Advanced Fillet Welding System

Overview
Dresser-Rand is one of the world’s largest providers of impellers used within compressors for liquids and gases. The current welding system used is not suitable anymore and Dresser-Rand has tasked our team with redesigning it.

Objectives
The objectives of this project were to develop a welding system that is capable of applying a fillet welded joint in a location that is not visible from the outside of the impeller. This welding system must accommodate a wide variety of impellers. It also must also be portable as it might be used in many different locations at Dresser-Rand.

Approach
- First, the team visited the customer at Dresser-Rand headquarters located in Olean, NY.
- Dresser-Rand assigned requirements of a 2-foot long welding torch that is versatile in what it does.
- The team then reviewed patents in order to generated concepts.
- These concepts were narrowed down using a weighted matrix system, where the highest value became the initial design.
- Initially, an entirely rigid torch with threaded attachments was the design, but having too many parts led to a failed idea.
- From here, a completely flexible torch design was brainstormed, but never pursued as it was too unrealistic of a design.
- The team combined the best components from each of the previous designs and ultimately came up with a rigid and flexible design for a welding torch.
- This prototype was created in Solidworks to gain an understanding of what dimensions would be appropriate for rigid and flexible sections of the torch.
- Once the team was satisfied with the Solidworks model, stock materials and specified components were ordered online.
- Machining and assembly was performed in the learning factory.
- 2024 Aircraft grade aluminium piping was tapped and curved to fit the shape of the impeller.
- Flexible head attachment was ordered and attached on one side of the pipe, while the other side attached to the handle.
- Testing was performed to validate the torch was able to weld a single pass path inside the impeller.

Outcomes
- The sponsor will save a large amount of money (NDA protected) as a result of this project, due to the rigid and flexible torch reducing the amount of welds required from 8 to 4.
- This will reduce the amount of time required to weld the impeller blade to the cap by over 50%.
- The process produced a unique welding torch that cannot be found anywhere on the market.