Overview:
Dresser-Rand is a world leader in energy conversion technology, designing, and manufacturing. Dresser-Rand has been known for designing and manufacturing world class impellers that are utilized throughout the oil and natural gas sector, to change the fluid pressure. In the past, they produced impellers complete with z-blades riveted to the disc and cover. Now that these particular impellers have been in service for an extended period of time, it will be necessary to have them be reworked. The team needed to develop a process that deals with the geometric complexity of z-blade impellers which inherently has tight specifications.

Problem Statement:
Due to new manufacturing techniques riveting is not favored and welding is preferred but it’s difficult to weld z-blades as-is, owing to its thickness being below the minimum required by many current welding processes. This results in a change in geometry that negatively affect aerodynamic performance. The purpose of the project is to investigate alternative manufacturing methods that will meet performance specifications for the impeller conversion and reduce cost.

Objectives:
Research alternative joining methods for the z-bladed impellers that would maintain performance and keep cost at a minimum. Weigh the costs and benefits of each proposed manufacturing solution. Develop a cost analysis and routing sheet for the ideal solution.

Approach:
- Visited the plant in Olean, NY to survey the process and learn more about the z-blade impellers. Discussed goals and expectations of the redesign with the sponsor. The team then used the information from the sponsor to outline project specifications
- Alternative manufacturing methods for fastening metal were researched to determine potential solutions
- Different methods were selected and compared: Electron Beam (EB) Brazing, TIG welding and Laser Welding
- TIG Welding and EB Brazing proved infeasible and Laser Welding was selected as the optimal solution
- Determine cost analysis and payback period for solution
- Develop routing for the optimal manufacturing solution

Outcomes:
Laser Welding was determined to be the proposed solution due to high welding speeds that require minimal post-welding work, no filler or shielding gas required and very low operating cost. The biggest drawback was a high capital investment cost. A payback period for the capital investment was calculated. The routing was produced to determine the set-up and run times of the steps in the optimal solution.