

CIRTrans : Consortium Industrie Recherche sur les Transmissions de puissance

PhD proposal – September 2019 - Lyon

- Detectability of bearing and gear defects in geared mechanical transmissions: manifestations and new transfer paths -

Institut National des Sciences Appliquées de Lyon

Laboratoire de Mécanique des Contacts et des Structures UMR 5259

Context of CIRTRANS consortium

CIRTRANS is a consortium that establishes a network of skills on power transmissions and which brings together the following industrial and institutional partners: VOLVO, ALSTOM, SAFRAN, REEL, TEXELIS, GIMA, INSA Lyon, Centrale Lyon, ECAM Lyon.

This consortium has taken shape in recent years thanks to the skills network that has been built around gear specialists. Its vocation is to develop and perpetuate expertise by bringing together people and resources around the same goal: power transmission.

It allows its members to move forward together by pooling resources while benefiting from the research potential of our laboratories and associated schools, to develop knowledge and skills through research projects, or converge towards common methodologies and tools.

It is within this framework that the present thesis proposal.

PhD objectives

On helicopter turboshaft engines, bearings or gearing degradation can lead to dreaded events. A monitoring system is implemented to detect this type of degradation and thus guarantee the safety of the aircraft. However, late detection can have significant impacts on machine maintenance or lead to mission interruptions. Predictive maintenance therefore aims to anticipate these failures, so that the reliability of the engine is increased, mission interruptions are reduced and maintenance operations can be anticipated to improve the customer experience. These objectives are shared by CIRTrans members on their respective applications. SAFRAN, ALSTOM and REEL are

involved in financing and monitoring this thesis. A Safran Helicopter Engine turbine engine will serve as a reference configuration, and will allow a comparison with the numerical results from the thesis.

The main objectives of this proposal are therefore to construct an original model of a gear power transmission on which the different degrees of freedom associated with the rotations of the main parts will be preserved. This complete model will be based on elementary component models (rolling, meshing or coupling type links) whose complexity will be adapted according to the needs.

The models thus constructed will make it possible to reproduce, on a reference architecture, classical behavioral manifestations such as vibrations (of casing) or displacements (of shafts) generally measured on devices in operation. Other events, generally less explored on industrial applications, such as instantaneous angular speed (IAS), will also be available in these models. This integration will be done taking care to review the traditional models to integrate the couplings and transfer paths.

These generic behavior models and the associated methodology allowing the transfer to different industrial applications will serve as a basis for adaptation and development in different industrial sectors. Openness to other manifestations such as acoustic signals may also be explored by weak coupling, for example using vibrational manifestations as excitations of more precise models of acoustic radiation.

For more information, please contact:

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Requested profile: Bac +5 (engineering school or Research Master) in mechanics / vibrations / power transmission, good knowledge of vibratory behavior of power transmissions, numerical simulation tools and characterizations of their behavior. Programming skills, especially Matlab, Finite Element Models and numerical methods are desired.

Salary / Place / Starting: at least 2300 euros monthly / Lyon / September 2019

Duration: 36 months

For application, send CV and motivation letter to : adeline.bourdon@insa-lyon.fr or didier.remond@insa-lyon.fr

LaMCoS website: <http://lamcos.insa-lyon.fr/>

Research team website :

http://lamcos.insa-lyon.fr/front/equipe_activites.php?L=1&Equipe=4

