Semester project/Master project
Experimental and theoretical investigation of a particle damper for gas lubricated rotors

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General Information

Laboratory:	Laboratory for Applied Mechanical Design (LAMD)
Supervisor:	Prof. J. Schiffmann
Location:	Neuchâtel (travel allowance offered)
Starting date:	ASAP
Duration:	Semester
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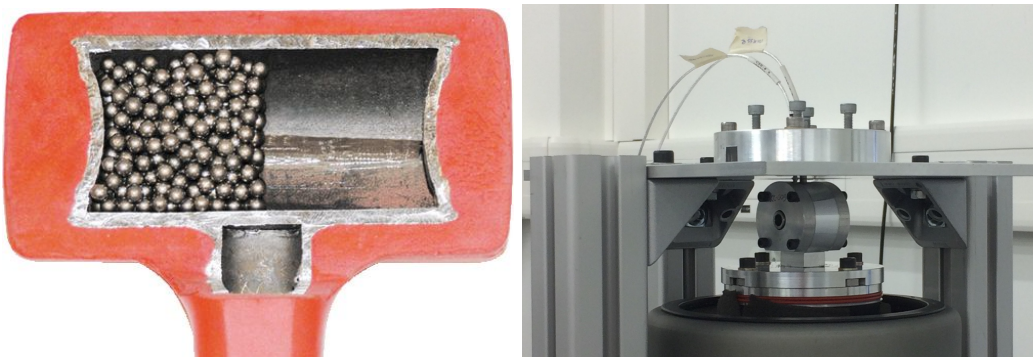
Background and objective

Gas lubricated bearings generally require very small clearances to allow stable rotor operation. Increased clearances are feasible if the loss of rotordynamic performance is compensated through the addition of external damping, by supporting the bushings in a flexible manner, on O-rings as an example. O-Rings offer a relatively large amount of damping but they feature a couple of disadvantages, namely temperature, frequency and amplitude dependency. In addition, their damping coefficient is difficult to tune and changes with the age of the O-Ring.
The student will research an alternative damping solution in the form of a particle damper (see example in Fig.1(a)) that offers similar damping performance as O-Rings. A test-rig (Fig.1(b)) based on the *Base Excitation - Resonant Mass Method* has been designed at LAMD which enables to experimentally characterize damping and stiffness of flexible structures.



(a) (b)

Figure 1: (a) Example of a particle damper in dead-blow hammer (b) Test-rig at LAMD

The student will design a miniature particle damper that can be fitted to the bearing bushings of a high speed gas lubricated rotor as well as perform the required modifications to the test-rig at LAMD to enable its characterization. After manufacturing of the damper and test-rig components, the student will experimentally evaluate the performance of the proposed damper on the test-rig.

Tasks (working plan guideline)

1. Literature research on particle dampers of various particle type
2. Design of the particle damper and modifications to the test-rig
3. Experimental investigation of particle damper performance on test-rig
4. Post processing of the measurement results
5. Report and Presentation

NB: A personal interview before starting the project is required. Tasks will be defined individually depending on Master/semester project.