Improving FEA Torsion Models Using Strain Gage Data

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The torsion testing team of San Jose State University's Personal Rapid Transport (PRT) system project Spartan Superway uses strain gage based measurements to find experimental errors, as well as to validate FEA model of complex structures.

Company/Institute: Spartan Superway, San Jose State University

Industry/Application Area: Mechanical Engineering Laboratory

Products Used:

- CEA-06-250US-350, General Purpose Strain Gages - Shear/Torque Pattern
- P3 Strain Indicator and Recorder

The Challenge

Modeling the behavior of mechanical stresses/loads using FEA software may not directly align with real world experimental measurements. Using FEA to accurately model the torsional behavior of a complex specimen tested in a Torsion Testing Machine is challenging. Performing torsion tests and then comparing the measured data with the FEA model results provides the opportunity to find experimental errors, as well as FEA model anomalies. Structural failure points need to be consistent and match between the FEA models and the real-life testing.

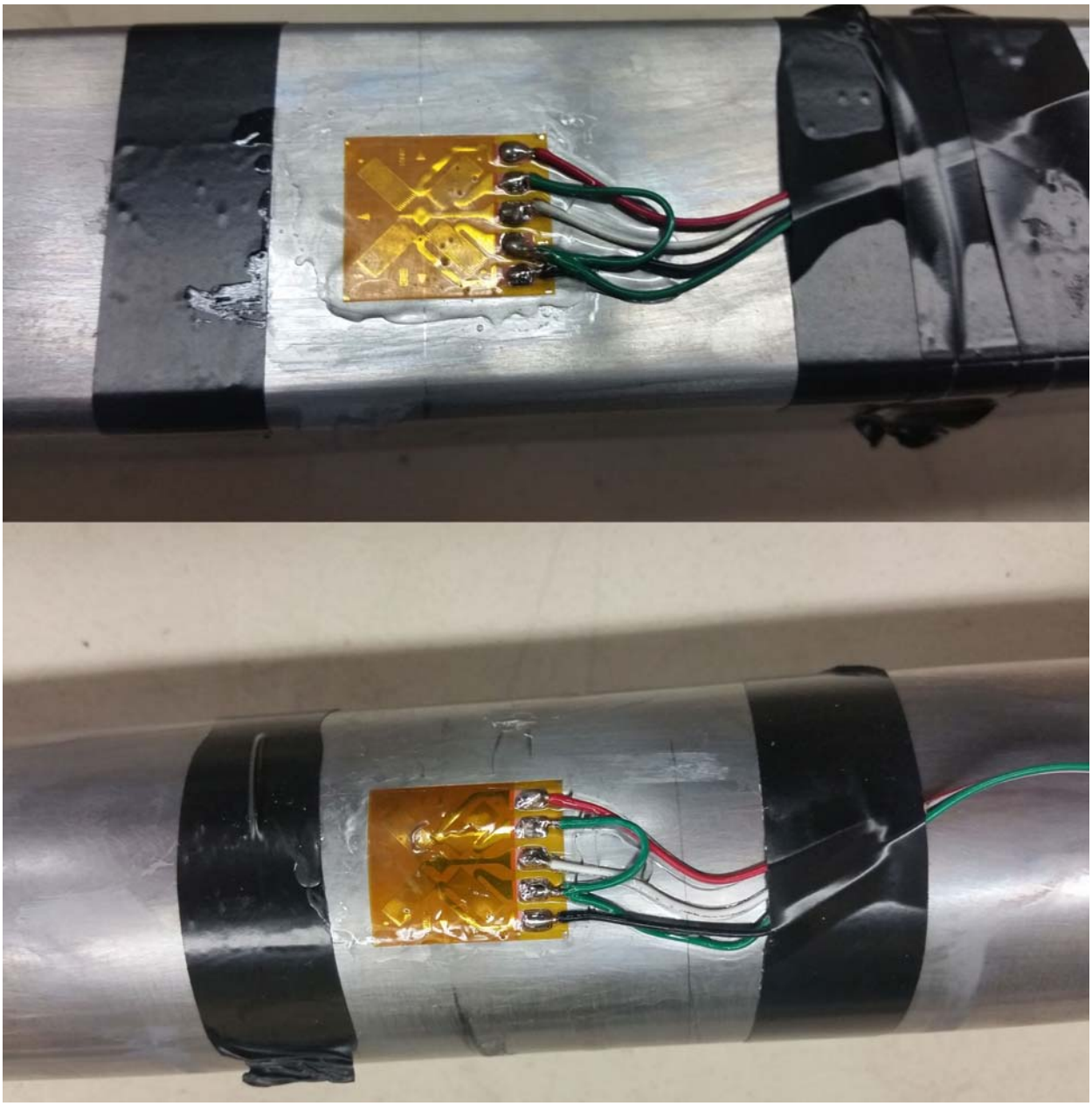

Figure 1: 250US strain gage placement to measure torsional shearing stresses on circular and square steel pipes

The Solution

A requirement for successful and efficient research and development is to create accurate FEA models that predict mechanical torsion stresses in complex structures. Starting with simple test specimen materials and geometries, like mild-steel with hollow, square and circular cross sections, and using experimental data to improve the FEA model for these simple structures, allowed the design team to move on to more complex structures. Using the 250US full bridge strain gages from Micro-Measurements allowed the team to compare mechanical behaviors, both experimentally and virtually, to verify FEA model accuracy, as well as isolate experimental errors.

The User Explains

The Spartan Superway Torsion Test Team conducted numerous torsion testing experiments to verify the accuracy of FEA software modeled designs. The real-world data collected was used to verify the accuracy of the modeled design using FEA software.

“The team was able to simply and accurately measure the strains created by the torsional loadings using the P3 strain indicator with the 250US full bridge strain gages.”

Acknowledgement:
Spartan Superway is an interdisciplinary project from San Jose State University to design a PRT (Personal Rapid Transport) system using renewable resources. We propose to develop and bring to market the elements of a solar powered ATN (Automated Transit Network) system that will be scalable, replicable, and that can be located within existing rights of way in urban locales.
Project Documentation: *https://drive.google.com/file/d/0B_eeAgZ-fLYZY09GdU02bnBPY1U/view?pref=2&pli=1*
http://www.engr.sjsu.edu/smssv/

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