RELIABLE, COST-EFFECTIVE CONDITION MONITORING, PROGNOSTICS AND HEALTH MANAGEMENT OF ROTATIONAL MACHINES AND DRIVES

Fields of use
Manufacturing/industrial

Mathematical modelling Statistical Analysis; Machining (turning, drilling, moulding, milling, planning, cutting); Plant Design and Maintenance Sensor Technology related to measurements; Vibration and Acoustic engineering

Current state of technology
Field tested/evaluated

Type of cooperation
Licensing cooperation agreement, technical cooperation agreement

Intellectual property
Copyright, Secret Know-how

Developed by
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Summary

A Slovenian public research organization has developed a platform built on a portfolio of hardware and software modules for diagnosis and prognosis of the remaining useful time of rotational machinery. The employed algorithms are completely new to the industry. The solution is capable of non-invasive monitoring on a wide range of classic industrial drive components.

Partners are sought for licensing and technical cooperation agreements.

Description of the invention

The researchers come from a Slovenian public research organization. The activities of the research group include analysis, control and optimization of various systems and processes, research and development of new methods and algorithms for automatic control, the design of computer-aided systems for control and supervision of devices, industrial and other processes.

On-line condition monitoring (CM), prognostics and health management (PHM) are instruments that enable migration from resource-intensive to cost-effective proactive maintenance programs. Currently, the main cost drivers for CM and PHM systems are (i) costly design cycle, (ii) use of conventional CM methodology that cannot handle nonstationary operational conditions, (iii) limited prognostic abilities reduced to trending only, (iv) poor interoperability with existing production management computer systems.

Most of the answers to these issues are constituents of the PHM prototype platform proposed. It builds on a portfolio of hardware and software modules backed by unconventional award-winning algorithms for robust diagnosis and prognosis of the remaining useful time of the rotational industrial machinery. The system can be integrated into the new machinery or implemented to the existing machinery. The machines and drives targeted for PHM solutions fall in the middle power and cost range which represents the majority of the industrial machinery. Large machinery in the top price range - although not excluded - are probably already equipped with proprietary original manufacturer systems for this purpose.

The platform is a low-cost diagnostic and prognostic device and software capable of noninvasive automatic monitoring on a wide range of classic industrial drive components, embedded systems and high-speed electromechanical systems.

Due to its relatively low-cost and the ability to not only monitor the condition of the machinery but also to predict the remaining useful life of a machine, the platform is offering a high return on investment to a broad spectrum of industrial end-users with ubiquitous and moderate price range asset portfolio, and not only to the owners of high-cost machinery.

The platform is developed to the level of prototype and is being functionally tested in an industrial environment. In the present form, it can already be used in many application areas like HVAC (Heating, ventilation, and air conditioning) systems, smart machines with self-diagnosability properties, etc. The results of field applications demonstrate all its powerful features: robustness to variable operating conditions, ability to perform prognostics of the remaining useful life, efficient and low-cost design cycle, and flexibility to specific demands of different applications. For example, implementation of the platform to a sending machine was able to assess the remaining useful time with 10-30% accuracy during the last half of the machine operation. There are other success stories, too.

The partners are sought among the manufacturers of the machinery and end-users in oil, petrochemical, gas, energy and process industry. The cooperation agreements include:
• Platform and know-how licensing.
• Technical cooperation with machinery manufacturers to integrate the platform into their products.

Main Advantages

The platform has the following advantages over the conventional CM and PHM systems:
▪ High accuracy of predicting the remaining useful life of the machinery.
▪ Lower design-cycle cost.
▪ Capability to handle of non-stationary operational conditions.

Interoperability with existing enterprise resource planning (ERP) systems.

Partner Sought

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