

APPLICATION OF ACOUSTIC IMPULSE RESPONSE IN DIAGNOSTIC TESTS OF ROTOR BLADE IN STATIONARY CONDITIONS

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ABSTRACT

A modified vibroacoustic method for the detection and observation of changes in the structural parameters of rotor blade in stationary conditions is presented in the paper. The modification of the method is connected with the excitation of the blade at two points and the used method of vibroacoustic signals analysis. The signal processing was enriched with new elements, which are based on some parameters of an analytical form of the auto-correlation function and power spectral density function. A new function was worked out in the form of the quotient of the power spectral density functions of acoustic response signals due to blade excitation at two thoroughly described points. Parameters of the new function present useful information for the evaluation of changes in the technical state of the blade. The characteristic feature of this information is that in the unchanged conditions in which the analysis is conducted (the fixed signal of excitation, unchanged conditions of the blade support at the test stand), it can be obtained from two measurable output signals and is highly sensitive to damage.

The suggested approach to the evaluation of changes in the structure of a rotating machinery element such as an axial-flow compressor blade reveals strong sensitivity of changes of the newly determined function parameters to the typical damage of the blade of this type.

Key words: rotor blade, vibroacoustic diagnostics, signal processing.