Air Products – Spring Hanger Evaluation Field Tester

Overview
Constant effort spring hangers are located in Hydrogen Carbon Monoxide (HyCO) plants to support catalyst tubes, where hot gases flow. They are tested to monitor any degradation in performance throughout their life to ensure that the springs continue to exert a constant force over their full range of displacement.

Objectives
Currently, the typical method of testing these springs in the field is time-consuming, labor-intensive, and imprecise. Air Products requested that the team design and build a prototype to try to reduce the testing time and also digitally output force vs. displacement data in order to determine any loss in performance over time.

Approach
- The team began by traveling to Air Products to get a better understanding of the project and also to develop a list of customer needs.
- Because they are no existing products to field test spring hangers we focused on three main components of the project: force application, force measurement, and displacement measurement.
- An external patent and product search was conducted to research different components that could be placed together to form several concepts.
- The team selected a design that uses two electric car jacks, load cell, and the rate of travel of the car jacks.
- To ensure our design would not fail during testing we performed a bending and buckling analysis on our design.
- We built a prototype that was designed to test a scaled down spring hanger that was loaned to us by Air Products. The prototype can be seen on the bottom right of this page.
- Force measurements were taken using the load cell and these were plotted against the displacement measurements from the car jacks rate of travel.
- The data can be archived and can be compared to later testing data to see if the spring hanger has lost any performance.

Outcomes
- We reduced the testing time of a spring hanger by approximately 75% using our design.
- The design allows for archiving force vs. displacement data which can be used to determine if the spring hanger has decreased in performance.
- The project provided Air Products with a new way to field test constant effort spring hangers.