Gas Buster for Underbalanced/Air Drilling

Overview
Currently there are very limited options for gas busters and the ones that are available have many drawbacks. CONSOL Energy has tasked the team to design a gas buster and run simulations to effectively show the effectiveness of the design.

Objectives
The objective of the team was to design a gas buster that would be able to move cuttings away from the vessel while diverting 100% of the air/combustible gas to the flare. CONSOL required us to run CFD simulations on the models that we create.

Approach
- First the team did a site visit to see a current gas buster unit
- The team gathered all the parameters for the gas buster as well information on the natural gas industry.
- The team did detailed research and patent searches to generate ideas for a baffle design to incorporate into the vessel
- In terms of designing the other components such as the filtration system, concepts were ranked and scored by the team.
- Using parameters given by CONSOL, and through research, the base geometry of the gas buster was modelled in Solid Works
- A combustion analysis of back draft explosion was conducted by using the gas constituents. Based on these results, material research was conducted
- A material was determined through the economic analysis and the combustion analysis.
- FLUENT (a CFD software) was run on the gas buster to determine if the gas would separate from the inlet flow
- For the optimal design, various geometries were simulated in FLUENT until the best geometry was determined.

Outcomes
- Conducting optimal design studies using CFD analysis, a design that would most efficiently separate the gas from the mud inlet flow was determined
- CONSOL energy has the foundation for the design of their own proprietary gas buster
- The major research into the design and analysis has been completed for future teams to build off of