Determination of the Transverse Rigidity of Steel Wire Ropes

Overview
Our sponsor presented us with the challenge of designing and building a device that attaches to a compression testing machine. This device holds a steel wire rope and exerts a transverse force on the rope while measuring its horizontal and vertical deformation. Challenges that faced our team were mounting the measurement system onto the device, making the device large enough while saving money, and machining a large V-groove without much machining experience.

Objectives
Our team’s objective was to create a device that would allow us to test successfully while following the ISO standard provided by our customer. What we did for the project this semester was mostly hands-on machining work and a large amount of SolidWorks design.

Approach
- We gathered the customer’s needs through email correspondence and phone meetings
- Four concepts were generated and one was selected based on the customer’s needs and ease of manufacturing
- We reviewed existing patents and searched for existing products
- We visited the sponsor, witnessed steel wire breaking strength tests, and saw how the steel wire rope was made
- We used SolidWorks to simulate the deformation of the steel wire rope in order to design our device
- We created CAD models using SolidWorks
- We fabricated one prototype, shown on the right
- We were able to perform testing with 26mm steel wire rope
- We consulted our test results and compared them to what we expected in order to validate our prototype
- Our results for the values of deformation were expected and any discrepancies were explained with the existence of empty space in the wire

Outcomes
- The sponsor will be able to acquire quantitative data about the transverse rigidity of their steel wire ropes
- Having data about their steel wire ropes will allow Bridon American to qualify their ropes and better select them for certain applications
- Better selection of ropes will save time and money