

Master Thesis Project

Design of flexible piezoelectric microenergy generator for automotive application

Background:

The European H2020 ECSEL project 'Energy ECS for future mobility' focuses on development of technologies to improve digitalization of e-mobility systems and related energy solutions. One of the objectives is to develop a miniaturized self-powered sensor system by harvesting energy from the environment, which is the most promising technology for energy saving.

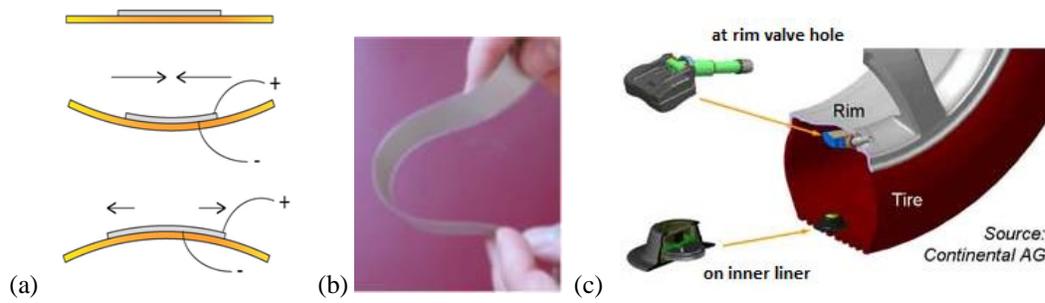


Figure 1: (a) Schematic of piezoelectric principle used for vibration-based energy harvester technology; (b) Flexible piezoelectric PVDF; (c) Examples of TPMS placement in a tire.

Purpose and Project Description:

The focus of this master thesis work is to simulate and design a first prototype for a flexible piezoelectric energy harvester for tire pressure measurement system (TPMS) using physical effects to which tires are exposed to (Fig.1).

The tasks and acquired knowledge are:

- Literature survey for flexible energy harvester (piezoelectric and triboelectric) using vibration, pressure/force and rotation of the tire.
- Learn theory about piezoelectric and triboelectric harvesters
- Apply FEM (COMSOL Multiphysics) and Matlab for simulation and modelling of both harvesters (mechanical and electrical).
- Build a simple experimental setup for measurements and test the flexible harvester in lab.
- Correlation between experiments and simulation.

Student Background:

This project is suitable for students who are interested in computational mechanics and FEM. Students with strong interest and good experiences in programming are encouraged to apply. There will be interaction with the RISE institute through several joint meetings during the project, as well as during the experimental setup process.

The project is suitable for 1-2 students from MPAME, MPPDE, MPSYS, MPSEB and master programs linked to MC2 department or Engineering Physics.

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About:

RISE, Research Institutes of Sweden AB:

RISE is a Swedish research institute within electronics, optics and communication technologies. As one of Europe's top research institutes, we provide cutting edge resources and knowledge within electronics, optics and communication technologies. We have the facilities and lab resources to offer advanced R&D as well as small scale production and prototyping. Our mission is to find new ICT-solutions for existing and future demands, creating sustainable growth in industry and society.