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Abstracts of Papers

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[203] Lamb wave modelling and experimental study on acoustic emission using ANSYS

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ANSYS finite element modelling software was used to study the velocity of Lamb waves in metallic objects. For Lamb waves, velocities and frequencies are dependent on each other; therefore, to pin down the source location with minimum error it is vital to study excited wave modes. Here, we have used a Hsu-Nielsen lead break test as an artificial acoustic emission (AE) source. For in-house experiments a prototype AE system was developed and thin film transducers were used. We performed the lead break tests in finite element modelling software by selecting an appropriate exciting force, dividing the test object geometry into elements of suitable shape and size and setting the calculation steps. The time difference between the arrival waves on each node revealed that the velocity of the lower order Lamb wave mode is more dominant. Finally, the theoretical simulation results were compared with experimental results that were found to be in good agreement, thus signifying that the use of ANSYS finite element software to simulate Lamb waves in acoustic emission experiments is viable and acceptable.

[204] Vibration response demodulation, shock model and time tracking

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The reliable monitoring of a rotating machine requires amplitude and phase demodulation over well-chosen frequency bands. Although often applied, the behaviour of this estimator is not so well established in such a context, particularly for earlier and accurate fault detection. In an attempt to provide keys for the understanding of vibration measures, this paper proposes a vibration signal model of a faulty gearbox. More attention is given to the amplitude modulation function to better model the shocks created by local tooth defects and incurred by all of the meshing frequency harmonics. The proposed shock model is defined as the response of a mechanical system excited by a Dirac function, assuming that the fault does not evolve during the measure. Parameters of the resulting response models, exponentially periodic waves, are set to fit as much as possible to a sequence of signals to model the time evolution of the GOTIX bench during a fatigue test. All signals are processed by AStrion, an automatic and data-driven spectral monitoring approach. Interestingly, setting various fault model parameters, damping factors, amplitude modulation rates, frequency modulation indices, fault location and number helps regarding the understanding of the modulation phenomenon and illustrates the intrinsic limits of the demodulation approach.

[205] Some problems of vibration-based health monitoring

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Integration of the Russian scientific and technological achievements with similar foreign developments caused a conflict of interest and misunderstanding, particularly in machinery condition monitoring, diagnostics and health monitoring. The conflict of interest is primarily associated with the commercial interests of certain firms and companies aimed at selling their products and the related intentional and unintentional misconception in machinery diagnostics. The misunderstanding relates to the lag of foreign countries in some fields of science and technology, specifically in machinery vibroacoustic diagnostics and health monitoring.

The purpose of the paper is to present the basic terminology of diagnostics, monitoring and vibroacoustics and its application to real engineering solutions.

The terminology is suggested by guidelines and regulations, reference, scientific and educational materials, including the research carried out by the authors.

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