Molten Metal Filtration

Overview
In the metal casting industry molten metal filters are often used to filter out slags and contaminants from the metal as the metal passes through the mold. Two types of filters are often compared and contrasted with ideas and theories that have never been scientifically proven. These two filters are pressed ceramic filters and foam style slurry made filters.

Objectives
The objective of this project was to analyze the four main theories of metal filtration. These theories were: Large Particle Filtration, Filter Cake, Deep Bed Filtration, and Tailback Theory. We were also tasked to analyze the way in which the filters alter the flow of the molten metal. Our final objective was to analyze the mechanical properties of the filters by use of two different bend tests.

Approach
- We first spoke with Hickman, Williams & Company about their goals for this project
- We then toured Buck and Donsco Foundries in order to gain a knowledge of the filters use
- From here we managed to narrow down how we would analyze the filters
- Upon approval of our project we began construction of the various testing apparatuses
- Once construction was complete we began to pour iron into the test molds
- A testing apparatus was constructed and used for the bend tests
- Once the molds had solidified, metallography was performed on samples taken from the molds
- Quartz glass pouring experiments were carried out and filmed
- All relevant data was collected and compiled
- Data was presented to our advisor and sponsor

Outcomes
From the data collected we were able to come up with the following conclusions about the four theories:
- Large Particle Filtration was proven to be a prevalent factor in the filtration of slag
- Filter Cake Filtration was proven to occur in almost every pour we conducted
- Deep Bed Filtration was not proven to happen in any of the samples that underwent metallography analysis
- Tailback Theory occurred multiple times and we have collected video proof that it helps with filtration