Diaphragm Fabrication: Time & Cost Reduction Methods

Overview
The diaphragm is a critical part of the multistage centrifugal compression; the vanes must be precise in size, shape, and surface finish to properly guide the flow of gases from the impeller to the next stage of compression. The current CNC machining process, using 3 & 5 axis machines, has a cycle time of 57 hours and a cost of $7,500. Dresser Rand is looking for time and cost reduction methods while obtaining the desired dimensional accuracy and surface finish.

Objectives
The team aimed to find alternative manufacturing methods to fabrication Dresser Rand's diaphragms. This was done while considering possible material choices, surface finish, dimensional accuracy, as well as cost and cycle time. Each alternative was evaluated on advantages and disadvantages compared to the current process.

Approach
- Visit sponsor to observe current process
- Evaluate the current manufacturing process, find areas of concern
- Research alternative methods that target the areas of concern
- Narrow alternative choices to feasible methods
- Alternative methods include additive manufacturing: electron beam welding & digital part production, resin bonded sand casting, and composites.
- Contact companies currently implementing alternative methods found
- File mutual confidentiality agreements, send CAD files, receive quotes
- Evaluate how alternatives would be implemented by Dresser Rand
- Compare alternative methods
- Conclude and recommend findings to Dresser Rand

Outcomes
Dresser Rand is currently implementing the best process for the fabrication of diaphragms. No significant time or cost reductions were found while evaluating the alternative methods. Additive manufacturing, which two of the proposed alternatives encapsulated, is a very young process. There is promise for growth and development in the future and it is recommended that Dresser Rand revisit the possibility of implementing additive manufacturing in the future.