging, as well as high-current DC charging, enabling customers to easily benchmark and analyze the charging behavior of plug-in and electric vehicles.

Ipetronik’s datalogging systems can be used for test bench applications and on-road testing at the same time. The ability to share the same data acquisition software between road and rig adds value for customers, as data generated from two different test applications

can be easily compared and fed back into simulation models.

The road ahead

Key to the company’s continuing success is the ability to look at potential trends.

“In the past, innovation was mainly hardware-based,” explains Strothmann. “This would include adding more storage capacity to the logger, more measurement inputs, higher sample rates or wireless data transfer functionality.

“In the past five years, we have seen an increasing shift toward more software-centered innovations. These relate to a wide range of functions, which integrate our products deep into the workflow of our customers. One major innovation is that we can deliver customer-specific solutions, based on our core IPEmotion data acquisition software, on a large scale.”

The IPEmotion software includes a Windows version for all PC-based measurement tasks, but Ipetronik has also modularized the software over the past three years so that it can be used on Linux-based datalogging operations.

“Based on a common source platform, we provide customer-specific OEM setups, which include dedicated functions to optimize workflow,” Strothmann explains.

Strothmann believes three major trends will emerge in the coming years.

“The electric drivetrain is the enabling technology for fully autonomous vehicles,” he says. “Once the software is able to operate these powertrain systems, it will be possible to have self-driving vehicles. We are preparing new datalogging systems to support validation of autonomous vehicles.”

Vehicles will also be fully connected, Strothmann continues. “However, the datalogging systems will need IoT connectivity too. We implemented this in our loggers for remote access and health status diagnostics. The functionality will be expanded to provide remote service operations, such as vehicle software updates and diagnostic functions.”

Big data will also play a role, and Strothmann believes it will be important to have software tools to convert this data into usable information. “With our new IPEcloud MDM software platform [due in 2019], we will introduce a new product that can manage data in a systematic and structured way, and can apply MATLAB-based data analytic functions.”

Keeping up with the rapid pace of electrification is a constantly evolving challenge. Ipetronik’s development means its products – and the customers who use them – will be ready to deal with whatever the industry throws at them. ○

