US Silica – Rod Mill Charging

Overview
US Silica Mapleton Facility workers currently load 300lb steel rods into a rod mill manually which causes serious ergonomic safety issues. The system needs to be automated in order to alleviate those safety concerns. A design will need to be easily integrated into the existing equipment to reduce project costs, as well as adhere to MSHA safety standards.

Objectives
The following objectives were worked on throughout the semester:

- Automate the rod bed release mechanism
- Automate the rod charging process
- The system must be reversible to retrieve the rods from the rod bed
- A PLC flow diagram will need to be designed to encompass the system

Approach

- The team first gathered all customer needs and existing drawings of the equipment
- 15 concepts were created and concept selection was carried out using a Pugh Matrix and QFD
- The best concepts were further developed until US Silica selected the automated rollers and automated rod bed release mechanism
- Existing patents were investigated and all were expired
- US Silica Mapleton Facility was visited multiple times throughout the semester to gather information
- Calculations were carried out to determine the power of the motors as well as if slipping will occur between the rods and the rollers
- The existing equipment was modelled in SolidWorks as well as the final design
- A SolidWorks animation was created to show the inner workings of this design
- A prototype was made using a 1HP motor and a V-shaped pulley to represent a roller
- When testing a rod on this motor, it was proven that slipping will not occur

Outcomes

- Rod Mill Charging at the Mapleton Facility will now have a low safety risk as a result of this project
- The workers will now be able to spend the half hour of time this task takes on other work since it will be automated
- This project decreased ergonomic safety risk, and sped the process up
- This new approach to rod mill charging will be able to be easily integrated into the current system in order to reduce project costs