**Overview**

Dresser-Rand is a major compressor manufacturer, and the impeller is one of the key components in the compressor. During the development process, Dresser-Rand depends heavily on its aero test rigs to validate their impeller designs. Traditionally, the machined aluminum test impeller cost $15,000-$20,000 with a lead time of ten to twelve weeks. Now, the team is working on making the test impeller using 3D plastic printing for a lower cost and faster lead time.

**Objectives**

According to the requirements from Dresser-Rand, the first goal is to design the impeller to survive 18,000 rpm at room temperature for the overspeed test. After this, further analysis and experiments will be performed to make the impeller stay functional and not significantly deform at 12,000 rpm under 300°F.

**Approach**

- Visited Dresser Rand site in Olean, NY and received a better scope of the task at hand.
- Studied CAD Designs given to us by Dresser Rand
- Conducted a preliminary analysis stress heat map for PEEK only and complete model
- Created CAD models to simulate design improvements to the impeller model.
- 1/8th model prototype fabricated out of ABS plastic to emulate the structure of future design to be used by Dresser Rand
- ½ ABS model prototype fabricated to test metal ring support concept.
- Met with a representative from a materials company to discuss different types of PEEK filaments
- Performed several Finite Element Analysis (FEA) Tests to validate our designs
- Conducted a Final Analysis Stress Heat Map for the PEEK only and completed model.
- Iterations of tests led to a new reinforcing material and altered printing settings.

**Outcomes**

- All objectives were met and/or exceeded
- Although a fully functional part was not made, there is a basis and manufacturing procedure set for Dresser Rand to follow to creating future 3D printed impellers
- Project can potentially reduce lead time of producing impellers and dramatically reduce cost of production.