Tesla Pump for Cryogenic Propellant Mixing and Transfer

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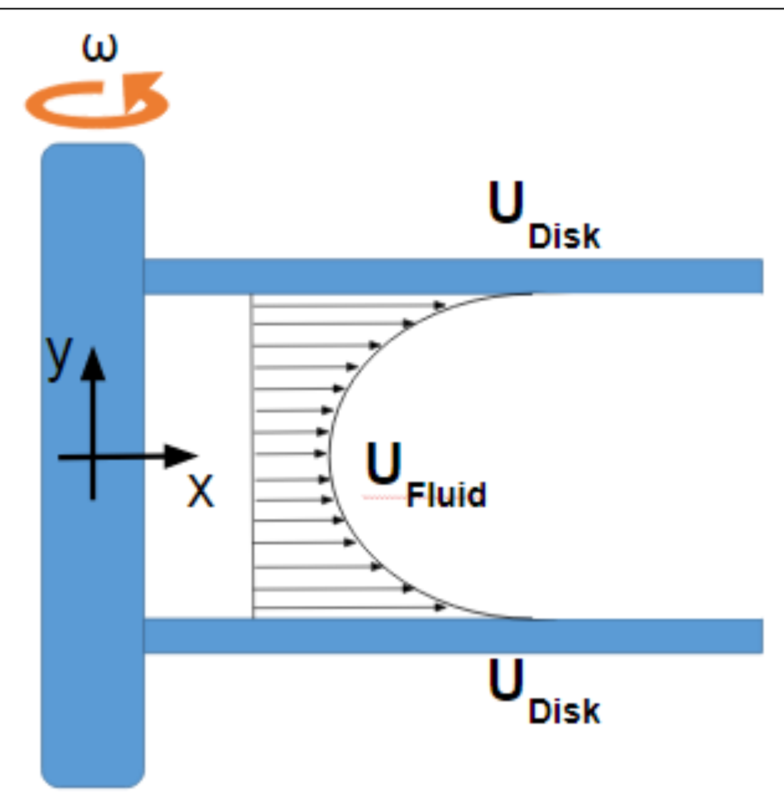
Scope

This project calls for the development of a Tesla Pump used to mix and transfer cryogenic fluid. It should prevent temperature gradients within the system, minimize cavitation and optimize system efficiency.

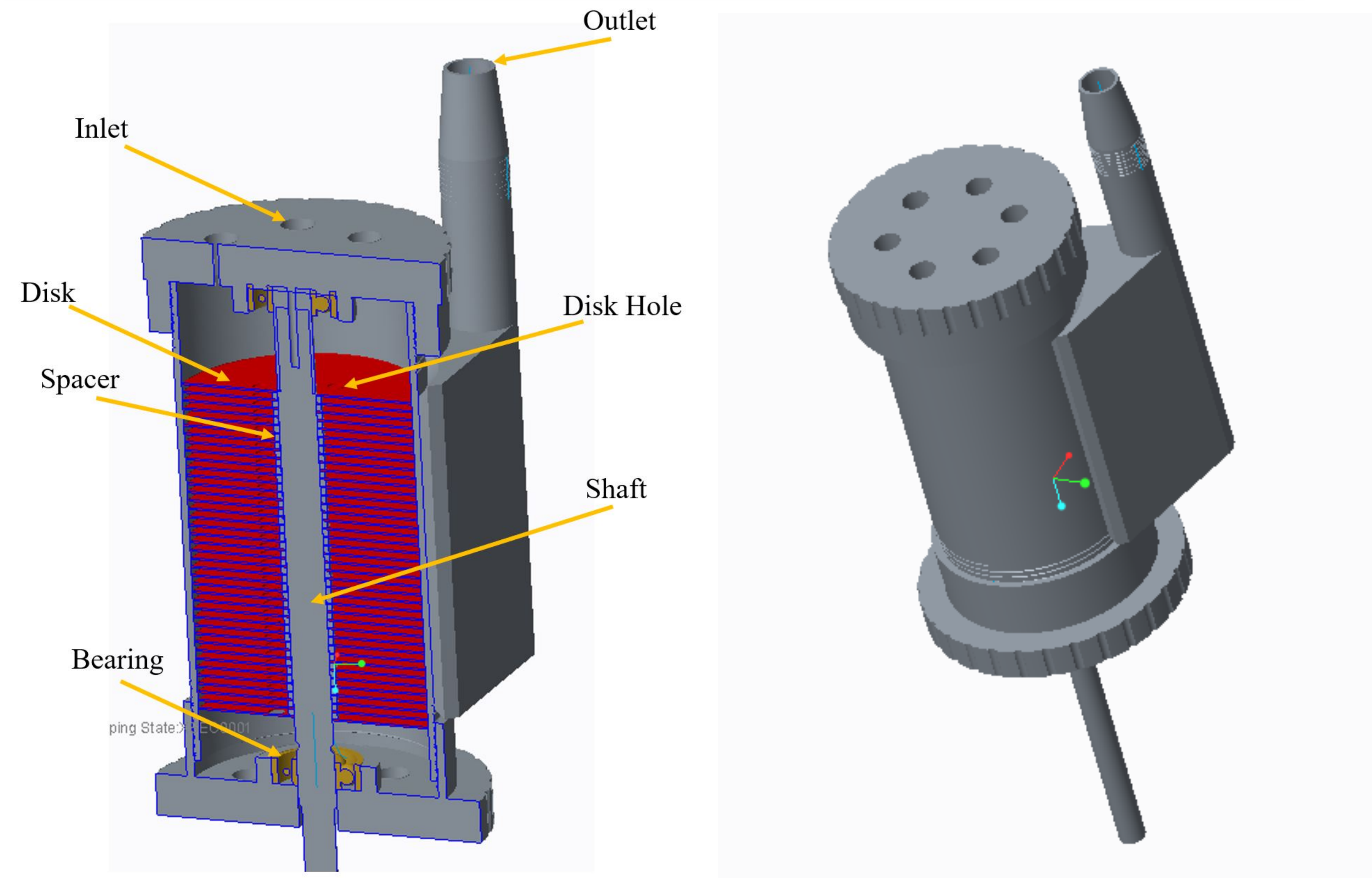
Background

- Flat disks spin to transport fluid via the boundary layer effect
- Simplified layout and manufacturing process compared to bladed pumps
- Performs well with abrasive and cryogenic fluid
- Produces less cavitation throughout the system compared to bladed pumps

Boundary Layer Amid Rotating Disks



Design



Project Objectives

- Develop a working prototype of a tesla pump capable of mounting on 8 in. diameter flange
- The pump should be able to transfer fluid at a rate of <u>15 gallons per minute</u> with a <u>5 psi pressure rise</u>
- Test prototype with water, but develop a model for testing with cryogenic fluids such as liquid nitrogen or liquid hydrogen
- Investigate how disk spacing affects flow rate, pressure rise, and more
- Develop final pump configuration and performance analysis based on results

Potential Challenges

- Manufacture to specified dimensions
- Stress from torque may deform extremely thin disks
- Avoiding stagnant fluid buildup
- Financial issues ordering complex parts
- Safe working conditions for cryogenic fluids
- Meeting goals within size constraints

Future Work

- Continue component designs
- Order material and parts
- Manufacture other components
- Develop a working prototype of the Tesla Pump
- Determine a relationship between disk spacing and meeting project objectives
- Optimize design based on tested results

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