ArcelorMittal4 : Pneumatic Conveyor Design

Overview
ArcelorMittal in Steelton Pa is a large steel manufacturing company that manufactures rails using electric arc furnaces. This manufacturing process creates dust by-products that consist of metal and their metal oxides and it is mechanically transported from the Bag-house to pneumatic conveyors that enable the material to be loaded into trucks. The current pneumatic system is outdated and need renewing both from a mechanical aspect, as well as electronically to improve its efficiency and reliability.

Objectives
ArcelorMittal has contracted Team B to redesign the pneumatic conveyor as well its control system used at their steel manufacturing plant. An updated electronic control system along with a CAD (Computer Aided Software) based of conventional dense-phase pneumatic system was offered by the team for the sponsors evaluation.

Approach
The design team's approach followed the design process quite strictly.
- Initially, extensive research on available pneumatic systems was conducted to choose the most appropriate design applicable including patents.
- The design team visited the plant in Steelton to gather data from Sponsor.
- Four concepts were designed: dense phase, dilute phase, vacuum.
- Selection processes paired with customer needs led to the dense phase model.
- Fluid flow analysis was conducted on the system to optimize overall efficiency.
- Electrical prototype of PLC was fabricated with fully functioning code.
- Results were validated through a troubleshooting checklist.

Outcomes
- ArcelorMittal will be able to upgrade their existing system at the Steelton plant which will allow for better user interface and higher efficiencies.
- The sponsor will stay well within budget for the project
- PLC (Programmable Logic Control) will allow the pneumatic conveyor operate both manually and electronically.
- Old relay system will be replaced with fewer updated electronics that is more reliable, user friendly and requires lower maintenance.
- Improved piping system will improve flow efficiency and reduce energy costs.