

## Case Study

### Gathering data for the development of tires for modern vehicles

Megaride relies on measurement technology from Kistler for its innovative simulation software for tire and vehicle dynamics testing

**Vehicle development heavily relies on measured data from the road. Yet getting accurate and reliable real-world data is no mean feat. This is why Seaside Racing was created. The annual event was started four years ago by Megaride, as a spin-off project of the University of Naples, committed to developing innovative simulation software for tire and vehicle dynamics testing, and Kistler, the market leader for dynamic measurement technology. It unites innovators and researchers in the automotive field to test vehicle dynamics and tire performance under competitive conditions and thus provides the foundation for innovation based on measured data.**

Understanding how a vehicle interacts with the road is crucial for automotive development. Precise and reliable data provides engineers with the clues they need to find new improvement potential and develop vehicles that ensure that passengers are safe and comfortable in any driving situation. With electrification this becomes even more important, as vehicle's architecture, performance and behavior evolve. However, gathering precise and reliable measurements is not an easy task – especially when gathered in harsh driving environments, where the capabilities of tire performance and vehicle dynamics are pushed to their limits.

#### **Innovation grounded in real-world measured data**

During racing conditions both conventional and electric vehicles are subjected to extreme forces and state-of-the-art measurement technology ensures that key physical quantities are accurately collected to characterize engineering models. With this goal, the yearly Seaside Racing is organized by Megaride, a spin-off project of the University of Naples which was established in 2015 and has since developed into a company focused on technological transfer in the field of automotive engineering. Megaride supports their customers with simulation software and development tools, which bring together findings from applied research and real-world measured data, a necessary factor for delivering innovation. Andrea Sammartino, Megaride's project coordination manager lists the range and volume of data collected: "In 2024, we gathered close to 60 hours of real-time tire data

under different thermal and wear conditions, on passenger interaction, on the acceleration of the vehicle and on the impact of suspension dynamics on tire performance and wear.”

## **Reliable insights thanks to accurate measurement technology from Kistler**

For Megaride, measured data is vital for developing their computer software and modeling tools further, as the precision of input data defines the reliability of the virtual model. They are specifically interested in information on vehicle dynamics and tire performance to feed into their innovative simulation software for vehicle testing. To collect the data, they rely on established Kistler solutions for vehicle dynamics: the Correvit S-Motion sensor, the RV-4 wheel vector sensor and the RoaDyn wheel force transducer (WFT). The Correvit S-Motion sensor is engineered specifically to measure the vehicles' longitudinal and lateral speeds, providing Megaride with the data they need to evaluate tire kinematics, especially under extreme conditions. The RV-4 wheel vector sensor allows complete acquisition of the wheel movement, while the RoaDyn wheel force transducer enables engineers and developers to better understand how the vehicle's wheels interact with the road surface by measuring the forces and moments acting on the wheels.

## **Precise measurement data on tire kinematics and vehicle dynamics**

The Correvit S-Motion optical sensors from Kistler deliver critical data on vehicle speed, slip angle, and dynamic motion, offering a non-contact solution for measuring both longitudinal and lateral motion. “There is often a need for direct measurement of speed components to evaluate tire kinematics. From this point of view, S-motion plays a key role,” says Andrea Sammartino. The Correvit S-Motion uses advanced optical technology that captures vehicle dynamics with high resolution, utilizing sophisticated algorithms to analyze light reflected from the road surface. It ensures accurate measurements by eliminating potential interference from external factors such as tire wear, varying road conditions or mechanical misalignment. The solution operates by tracking vehicle motion in real time, providing accurate data on parameters such as speed, lateral acceleration and slip angle. The data leads to valuable insights into the tire's contact patch behavior during cornering, which is critical to understanding the limits of adhesion and optimizing tire performance.

Megaride's testing setup also includes Kistler's RV-4 wheel vector system, a robust and quick-to-mount sensor designed to measure space and direction coordinates of the vehicle wheel. Thanks to five high-precision angle transducers, the RV-4 carries out all movements with the wheel except for the rotation about the wheel axis. This sensor adds further useful information for the development of traditional vehicles as well as for motorsport applications and enables accurate simulation of tire and vehicle dynamics.

## **Measuring forces acting on the wheel**

The RoaDyn WFT measures six components of force and moment – longitudinal, lateral, and vertical forces, along with torques that occur during dynamic maneuvers such as cornering, acceleration, and braking. With the ability to withstand forces of up to 60 kN and operate at speeds of over 300 km/h, the WFT is robust enough to withstand the most extreme conditions, making it ideal for motorsports and also electric vehicle development, where weight is larger, and the road-vehicle interaction is different from ICE-based systems. The system also integrates seamlessly into existing vehicle data acquisition setups, providing a comprehensive and continuous flow of high-precision measurements crucial for fine-tuning performance and optimizing tire and vehicle dynamics.

By analyzing slip and drift angles provided by Correvit S-Motion in conjunction with data from the RV-4 and RoaDyn WFT, Megaride can refine its vehicle dynamics models to ensure they accurately reflect real-world performance and enable teams to make data-driven decisions during development and also races. "For us, these data points are invaluable in creating and validating the simulation models we develop for motorsport teams and commercial vehicle manufacturers alike", highlights Andrea Sammartino.

### **Charting new paths**

Kistler supports Megaride's mission to meet the evolving needs of the automotive industry and motorsport. Andrea Sammartino sums up: "The new frontier is moving more towards ride and comfort applications." Once again, measured data will give development engineers the tools they need to navigate the new opportunities opening up. Precise and reliable measurements – especially gathered in harsh environmental conditions – will continue to be a key factor in advancing automotive development. By relying on Kistler's measurement technology, Megaride is well equipped to provide insights that optimize performance and comfort in the rapidly changing automotive landscape. "Together with Kistler, we are committed to providing the automotive industry with the insights needed to navigate these challenges and enhance the driving experience."

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

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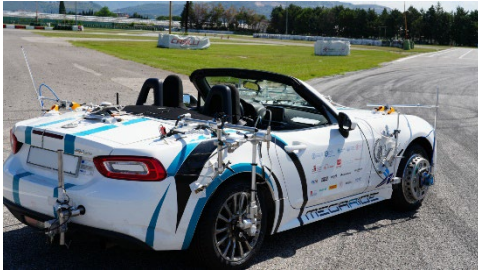
At Seaside Racing, measurement technology solutions from Kistler provide critical data that Megaride uses to optimize its innovative simulation software for tire and vehicle dynamics testing for motorsports and commercial vehicles.



Designed for performance, Kistler's RoaDyn wheel force transducer (WFT) measures forces and moments on the wheels during dynamic maneuvers, providing precise data essential for optimizing vehicle performance and tire behavior under extreme conditions.



Accurate, real-time speed and slip angle data is key to optimizing tire performance, made possible by the Correvit S-Motion optical sensor's advanced measurement technology from Kistler, which captures vehicle motion without contact to provide accurate data under varying road conditions.



During racing conditions both conventional and electric vehicles are subjected to extreme forces. State-of-the-art measurement technology from Kistler helps Megaride ensure that key physical quantities are accurately collected to characterize engineering models.

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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 2023, it posted sales of CHF 465 million. About 9% of this figure is reinvested in research and technology – with the aim of delivering better results for every customer.