

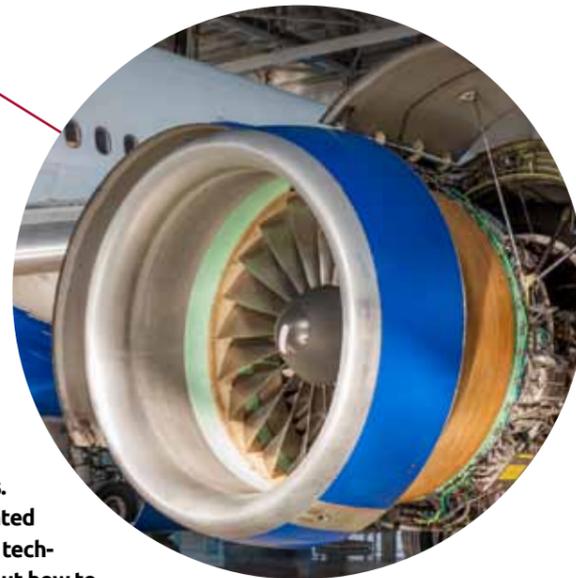
FRAUNHOFER INSTITUTE  
FOR INTEGRATED CIRCUITS IIS

## RFID, CPS, ENGERGY HARVESTING, SENSOR TECHNOLOGY

### *The Future of Predictive Maintenance Starts Today*



**P**roactive, needs-based, and holistic: optimised maintenance and servicing leads to reduced costs and generates added value for a company's processes and products. RFID, sensors, and contactless communication are key technologies on the road to an enhanced ROI. On the basis of individual cases, Jürgen Hupp of Fraunhofer Institute for Integrated Circuits IIS, demonstrates how enterprises can make better use of the captured data for maintenance processes. The main focus lies on information about life cycles, needs-based maintenance, and specific locations. Technology alone is not sufficient to optimise processes. On the contrary, methods of making use of collected data must be highlighted for users to realise the goal of predictive maintenance. "The opportunities technologies offer can contribute to the company developing its own ideas about how to optimally design their individual maintenance processes," Jürgen Hupp summarises.



### Solutions by Fraunhofer IIS for predictive maintenance will create new business cases for company processes

Jürgen Hupp, business field manager, networks and identification, Fraunhofer IIS, in an interview with "RFID im Blick Global"

#### Life cycle information always available locally

Jürgen Hupp identified three use cases for adaptive systems: "In the first case, information on the life cycle is 'added'. Data on manufacturing, on the construction plan, on individual components, and the object's identification number are available locally at the object. Test engineers or technicians can read out this information in the field and change the respective parts – independent of the system's connectivity. The product provides details of the servicing job and also saves the completed job's protocol in the maintenance history, which is available directly from

the object at any time. This method of data storage offers decentralised data management. If there is no connectivity to the system, the required information can be accessed locally from the product, for example via the integrated RFID transponder."

#### Sensors support needs-based maintenance

"For needs-based maintenance processes, operational data such as data from a machine or a vehicle, is captured by sensor technology. The sensors monitor the usage, saturation, and bearing wear of a product. The data collected is made available wire-

lessly from the system via a control centre or cloud application. Connectivity is the essential part of this solution. Combining passive RFID technology and sensors is also possible. The 'Smart Fibre' project has already demonstrated the potential of such a solution. In the wind power industry, a hybrid solution of RFID and sensors monitors the structure of fibre composites to prevent a wind energy plant from exceeding its capacity limits. The institute developed a wireless system that is powered by LF-technology and uses HF-RFID for data transfer. The solution was miniaturised so that it would not interfere with the composite structure of the wind turbine blades," explains Hupp.

#### Energy harvesting systems are in the prototype stage

Active radio technology is used to achieve long reading ranges comprehensively. Such an application case will present big challenges to the power supply of sensor systems in particular. "If there is no energy supply directly available, power-saving technologies are used by the sensors in order to guarantee a battery life of at least two to four years. In the "Maintenance on Demand" project, needs-based maintenance of vehicles via sensors has already been carried out. Another way to generate energy is energy harvesting systems which obtain energy through vibrations or thermogenerators. Such energy-sufficient solutions could be employed anywhere in which neither a permanent power supply nor regular battery changes are realisable. If data must be transferred for maintenance purposes directly from a machine that allows neither opening nor hardwiring, energy harvesting is the next logical step. A development project at the Fraunhofer IIS is currently in the prototype stage in order to demonstrate the technological opportunities of this solution," says the business field manager.

#### The "s-net" sensor network for connected processes and specific location

"For the precise location of individual objects or components, for example in plant farms, at factory sites, or in a hospital, various technologies are appropriate. GPS is used for location purposes in global outdoor tracking applications. Indoors, RFID and wireless sensor technology play a substantial role. The 's-net' sensor network developed by IIS connects power-sparingly and is suitable for cyberphysical systems. The communication protocol analyses the interior network structure to identify a specific object, thus making selective maintenance of a specific but portable asset possible," explains Hupp.

#### From industry to medical engineering

The business field manager explains: "Solutions where maintenance and servicing play a role can be used. From the maintenance of vehicles, machines, or drive technology in the industry to the maintenance of devices and instruments in medical engineering; everything is possible. The same technology that is used for maintenance and servicing processes also enables the location or connection and coordination of devices within the environment. With its use cases, digitation of processes crosses the boundaries into Industry 4.0. Data from maintenance can also generate added value for product development by pointing out areas for improvement, for example."



#### Highlight new ways to use data

Numerous companies are not yet aware of predictive maintenance's potential, emphasises Hupp. "The companies often only see the investment costs for innovative technology but leave the added value for processes as well as the realisable ROI out of their considerations. Specialist knowledge of the entrepreneurs in this field needs to be expanded. It is the task of the IIS, and of the Working Group for Supply Chain Services (SCS) located there, to highlight new paths to making use of data. Holistic, predictive maintenance leads to process optimisation and generates added value for products and services. Outages, interrupted process, and downtimes are reduced, saving money and enhancing efficiency. Companies profit from predictive, needs-based maintenance."

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Jürgen Hupp, business field manager, networks and identification, Fraunhofer IIS

