COSENAM: Contactless Sensor/Actuator Method for Regular Health Monitoring of CFRP Structures

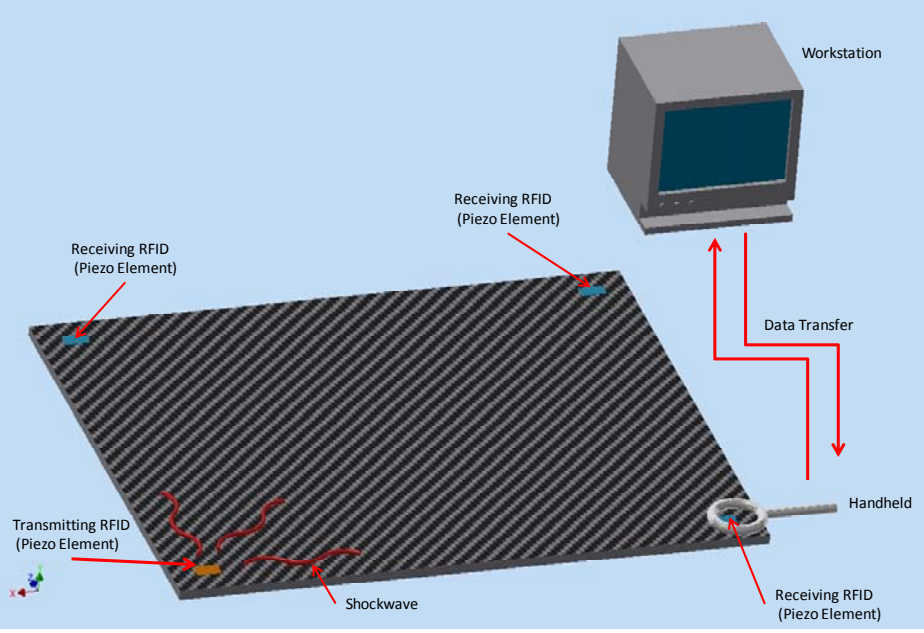
HPS GmbH, Germany has developed a cost effective method for monitoring the structural integrity of CFRP structures without touching the hardware. This method has been patented by HPS in 2007. Currently HPS is looking either for cooperation partners for delta developments to a complete system or for interested entities exploring other options w.r.t. this patent.

1. The Technology

The technology is based on a combination of RFID and piezo actuation and sensing technology. Due to the flexible and flat design, the RFID sensor actuator can be easily integrated into fiber reinforced structures during the molding process or later. The sensor / actuator patches provide:

- wireless data transfer,
- wireless energy energy transfer
- sensing and actuation of ultrasonic waves

With this combination it is possible to investigate the actual status of the material and to transmit this information wireless to an external system.



Principle of wireless health monitoring of CFRP structures

For the detection of fatigue effects, impacts or damage, such as microcracks or delamination, which cannot be detected with naked eye, several technologies have already been invented and developed. Examples or ultrasonic, X-ray, externally attached piezo-ceramics. But all of these methods need a high effort in handling of large tools over a large surface. Or cables are disturbing the measurement procedure or are decreasing the performance of the structure. In aerospace, or e.g. in the print industry, the maintenance of specific items via RFID-tags is already in use. The novelty of COSENAM is the combination of both for the process:

1) Energy is transmitted wireless into the piezo element via a lightweight handheld tool
2) After ignition of the piezo element via handheld and RFID tag, a shock wave is transmitted through the structure.
3) These waves are receipted by another piezo-element identified by the connected RFID tag.
4) These information will be submitted again back to the handheld
5) Data evaluation can be performed at a separate work station or automatically.

The detection of failures are based on calibration of the structures and a data base.

2. Potential Applications

The technology achieves its highest benefit in structures, which are subject to very long life cycles such as in aerospace, automotive and wind energy sector. Continuous maintenance and technical checks are necessary in order to avoid major failures up to catastrophic events.

A cost effective method for the health monitoring, such as COSENAM, enables a quick control of the structure without lengthy attachments of cables or measurement systems.

Due to the contactless nature of this technology and the easy identification of the sensor actuators the technology has high potentials in cost savings compared to present wired solutions.

3. Patent Reference

Patent Owner: HPS High Performance Space Structure Systems
Patent N°: DE 10 2007 014 696 B3

3. Interest by HPS

The technology is not yet in a final development status. Delta investigations must still be performed up to several demonstrator models for the verification of the function. HPS is searching either a partner for the delta development, e.g. in the data processing and signal investigations, or in the programming and development of the specific RFID tag. On the other hand, in case of interest and common agreement, HPS is also willing to sell the patent.

4. Contact

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