

Smart acoustic sensors for minimum machine downtime

Hannover Messe 2019: Fraunhofer IDMT from Oldenburg demonstrates a system for acoustic condition monitoring of industrial machines, which is also available “as a service”

At Hannover Messe, taking place April 1st to 5th, the Oldenburg based branch of Fraunhofer IDMT will be presenting the latest version of its intelligent system for acoustic condition monitoring (Hall 2, Booth C22). The experts from the Hearing, Speech and Audio Technology (HSA) division of Fraunhofer IDMT have developed a solution that uses smart acoustic sensors to monitor the condition of an industrial machine by analyzing the sound it produces. This allows detecting malfunction at a very early stage, so that machine downtime can be reduced to a minimum.

Oldenburg/Hannover, March 20, 2019. With the help of axial piston pumps, machines are capable of lifting heavy loads. In conveyor systems, axial piston pumps are the driving force. If these critical components fail to operate properly, damage to the machine, and consequently machine downtime, is likely to occur, oftentimes resulting in considerable financial loss. This is the reason why the experts from the Hearing, Speech and Audio Technology (HSA) division of Fraunhofer IDMT decided to focus on axial piston pumps in their

effort to develop a solution for acoustic condition monitoring in industrial settings. By analyzing the sound produced by these pumps, Fraunhofer's system can ascertain whether or not a pump works as it is supposed to.

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Acoustic condition monitoring for minimum machine downtime

This is how Fraunhofer's condition monitoring system works: Battery powered sensors are locally attached to capture the sound produced by the pump (either airborne sound or structure-borne sound); then the sensors compare the recorded sound with reference audio data; this aggregated information is eventually made available in the form of metadata. The solution, which can be retrofitted to any machine, not just allows making a general assessment of the condition of a machine, but also provides information on the type of problem detected (e.g. radial/axial play in ball bearings, problems with the hydraulic system). Using the information provided by the system the service engineer can immediately start to check the machine before any damage and machine downtime can occur.

Danilo Hollosi, head of the Acoustic Event Recognition group at Fraunhofer IDMT in Oldenburg, is proud of what the researchers' have achieved so far: „Based on our sensor systems for pattern recognition, we have developed a robust and reliable system for acoustic condition monitoring that is capable of significantly improving the process of production facility maintenance. And our system addresses both the needs of facility operators and facility providers“.

Treading new paths: acoustic condition monitoring “as a service”

At Hannover Messe, the Fraunhofer experts will be showcasing a demonstrator that allows configuration of the wireless sensor nodes over a tablet PC.

Detected acoustic events can be visualized on a dashboard. For real-world industrial settings, the system can easily be integrated with existing communications and sensor infrastructures.

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Fraunhofer's condition monitoring system is also available „as a service“ that can be distributed via alternative business models (e.g. leasing). Data generated by the system can be made available for being used for other purposes in Industry 4.0 scenarios.

„This opens up new opportunities for facility providers to extend their portfolio of products, and for facility operators to benefit from alternative ways to procure condition monitoring services. We and our partners are currently designing further business cases for scalable services based on our acoustic sensor systems“, says Danilo Hollosi.

Designed for security critical applications requiring enhanced data protection

An important advantage of the system lies in the fact that data is predominantly processed directly on the sensors.

This means that the system can be used locally and without requiring access to a server or the Internet. The system thereby meets highest security standards also when used in facilities that require special protection.

The condition monitoring system has mainly been developed and tested in a research and demonstration project named „ACME 4.0“, which is funded by the German Federal Ministry of Education and Research. It has achieved Technology Readiness Level 7 already. In 2018, the system was extensively

tested in real-world scenarios with user companies from various industries (e.g. energy supply, water management, heavy industry, machine construction, plant engineering). Apart from being applied for pumps, the system was also used for condition monitoring of motors, turbines, and compressors. Industry partners in ACME 4.0 are Bosch Rexroth AG and Infineon Technologies AG.

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Feel free to stop by Fraunhofer IDMT's booth C22 in hall 2 at Hannover Messe (April 1 to 5, 2019), and check out the demonstrator for acoustic condition monitoring in industrial settings. In addition, visitors will have the opportunity to test a demonstrator showcasing how automatic speech recognition (speech-to-text) can be used for hands-free process documentation.

Hearing, speech and audio technology at the Fraunhofer Institute for Digital Media Technology IDMT in Oldenburg

The objective of the Hearing, Speech and Audio Technology Division (HSA) at Fraunhofer IDMT in Oldenburg is to transpose scientific findings in the field of hearing perception into technological applications. Its applied research priorities are the improvement of sound and speech intelligibility, personalized audio reproduction and acoustic speech and event detection. Application fields include consumer electronics, transport, the automotive sector, industrial production, safety, telecommunications and healthcare. Through scientific partnerships, Fraunhofer IDMT-HSA has close links with Carl von Ossietzky University, Jade University and other institutions engaged in hearing research in Oldenburg. Fraunhofer IDMT-HSA is a partner in the »Hearing4all« Cluster of Excellence.

Further information: www.idmt.fraunhofer.de/hsa

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Bildunterschrift:

Foto 1: Fraunhofer IDMT from Oldenburg uses smart acoustic sensors to monitor the condition of an industrial machine by analyzing the sound it produces. The system, which is also available „as a service“, is designed for being used also with security critical applications requiring enhanced data protection.

Foto: © Fraunhofer IDMT.

Foto 2: At Hannover Messe, the Fraunhofer experts will be showcasing a demonstrator that allows configuration of the wireless sensor nodes over a tablet PC. For real-world industrial settings, the condition monitoring system can easily be retrofitted to all kinds of existing infrastructures. Danilo Hollosi, head of the Acoustic Event Recognition group at Fraunhofer IDMT in Oldenburg, will be welcoming you at our booth C22 in hall 2.

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