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Joint Japanese-Swiss project in energy harvesting

Tokyo (SCCIJ) – The Swiss Federal Institute of Technology in Zurich (ETHZ) and Nabtesco from Japan, a world leading mechatronic systems manufacturer, are cooperating in a joint research project about harvesting energy for future freight trains. The project is carried out at the Power Electronic Systems Laboratory, D-ITET, and targets the conceptualization and optimization of novel concepts for energy harvesting from moving conductive surfaces. An example application is the power supply of sensors or actuators on next generation wagons of freight trains.

Creating electricity on-board

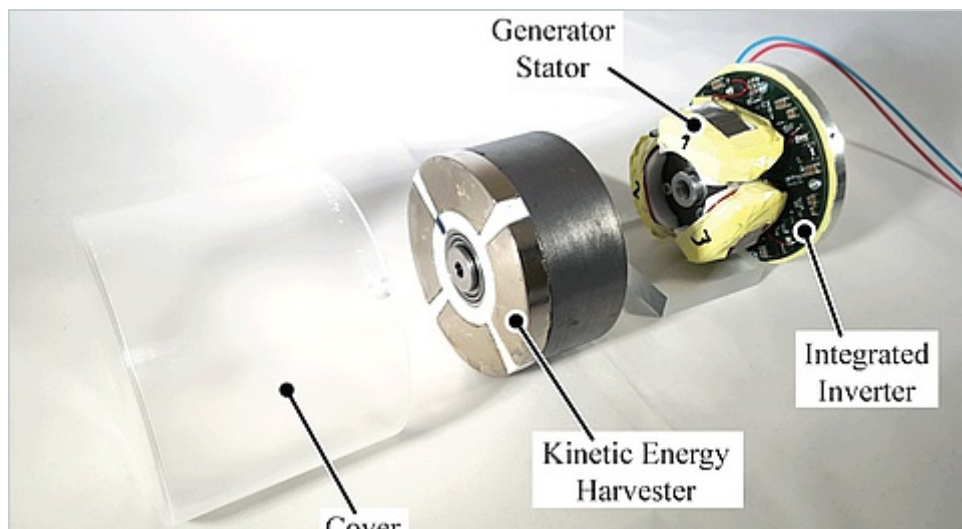
With the continuously broadening application area of Internet of Things, robust energy harvesting systems for supplying remote sensors and actuators are gaining in importance. Harvesting energy directly at the location of consumption allows omitting the cables and various energy conversion stages.

Especially in systems with distributed sensors/actuators and applications in harsh environments, e.g. in railway applications, this gives a noticeable advantage in increasing the reliability and the efficiency along with decreasing costs.

Currently, freight wagons do not have on-board electric power supply and accordingly, cannot employ electronics, e.g. for monitoring the wagon condition or the conditions of transported goods. Another application is the supply of a future anti-lock braking system on freight wagons.



Main ETH building in Zurich



Novel kinetic energy harvester for supplying sensors and actuators on next generation freight trains (click to enlarge)

Innovation of power electronics systems

With the energy harvester and related power electronics developed in the course of this research project, this deficiency can be overcome and new monitoring and sensing concepts are enabled in a wide range of industrial applications. The depicted energy harvester allows to harvest up to 7.5 Watt of electric power from the moving freight train's wheel over an air gap of 10mm.

The research at Power Electronic Systems Laboratory (PES) at ETHZ opens up new fields of applications and drives the innovation of power electronics systems in close partnership with both Swiss and international industry. The people involved in this project are Michael Flankl, and Professor Johann W. Kolar. In line with the focus areas of ETH Zurich, fundamentally new concepts, e.g., for sustainable energy systems, sustainable mobility, future data centers, and medical applications, are of primary interest, along with general scientific challenges and the pursuit of excellence and an internationally leading reputation.

About Nabtesco

Nabtesco, based in Tokyo, provides various machines and equipment used in the air, on the ground or at sea. Products include devices and equipment for aircrafts, railways, automobiles, and ships and vessels as well as equipment for automatic doors and industrial control. Business areas of Nabtesco consist of "precision equipment", "transport equipment", "aircraft and hydraulic equipment", and "industrial equipment". In April 2011, Nabtesco had acquired the automatic door business of Kaba Holding AG of Switzerland and established Gilgen Door Systems AG. Nabtesco Group had 7,200 employees and sales of JPY 245 billion with a net profit of JPY 17,6 billion in the year ending Dec 31, 2016.

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