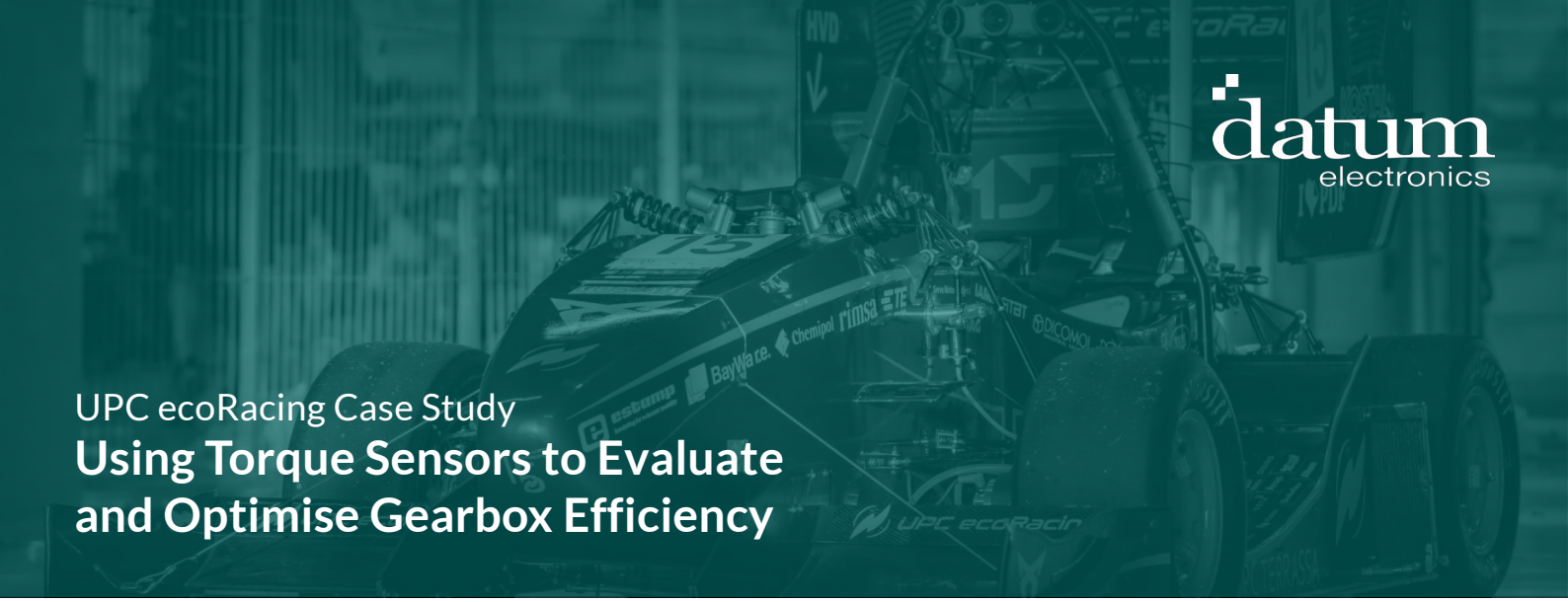


UPC ecoRacing Case Study

Using Torque Sensors to Evaluate and Optimise Gearbox Efficiency

The Client

UPC ecoRacing is a highly-decorated student-led engineering team based at the Universitat Politècnica de Catalunya, focused on the development of race cars for the international Formula Student competition.

Founded in 2008, the team has developed a series of prototype vehicles, transitioning from hybrid concepts to fully electric race cars in 2014. Its work is centred on applying advanced engineering methods within a competitive environment, emphasising efficiency, performance, and reliability.

"We have finished the 2022-2023 season, and we are very pleased with our performance. This year we have carried out the latest evolution of our concept of autonomous and electric vehicle, ecoRD 2023, optimizing and making our single-seater more reliable."

The Challenge

The team needed a reliable way to measure torque, speed, and power output from the motor. Using this data, they could then measure the output at the other side of the gearbox to calculate overall drivetrain efficiency.

This approach would allow them to identify where losses were occurring within the system and use that information to refine the gearbox design for improved efficiency.

Improving efficiency was not only important for vehicle performance, but also for competition scoring, where teams are assessed on both performance and energy efficiency. Accurate torque measurement therefore played a key role in supporting both design development and overall results.

The Solution

Datum Electronics supplied a combination of torque sensors to enable measurement both within the drivetrain and in a controlled test environment. A custom **RS425 Contactless Torque Transducer** was provided for integration with the high-speed motor, designed to operate at speeds of up to 20,000 rpm while maintaining measurement stability. This allowed accurate capture of torque, speed, and power at the motor output.

UPC ecoRacing were also supplied with a Size 2 **M425 Torque Transducer** rated at 500Nm. This sensor was installed within a dedicated test rig to measure the torque at the output of the gearbox.

"Achieving these good results on track has been a long road, involving a lot of work and effort, and we want you Datum to remain with us to consolidate this performance. Your presence in the project is key to the evolution of both industry and the professional growth of the students involved.

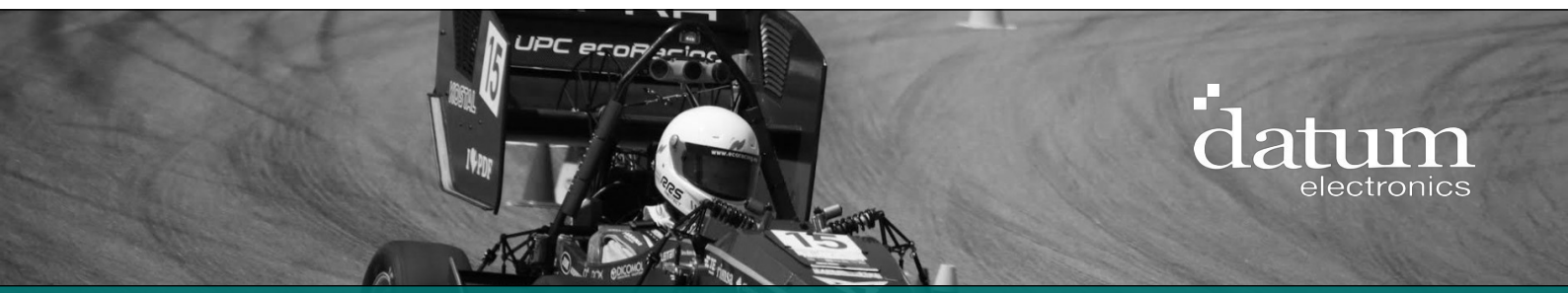
That's why we want to thank you, from the entire team, for all the support you gave us"

Quim Segura, UPC ecoRacing Team Leader

The Outcome

By measuring both the input and output of the drivetrain, the team was able to compare performance across the gearbox and calculate overall efficiency. This provided a clear view of where losses were occurring and supported further optimisation of the gearbox design.

The results from the 2023 season were the greatest in the team's history, earning 21 trophies and being able to finish all the dynamic events on track. The ecoRD23 remains their most awarded car to date.

Learn more about UPC ecoRacing at ecoracing.es.

Discover Datum Electronics torque measurement solutions at datum-electronics.com.