Precision Castparts Corporation

Overview
Precision Castparts tasked this team with redesigning their water wash system. The purpose of this system is to clean ceramic investment casting molds after the dewaxing process, but before casting. Improvements to this system would decrease the number of inclusions in the cast parts, thereby decreasing the cost and labor hours required for reworking the parts.

Objectives
The objectives for this project are as follows:

- Identify existing problems with the current water flushing system. By recognizing any issues with the current system, the team, in collaboration with PCC, will be able to propose improvements to the system.
- Create a prototype water washing system that will simulate the improved water washing techniques. Testing will be performed on this prototype to evaluate the effectiveness of the techniques.
- Provide recommendations for adjustments to the water flushing system or for future work based on the outcomes of the prototype testing.

Approach

- The current water washing method at PCC was analyzed via video and discussion with engineers at PCC at the Groton facility.
- A functional prototype was designed and built to address each of the key observations. The main improvements made were:
  - Flipping the mold so the pour cup faces down
  - Add a vibrating element to continually move particles
  - Include a stainless-steel mesh filter to gather particles
- Baseline data was collected because no baseline data was supplied by sponsor. Then, tests to collect data with the mold flipped, and then flipped with vibration were performed. The team conducted tests changing only one variable at a time in order to isolate results.
- Data collected was percent of particles flushed out of system: dry weight of particles in/dry weight of particles collected in filter

Outcomes

- The project provided PCC with information for how to move forward in their water wash improvement project, such as which techniques are worth further investigation.
- The original flushing method was determined to be the most effective individual method.
- Adding a pneumatic vibrator decreased the variation effectiveness. The team suggests adding vibration to current system.
- The team suggests a “double-flush” cleaning method consisting of one thorough flush with the pour cup facing up followed by a thorough wash with the pour cup facing down and vibration to attack particles left in opposing locations.