ArcelorMittal’s Taphole Replacement Project

Overview
ArcelorMittal, the world’s largest steel producer, contacted The Pennsylvania State University with the need of assistance in designing a revolutionary lifting device and new procedure for use in moving a taphole module into position inside of an Electric Arc Furnace. The team, consisting of four Industrial Engineering students, visited the plant, interviewed employees, and brainstormed solutions to the problem. The final deliverable was a full CAD engineering drawing, a Standard Operating Procedure, and a working prototype showing the new process.

Objectives
- Visit the Coatsville, PA plant to learn about the current process and variability within this process
- Brainstorm concepts that can potentially solve the current taphole replacement problem
- Use advanced decision-making tools to select an optimal concept and develop it into a full 3D CAD model and Engineering Drawings
- Create a Standard Operating Procedure (SOP) that will reduce overall variability for the proposed solution
- Create a working prototype that will demonstrate the proposed solution

Approach
- Customer needs were gathered by interviewing ArcelorMittal employees during site visit
- Three concept solutions were generated by discussing possible resolutions with sponsor and team members
- One optimal concept was selected by conducting an AHP pairwise comparison
- The optimal concept was further refined and then a final CAD model was developed and given to our sponsor to be manufactured
- An SOP was created that standardized the taphole replacement process and reduced overall variability
- In order to further reduce variability, a Visual Inspection System was designed to reduce cycle time
- A prototype was then created that incorporated all aspects of the project

Outcomes
- Once fully implemented, the project solution will greatly reduce the overall variability and improve the safety in the replacement process