

Post-Doctoral position Dynamics of magnetic structures

Supervisors: Corinne Rouby (UME) & Laurence Bodelot (LMS)

In flexible permanent magnets, each part of the structure create a magnetic field that has an effect on the whole structure, which leads to a peculiar dynamical behavior. The objective of this project is to characterize the effects of a strong permanent magnetization on the mechanical behavior of flexible structures and the coupling with an electrical circuit via the induction phenomenon. For this post-doctoral work, it is planned to approach the problem both theoretically and experimentally.

In order to treat the problem theoretically, a simple situation is envisaged: the case of a flexible magnetic beam which oscillates near a conducting loop. The beam will be assumed to be inextensible and the permanent magnetization will be modeled by a density of permanent magnetic moment. An energetic approach, taking into account elastic and magnetic energies of the system, will be used to establish the equations of the problem. The influence of different parameters (magnetization orientation, position and geometry of the conducting loop, modal shape of the flexible magnet,...) on the dynamics of the system and the importance of the inductive coupling should be investigated.

In parallel, an experimental validation will be performed. A significant part of the work will consist in finding the right process to make prototypes of flexible magnets. The latter will be composed of magnetic particles dispersed in an elastomeric matrix. The questions of the choice of the particles material to use and the manner to magnetize them are still to be answered.

The present offer is a one-year post-doctoral position funded by the Fédération Française de Mécanique (F2M) and hosted jointly by two laboratories in Palaiseau (south of Paris): Unité de Mécanique at ENSTA ParisTech and Laboratoire de Mécanique des Solides at École Polytechnique. Applicants should have a strong background in theoretical and computational solid mechanics, physics and coupled problems. Experience in experimental mechanics would be a plus. To apply, contact C. Rouby (corinne.rouby@ensta-paristech.fr) with a CV, the name of two references and a list of publications. The position can start in january 2014.