

1.8.2. MODELLING OF DYNAMICS OF HETEROGENEOUS SYSTEMS AND STATE IDENTIFICATION

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The condition monitoring and diagnostics problems of constructive elements of different mechanical systems were investigated. In that paper the systems heterogeneity is related with the changes of its technical state or physical condition. Modelling of dynamics and analysis of correlation with system (object) state is the base for new diagnostic methods and algorithms.

The theoretical models of damaged continuous mechanical and heterogeneous multi-layered cylindrical systems with different features of elasticity were created. On this base new vibration diagnostic methods and algorithm for impulse impact optimization were made for directional system physical condition change. Applying analytical and finite elements models the dynamical characteristics were investigated and new vibration diagnostic methods and algorithm for systems defect level were suggested: it allows comparing the safety of monitoring objects and technological systems.

The diagnostic method based on Lamb waves' interference was created for mentioned systems, the methodology signal processing of Lamb waves' interference was based on two dimensional functions Fourier transformations and gradient of signal image characteristic parameters monitoring. It allowed determining the thickness of internal layer of heterogeneous cylindrical structure with significantly smaller outlays. The method which allows controlling interference of Lamb wave and achieves better quality of information of diagnostic signals in the cylindrical systems inner wall state control was developed too.