Pushrod Load Measurements on Michigan State University's Formula SAE Racecar

Authors: Stefan Trentacosta, Phil Yuzon, Kyle Raden

Strain gage sensors from Micro-Measurements®, a brand of Vishay Precision Group (VPG), are used by the Michigan State University Formula Racing Team on its 2015-16 season SR-16 car to understand the loading on each of the tires. The acquired data is used to improve suspension tuning for increased cornering performance. Increasing the cornering performance allows for higher corner exit speeds, resulting in faster lap times.

Company/Institute: Michigan State University Formula Racing Team

Industry/Application Area: Formula SAE

Product Used:

- General Purpose Strain Gage Sensors—Tee Rosette, CEA-06-062UT-350
- Application Kit for Experiential Stress Analysis (ESA): GAK-2-AE-10 Kit

The Challenge

The 2015-16 Michigan State University Formula Racing Team wanted to collect as much data as possible to understand the dynamic loading on the tires of the SR-16 racecar. Understanding the loads applied to the tires enables the team to better tune and optimize the car to its fullest potential.

The Solution

Using the strain gages provided by Micro-Measurements, the team successfully bonded the strain gages to the pushrods. The strain gage sensors were used on track for data acquisition and analysis. By analyzing the loading effects on the tires at different parts of the track, the MSU Racing Team was able to optimize the suspension setup. The data helped determine the right setup for toe, camber and caster.

Figure 1: Completed application of strain gage on pushrod with protective heat shrink over the strain gage sensor

The User Explains

The pushrod strain gage data was used to see the axial loads on the tire surface. This data is also used to tune the suspension components to better utilize the tire contact patch. The foil strain gage sensors were connected to a student-designed amplifier, then the signal was sent to a Bosch DDU7 data acquisition system. The foil sensors mounted to the pushrod were light and compact to reduce

weight. They were protected with semi-adhesive heat shrink and DR 25 heat shrink. The data was acquired real time with the use of the Bosch DDU7 while the car was driving. Using the data gathered from testing will allow the team to better set up the car for competition events.

"Using a real-world experiment with the CEA-06 foil strain gage sensors on the pushrod, our team was able to maximize the potential of our racecar."

Acknowledgement:

The MSU FSAE team would like to acknowledge the Society of Automotive Engineers for providing students with an opportunity to design, build, and compete with a custom open wheel racecar. The experience and knowledge gained from these events is very valuable and can be used in real world industry experiences. http://www.egr.msu.edu/fsae/

Contact Information

Dr. Gary Cloud, Faculty Advisor
Michigan State University Formula Racing Team
428 South Shaw Lane
2555 Engineering Building
East Lansing, MI 48824
USA
Email: cloud@egr.msu.edu
Web: www.egr.msu.edu/fsae/

Vishay Precision Group, Inc. (VPG)
Micro-Measurements
mm.us@vpgsensors.com