Semester project

Generic geometry modeling of gas-lubricated foil bearings

General information

- Laboratory: Laboratory for Applied Mechanical Design (LAMD)
- Supervisor: Arnau Català i Rams, Prof. Jürg Schiffmann
- Location: Neuchâtel (travel allowance offered)
- Starting date: ASAP
- Duration: Semester
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Background and objectives

Gas-lubricated foil bearings (GFBs) are characterized by the presence of a compliant structure that deforms under load (Figure 1), providing several advantages in terms of robustness and stability. Advanced designs of GFBs explore the possibility of having different heights of the compliant structure along the angular direction of the bearing, aiming for a better performance.

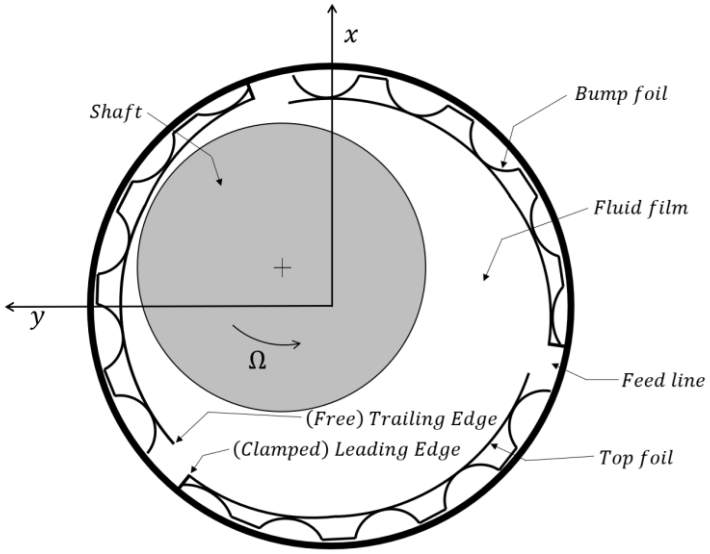

Figure 1. Drawing of a gas-lubricated foil bearing

The student will work on the numerical modeling of GFBs, adapting the available codes from the lab to consider a more generic definition of the compliant structure. The student will have to modify the stiffness of the compliant structure accordingly with its height in every location, and consider these modifications into the solving schemes for the differential equation of the fluid film (Reynolds equation for compressible fluids).

Working plan guideline

1. Literature review on different geometries of GFBs
2. Literature research on the stiffness of the compliant structure as a function of its height
3. Modeling of generic compliant height structure into the available GFB code
4. Verification of the modified model against simplified cases and similar implementations on the literature
5. Report and presentation

Recommended prerequisites

- MATLAB
- Numerical methods
- Dynamics
- Structural and fluid mechanics