



Balanced Floating Labyrinth Seal

Overview

Dresser-Rand presented the team with the challenge of designing a balanced floating labyrinth seal. Although no such seal currently exists, the company holds a patent on the concept and wanted to test whether or not it was feasible. The team faced the goals of selecting a general seal design, testing its ability to float, and determining the force balance while under a range of pressure gradients.



Objectives

The objective was to provide concrete evidence that a floating labyrinth seal is feasible, and to create and analyze a functional design of one.

Approach

- Determined customer needs directly from sponsor
- Researched existing seal designs and proposed changes to make one float
- Created multiple potential design types and metrics with which to evaluate them
- Developed a repeatable, reliable, CFD method of testing seals
- Tested each seal variant and choose a final design type
- Optimized the final seal's ability to float and prevent leakage
- Performed a larger data collection for different pressure gradients and seal clearances
- Used a multivariable functional fitting tool to summarize results.

Outcomes

The outcomes of our project were very promising, and will likely incite further analysis by Dresser-Rand

- The concepts introduced in the patent were found to be functional and capable of having better characteristics than the current model in use.
- The seal was able to reduce flow leakage by approximately a factor of 2 compared to the stationary seal currently being used by Dresser-Rand.
- Implementing the design will reduce wear and thus increase the product's lifetime.
- The function that was created can be used to optimize each seal for different pressure gradients.

