

## Press release

### Integral drive analysis for a plug-in hybrid

Kistler supports research project on innovative drive concept

Winterthur, October 2019

**Kistler is collaborating with the University of Bath (UK) on a joint research and development project that focuses on comprehensive characterization of the powertrain in a vehicle with a plug-in hybrid drive concept. A combination of different measuring systems supplies a full and accurate picture of the vehicle's dynamics and driving behavior.**

Reducing emissions and cutting fuel consumption: these are two of the main requirements that are driving advances ahead in the automotive industry. Attention is constantly focused on electrification, and electrified powertrains are increasingly becoming established as the standard on the European market and beyond. The term "electrification" now includes the whole spectrum from start-stop technology for combustion engines to fully battery-driven electric powertrains. But this transformation also involves greater complexity for developers and additional challenges for manufacturers – with added pressure due to the need for short development cycles.

How does measurement technology from Kistler help to meet these requirements and generate added value for vehicle manufacturers? To take one example: by delivering reliable, high-quality measurement data that makes it easier to arrive at design-related decisions in the early phases of development. Let us take a detailed look at an assignment of this sort with the help of a specific example: a plug-in hybrid vehicle.

#### Interaction between various Kistler technologies

Kistler is collaborating with the University of Bath (UK) on a joint project to investigate the requirements for measurement technology that will be set by the powertrains of the future. For this purpose, a state-of-the-art vehicle from a renowned manufacturer in southern Germany has been made available to Andrew Lewis of Bath University and Simon Regitz, Head of Development at Kistler. The vehicle is equipped with a drive concept (plug-in hybrid) that presents various challenges in terms of development. The research forms part of a larger government-sponsored project that aims to define future development processes as combinations of vehicle simulation and distributed over-the-air measurement data (for more details, see: <http://vchv.uk/>).

One of the main challenges facing the researchers was to characterize the overall performance of the powertrain: this would enable a precise combination of laboratory conditions and on-road driving situations, leading to in-depth understanding of the powertrain's behavior in real time. This requires an accurate analysis of the powertrain's inputs, outputs and control strategies – including the torque and energy flows throughout the entire system.

To accomplish this task, various Kistler technologies were used in interaction with one another: the KiBox indicating system (for parameters related to the combustion engine and torque), the RoaDyn P106 wheel force transducer system on all driven wheels (for drive torque and braking forces), and torque measurement technology on the drive shafts (for torque distribution and recuperation). In addition, the control unit data was recorded and the current to the belt-driven starter generator was measured. A complete description of the vehicle's drive system becomes possible when this wealth of information is combined with integral analysis.

### **In-depth understanding of the powertrain is the key to optimization**

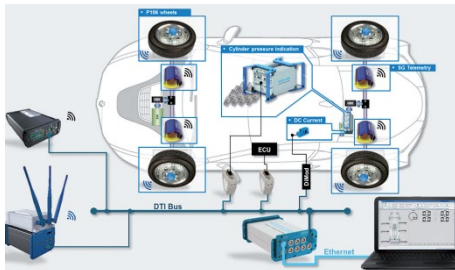
The research produced some surprising discoveries: the estimated battery capacity, for instance, proved to be significantly lower than expected. It was also possible to determine strategies for rapid response behavior with a dynamic accelerator. Information of this sort is essential for manufacturers who want to understand the performance of their powertrains under real driving conditions while minimizing interventions in the operation of the powertrain. First and foremost, however, this application shows just how much can be achieved with measurement technology solutions from Kistler – especially when they are combined for the purpose of integral analysis.

Initial results from this collaboration were set out in a joint paper that was presented at the *13th International Symposium on Propulsion Diagnostics* in Baden-Baden. This work points the way for the development of Kistler's vehicle measurement technology in the near future. It is also an excellent example of our activities in the powertrain segment that aim to help manufacturers accomplish their development assignments. As the next step in our cooperation with the University of Bath, we intend to collect more measurement data during actual driving. The focus is on one question in particular: how does the drive system manage energy and torque flows in order to support vehicle dynamics and improve drivability?

## Image material (please name the Kistler Group as picture source)



Successful collaboration on the plug-in hybrid: the joint team from the University of Bath and Kistler has already achieved measurable progress. (Source: IDPS, University of Bath)



Comprehensive analysis of the powertrain's behavior is possible with the help of a complex test setup comprising various technologies from Kistler.

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## About the Kistler Group

Kistler is the global market leader for dynamic pressure, force, torque and acceleration measurement technology. Cutting-edge technologies provide the basis for Kistler's modular solutions. Customers in industry and scientific research benefit from Kistler's experience as a development partner, enabling them to optimize their products and processes so as to secure sustainable competitive edge. Unique sensor technology from this owner-managed Swiss corporation helps to shape future innovations not only in automotive development and industrial automation but also in many newly emerging sectors. Drawing on our extensive application expertise, and always with an absolute commitment to quality, Kistler plays a key part in the ongoing development of the latest megatrends. The focus is on issues such as electrified drive technology, autonomous driving, emission reduction and Industry 4.0.

Some 2,200 employees at more than 60 facilities across the globe are dedicated to the development of new solutions, and they offer application-specific services at the local level. Ever since it was founded in 1959, the Kistler Group has grown hand-in-hand with its customers and in 2018, it posted sales of CHF 475 million. About 8% of this figure is reinvested in research and technology – with the aim of delivering better results for every customer.