

# CASE STUDY

## WIRELESS SHAFT TORQUE MEASUREMENT IN FORMULA SAE RACING CAR

### THE APPLICATION

The accurate measurement of torque in rotating systems is often a challenge. However it does provide one of the best examples of the T24 wireless systems versatility as it was used to monitor the torque of a racing car for a race team, from the University of Quebec.

Mantracourt provided a wireless modular system to measure torque as well as technical support to monitor the car's performance and gain essential information for design modifications, validation and optimised race-track settings.



### KEY BENEFITS

- ▼ Provides fast, accurate, wireless torque measurement in a rotating system where cabling was not suitable
- ▼ Small form factor and light weight as space and access at the rear of the car was limited

*"Wireless torque measurement is really important to improve our racecar. We use it for differential load transfer characterisation for many setups and it helps us to choose which one is the best for our application. It also helps us improve our differential model in our lap simulator."*

*Patrick Leroux, Manager of Vehicle Electronics, Formula SAE ETS*

# THE PROJECT:

## WIRELESS SHAFT TORQUE MEASUREMENT IN RACING CAR

### THE APPLICATION

Formula SAE is an international engineering competition where student teams compete with single-seater race cars they have designed and built themselves. Mantracourt have sponsored the 'Ecole de Technologie Superieure' engineering team from the University of Quebec, 2009 to 2013, providing instrumentation for their prototype design and build.

452 teams from 41 different countries spread across 5 continents take part in the competition and there are major Formula SAE events held in the USA, UK and Germany. Events also take place all over the world in countries such as Austria, Hungary, Japan, Thailand, Brazil and Australia.

### THE CHALLENGE

The team designed a new differential assembly for the 2011 prototype. Theoretical calculations predicted positive results for performance but validation and data acquisition were a must for its development.

The behaviour of the system needed to be monitored as there were a few discrepancies. Typical strain gauge installation for the measurement of the torque transmitted to the driveshaft was not an option because of rotating shaft. A complete, bespoke solution was also not possible as the time and cost was prohibitive.

Finally, the shape and physical packaging of the rear of the car did not enable easy installation of a standard monitoring system.

### THE SOLUTION

Strain gauges were installed on each driveshaft. These were connected to a strain gauge to radio telemetry (T24-SA) transmitter. A machined short cylinder, acting like a holder for the transmitter and the battery, was mounted on the driveshaft. The T24-AO1 wireless receivers were installed on a bracket near the transmitter to ensure the best signal integrity and were connected to the car's data acquisition system (Motec ACL). A

calibration was conducted using a known load in a static situation using our configuration software.

*"Our T24 range of wireless instrumentation technology is being used for similar projects in industry. It's ideal for rotating systems or locations where space or access is limited. This project also demonstrates how our technology is finding its way around the world."*

*Kelly Voysey, Marketing Manager, Mantracourt*



# THE RESULTS:

## WIRELESS SHAFT TORQUE MEASUREMENT IN RACING CAR

### THE RESULTS

During the 2012 season the Formula SAE ÉTS team enjoyed considerable success in several international competitions whereby they secured a number of 1st and 3rd places, against fierce competition.

"We really value Mantracourt's sponsorship and technical assistance", said Patrick Leroux, Manager of Vehicle Electronics. "Wireless torque measurement is really important to improve our racecar. We use it for differential load transfer characterisation for many setups and it helps us to choose which one is the best for our application. It also helps us improve our differential model in our lap simulator."

### PRODUCTS USED



#### T24-BSU

Wireless radio telemetry  
USB base station



#### T24-AO1

Wireless receiver with  
analogue output



#### T24-SAE

Strain gauge to wireless  
telemetry converter

### OPTIONAL



#### T24-ACMM

Wireless Sensor  
Transmitter Enclosure