Accurate Measurement of Rail Length

Overview
ArcelorMittal produces a large volume of steel rail for railroads at their Steelton, PA facility. To ensure customer requirements are met, ArcelorMittal has requested a team to design a process for accurately measuring the length of rails after production. A database with information about individual rails already exists and measurements will be tied to this system.

Objectives
- Design a measurement system capable of accuracy within the nearest 1/16 inch
- Output rail length measurements to a database and incorporate them into ArcelorMittal’s database
- Manufacture a durable and adjustable product intended for a long term use in a steel mill

Approach
- Customer needs were gathered by speaking to the customer during a site visit to ArcelorMittal’s Steelton, PA plant
- The team compared five different measurement techniques: tape measure, image processing software, encoder, differential length measurement, and laser measurement
- Patents were reviewed but the only relevant patents included a laser rangefinder, a holding/clamping device, and methods for data transfer
- The team went to the site three times during the course of the semester to understand the project requirements and perform testing
- Solidworks was used to design a prototype which was rapidly prototyped
- After testing, the team used iterative design to arrive at a final product
- Solidworks Simulation aided in material selection; ABS plastic for the bracket and aluminium for the reflector
- A gage R&R study was used to validate testing results
- Analysis was performed using Minitab software with most variability coming from part-to-part variability

Outcomes
- The sponsor will receive fewer customer rejections due to increased accuracy of measurements
- The sponsor can individually track the length of each rail in their facility
- With all the CAD files, the sponsor can remake pieces if they are used to failure