

Real time detection of nanoscale vibrations for processes with high precision requirements

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Abstract

A Spanish public research organisation has developed a procedure to detect nano scale vibrations at real time due to dynamic imbalance of high precision rotating parts and a system to develop it. This technology enables the design of new control systems in processes with nanoscale vibration, and thus improving accuracy and precision of rotating parts. A patent license and collaboration agreement are sought

Description

This technology has developed a procedure to improve the performance of ultra precision rotating devices by detecting nanoscale vibrations. The measuring

system estimates, in real time, the nanometric eccentricity on the device's spinning shaft, at high rotating speed. This eccentricity is caused by the device dynamic mass imbalance. The rotating devices for this type of application usually have the spinning shaft supported over fluid or magnetic bearings.

The eccentricity is estimated from the steady state vibrations caused on the device structure, during the rotary movement. These vibrations are measured employing piezoelectric accelerometer sensors. Then, by applying advanced spectral analysis algorithms to the vibration signals, the harmonics components related with these vibrations are identified. The quantification of the harmonics power, serves to estimate the eccentricity of the rotating device.

The use of piezoelectric accelerometer sensors instead other displacement sensors types, like capacitive, inductive, or others, is due to the versatility of this sensor type under several working environment conditions.

The main technologies involved are communication technologies (Ethernet-based approach), software engineering (embedded application), signal processing (frequency domain analysis) and Artificial Intelligence-based techniques (fuzzy logic).

The detecting system has been tested on air bearing

rotating devices, with high stiffness and vibration biggest than 15 nm.

Innovations and advantages of the offer

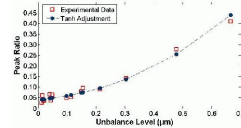
The main advantage of this real-time and continuous monitoring of ultra precision rotating devices is the improvement of the overall accuracy and precision of rotating parts by on-line detection of vibrations.

The monitoring system provides the necessary signals to design a control system to reduce nanoscale vibration, and thus increase the precision of the holding system.

It is a low cost - low complexity solution to deal with high bandwidth – low signal to noise ratio of vibration signals.

Current and Potential Domain of Application

Industrial manufacture of high precision processes



For further information (including IPR status) please contact:

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