SEMESTER/MSC PROJECT PROPOSAL

CFD simulations of the Thrust Force for A Two-Stage Turbocompressor Rotor System at Varying Operating Conditions

General Information

Laboratory: Laboratory for Applied Mechanical Design (LAMD)
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Background and Objective

Small-scale turbocompressors can replace the traditional compression devices in heat pumps (HPs) or chillers to achieve high efficiency at a compact. An appropriate turbocompressor requires the ability to operate on a wide range of operating conditions such as pressure ratios, mass flow, rotating speeds, etc. For the oil-free purpose, gas-film thrust bearings are applied to counteract the axial force generated by turbocompressors. However, the main drawback for a GFTB is its low load capacity inherited from the low viscosity nature of its gas lubricant. The thrust force varies with different operating conditions, which challenges the design of reliable GFTBs. To better guide the design of desired GFTBs, it is vital to obtain a map of the axial force generated by turbocompressors covering the entire working range. Computational Fluid Dynamics (CFD), therefore, comes into play in achieving this particular object at an efficient and economic manner.

Prerequisites:

CFD Experience with ANSYS

Tasks and Deliverables:

1. Mesh generation for both the fluid and solid domains.
2. CFD simulation for various specified operating conditions.
3. Post processing of numerical results to calculate the distribution of axial component of the pressure field and the resultant axial forces. Evaluate the temperature distribution in the solid domains.