Magnetically Enhanced Hydro Cyclone for Magnetite Recovery During Coal Beneficiation

Overview
Magneteite is employed in a water slurry during the coal beneficiation process. The slurry has a density in between that of coal and that of unwanted material so that only coal floats and can be scraped off. Magnetite has tripled in price so recovering as much magnetite from the slurry as possible is ideal.

Objectives
Our objective was to improve the sampling and testing procedures for examining a magnetically enhanced hydro cyclone prototype. Through standardizing samples and tests, we were to pinpoint the parameters that improved the prototype’s magnetite recovery efficiency the most.

Approach
• First, we read through reports that were written by groups who previously had worked on this project.
• After reading literature about hydro cyclones and the prototype, we brainstormed ideas about how to improve sampling and testing.
• Consulted our sponsor about the project and ultimately formulated a strategy
• Visited our sponsor to learn more about the application of our project
• Purchased sampling valves to improve sampling consistency
• Outfitted the prototype with the valves and made a lever to actuate both at the same time to further improve efficiency
• At first, piping modifications restricted flow so we raise the hydro cyclone.
• We also used wider piping on the rig to attain the maximum pressure differential through the hydro cyclone. This optimizes hydro cyclone efficiency.
• We tested the prototype by varying the dwell and overlap sequences of the electromagnets. We performed 14 runs and pulled 3 samples during each run.

Outcomes
• Duration of dwell time must be greater than the flux time of the electromagnets.
• Overlap sequences out performed dwell sequences in our testing.
• Further testing is required to further optimize hydro cyclone efficiency.