Overview
For this project, the team was tasked with designing tooling for Dresser-Rand to use in over-speed testing of their impellers. Due to the wide range of impeller sizes, the current tooling at Dresser-Rand requires a new set of steel plates to be manufactured for each impeller that is tested. This current tooling is extremely inefficient in the way that it wastes the company’s resources, time, and money. The team addresses this problem by designing a new tooling that is adaptable for a range of impeller sizes and is reliable.

Objectives
The primary objective of this project was designing a tool that is cost efficient, time efficient, adaptable to ranges of impeller diameters, and reliable. The team designed a full tool assembly for a specified range of impeller sizes and tested the reliability using finite element analysis. With this, the team provided details of scalability of the tooling for Dresser-Rand to apply the tool to other impeller sizes.

Approach
- The team talked to the sponsor, Tristen Barnes, on a weekly basis and visited the Dresser-Rand facility to define and understand the customer needs. Customer needs were then ranked used AHP.
- Patents and existing products relating to over-speed testing of impellers were researched but fairly irrelevant.
- The team generated various concepts, choosing the best concept and continuously making changes and improvements based on feedback from the sponsor.
- A final design was completed as a model in Solidworks.
- Once the design was finalized, the team used finite element analysis to assess the reliability of the design according to different forces that would be applied during testing. The results proved that the tool would be reliable.
- The petals and top piece of the expansion housing sub-assembly were 3D printed.
- The team outlined how to scale the model to apply the model to additional size ranges of impellers.

Outcomes
The outcomes of this project are outlined as follows:
- The proposed design (shown on the right) is a new and creative solution to the problem that Dresser-Rand faces with their current over-speed test tooling for impellers.
- The sponsor will save approximately $330K/year if they choose to use this tooling design in replacement of their current tooling.