Goizper Group

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# Smart sensor for pneumatic combined clutch and brake

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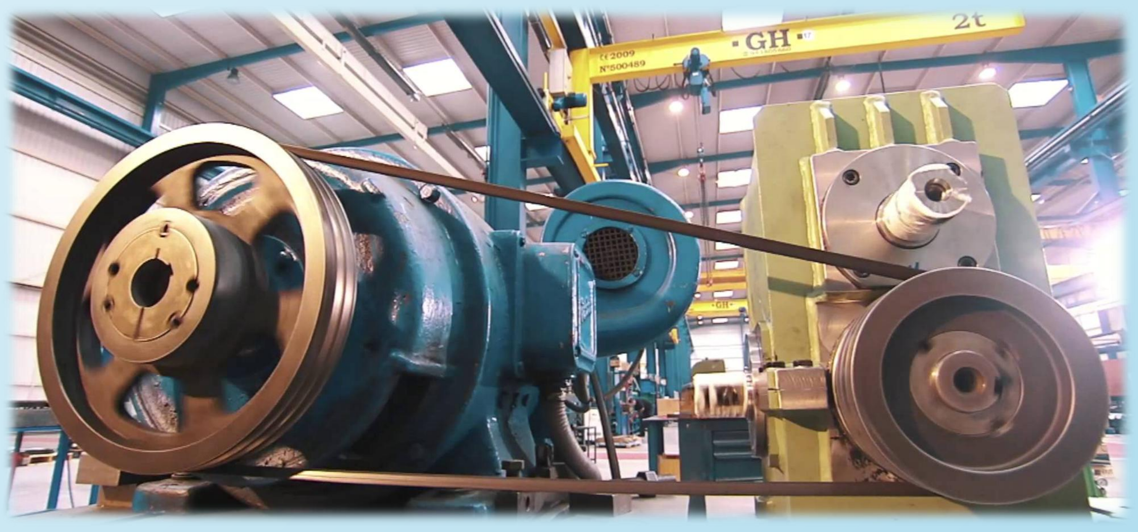
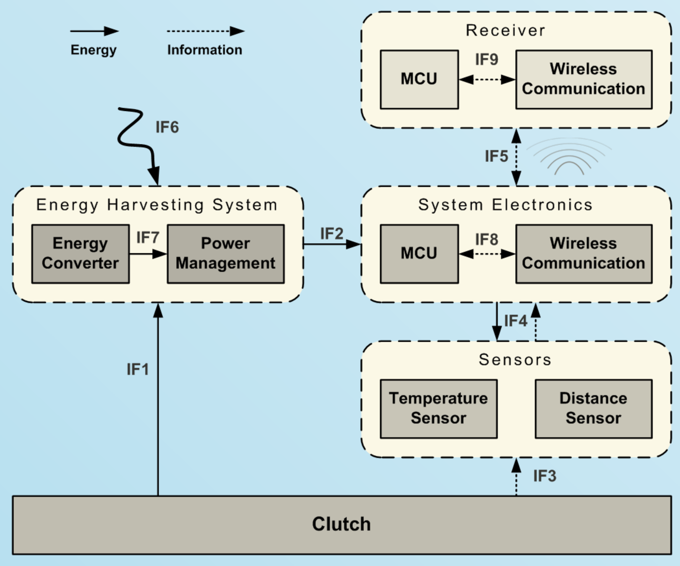
## Introduction



Clutch-brakes are the key solution in machinery where power transmission is needed: machine tool, metal deformation, elevation,… In this kind of combined clutch and brake the torque transmission is done by friction. During this transmission, a wear appears in the friction material. This wear must be controlled for avoid damage in the clutch-brake body when the disc is too much worn.

Non programmed stops happen due to this problem, usually due to bad installation or running out of the limits. The cost of this non programmed stops is the sum of the reparation and downtime cost, and it is around 15.000€ per unit and 1.500.000€ per year.

