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Inductive Vibration Harvesters

- Preliminary -

Oval wheel counter with Energy Harvesting

Description

The technology of Energy Harvesting uses ambient energy sources like light, thermal gradients or mechanical energy to generate electricity. Current generators to transfer ambient energy into electrical energy are solar cells or thermogenerators. Piezoelectric materials or inductive generators can be used to harvest mechanical energy. Inductive generators, which are also called electrodynamic generators, work like dynamos with a coil and a magnet moving relative to each other. In a typical implementation a flexible mounted magnet is moved by an external force, e.g. the vibration of a vehicle or an engine. This magnet induces a voltage in the coil, which is in proximity to the magnet, but mounted in a fixed position.

Due to the fact that state-of-the-art materials like inductive coils and magnets are used in inductive generators, they are a cost-effective implementation of a vibration harvester. However, most practical realizations show a resonant behavior, which means that the generator has to be tuned to the exciting mechanical vibration frequency. In addition to generators for periodic vibrations, also systems working with impulses are available. Popular examples for impulse systems are light switches which use the force of the human hand.
Typical applications for the use of inductive generators are motors, vehicles, floors, bumps, or rotating wheels.

Our offer in the field of Energy Harvesting

- Characterization of ambient energy sources and estimation of the potential output power of transducers
- Characterization of energy transducers
- Development of vibration harvesters and optimization of related components like coils, magnets etc.
- Development of optimized voltage converters and charge circuits
- Integration of inductive harvesters in given applications like rotating wheel systems
- System integrations of energy storage, sensors, wireless transceivers and further application circuits

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Implementation example

An oval-wheel counter is a flow measurement device, which uses two oval gear-wheels to measure the volume of various kinds of fluids, e.g. petrol or oil. The number of rotations of the gear-wheels is a measurement of the volume through the oval-wheel counter. By mounting magnets on the gear-wheels and coils in the housing of the oval-wheel counter, a simple inductive generator is realized. This inductive generator uses the flow energy of the fluids and can power various kinds of electronics in the oval-wheel counter. The energy from the generator could e.g. power a GSM module to transmit the measurement data for remote read-out. In a proofed implementation a typical output power of 20 mW is achieved with a flow rate of 50 l per minute. This means that it is possible to perform, for example, a level query at a gas station about once every 20 tank refills using only the flow energy.