

## PhD position at IFP Energies nouvelles (IFPEN)

Electrical Engineering, Mechanical Engineering, Physical Sciences

### Development of a methodology for on-line measurement and estimation of the rotor temperature of an electric machine

Due to the progressive hybridization and electrification of passenger vehicles, the optimization of electric motors is becoming a priority challenge for a responsible energy transition.

The thermal management of an electric machine is today a crucial issue to optimize its performance (power, efficiency) while controlling important characteristics for the target market: size, cost, etc. Therefore, the control of the temperature within the machine is a key point that can be addressed through different aspects: adequate materials, advanced cooling systems, adapted monitoring, etc. On this last point, monitoring the temperature of the rotor within an electric machine represents a major challenge since the rotor is a system rotating at high speed, making it difficult to instrument. Furthermore, heat transfer losses that occur are difficult to consider and model.

The goal of this thesis is to develop an on-line measurement technique of the internal (rotor) temperature of an electrical machine. The technique should allow to measure the temperature of the rotor based on the analysis of electrical quantities measurable with a conventional control system. The development of the technique will be validated by the use of loss / heat transfer simulation models and direct measurements applicable to the rotor (e.g. optical diagnostics).

The experiments carried out in the IFPEN laboratories will validate the relevance and efficiency of the developed diagnostic in a scientific context with an industrial vision of the needs.

The collaboration with the Laboratory Electrotechnical Systems and Environment (LSEE) will enable to have an expertise in the fields of electrical machines and measurements analysis of electrical signals. Travelling to LSEE is to be expected as well as regular exchanges with the teams of this laboratory.

**Keywords:** Electric motors, Thermal management, Physical measurement

<b>Academic supervisor</b>	PhD, HdR, MORGANTI Fabrice, LSEE
<b>Doctoral School</b>	<a href="#">ED n°585 - École Doctorale Sciences, Technologie, Santé</a>
<b>IFPEN supervisor</b>	PhD, SINDJUI Ralph, <a href="mailto:ralph.sindjui@ifpen.fr">ralph.sindjui@ifpen.fr</a> Mobility and Systems division
<b>PhD location</b>	IFP Energies nouvelles, Rueil-Malmaison, France 75% / LSEE, Béthune France 25%
<b>Duration and start date</b>	3 years, starting in fourth quarter 2022
<b>Employer</b>	IFP Energies nouvelles, Rueil-Malmaison, France
<b>Academic requirements</b>	Master's degree Electrical/Mechanical Engineering, Physical Sciences
<b>Language requirements</b>	Fluency in English, willingness to learn French

To apply, please send your cover letter and CV to the IFPEN supervisor indicated here above.

#### About IFP Energies nouvelles

IFP Energies nouvelles is a French public-sector research, innovation and training center. Its mission is to develop efficient, economical, clean and sustainable technologies in the fields of energy, transport and the environment. For more information, see [our WEB site](#).

IFPEN offers a stimulating research environment, with access to first in class laboratory infrastructures and computing facilities. IFPEN offers competitive salary and benefits packages. All PhD students have access to dedicated seminars and training sessions. For more information, please see our [dedicated WEB pages](#).