## Requirements

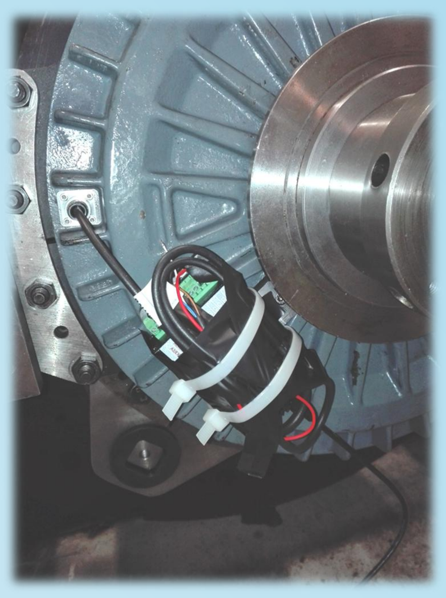



In order to reduce the costs of non-programmed stops, a smart system integrated in a clutch-brake is presented. The objective of this smart system is to monitor the wear of clutch-brake pads and measure maximum temperature at friction point while clutching.

The main parts of this smart system are a bluetooth low energy module, an inductive distance transducer, a thermocouple temperature transducer, and a kinetic energy harvester. The basic system has been designed, including interfaces among all of them. Also first evaluation modules of the energy harvester, distance sensor and temperature sensor have been mounted.

## Results

The energy harvester, distance sensor, temperature sensor, and also the wireless communication, have been check and verified in the test center of Goizper.



The distance sensor was robust enough (up to the point we have tested), showing a deviation between 10 and 100µm in a 4'2mm distance meassurement.

The Bluetooth Low Energy protocol was checked between an evaluation board (as peripheral) fixed in the rotating part of the system, and a mobile phone (as central). At a distance up to 5m, with a closed door in between, at a rotation speed up to 200rpm the communication was OK.

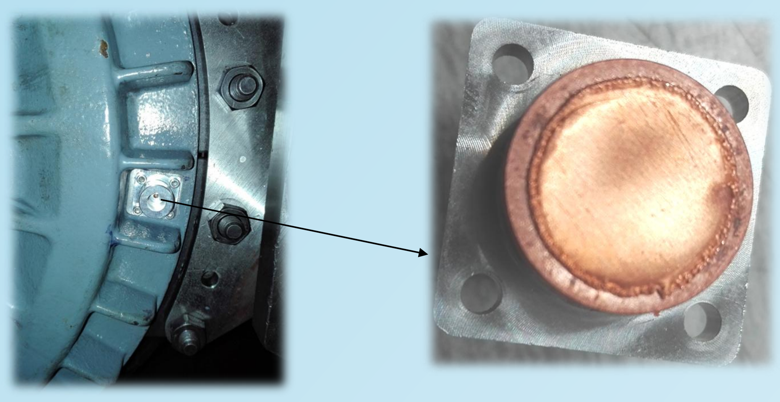
The kinetic energy harvester provided power, 1mW, will allow sensor activation every 12min.

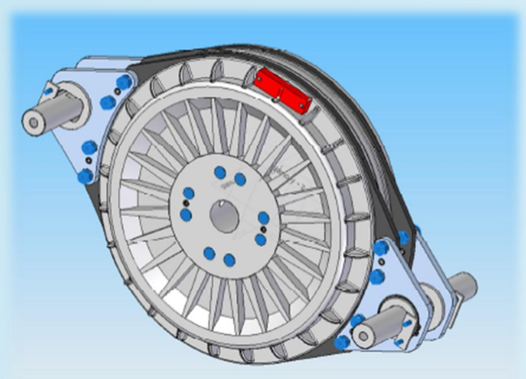
## Conclusions & Future Work

Including the suggested smart system in clutch-brakes will minimize the cost due to non programmed stops. The estimated reduction will be around 70%, and above all, it would reduce the tension and stress managing these situations.
The product characteristics, described as an autonomous wear and friction monitoring device, is an important added value to the products currently commercialise, and open more than one market sector to be addressed.

The next programmed activities are:

- Mounting a shell with the thermocouple to monitore temperature during rotation, and clycles of engaged-braked.
- Design of the PCB to control the tested sensors, and the Bluetooth Low Energy communications.
- Dimensional adaptation of this and Energy harvesting module to the available space





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