Dynamics of a flexible vertical rotor on active magnetic bearings during seismic disturbances.

Viktor Ovchinnikov[1], Mikhail Nikolaev[1], Vasily Litvinov[1]

[1]Research Institute of Mechanics Lobachevsky State University of Nizhny Novgorod, Russia

Previously developed computer model of dynamics of a complex flexible rotor on active magnetic bearings (AMB) [1-3] was improved allowing accounting for the following factors: seismic disturbances; rotor interaction with safety bearings; defects incurred during assembly process which substantially affect rotor dynamics, including non-orthogonality of the disk of axial active bearing to rotation axis. Model fitness is confirmed by numerical experiments studying effects of seismic disturbances on dynamics of vertical flexible rotor on AMB in the scale model of nuclear reactor with gaseous heat-transfer agent and in a model of vertical axial high-power wind plant. Rotor control system parameters and magnitude of seismic disturbances allowing for rotor operation without contacting safety bearings were determinted. Sample displacement of rotation axis of flexible rotor in one of radial AMB computed for the scale model during seismic disturbance is shown in Fig. 1.

This work was supported by the Russian Science Foundation, project no. 16-19-10279.

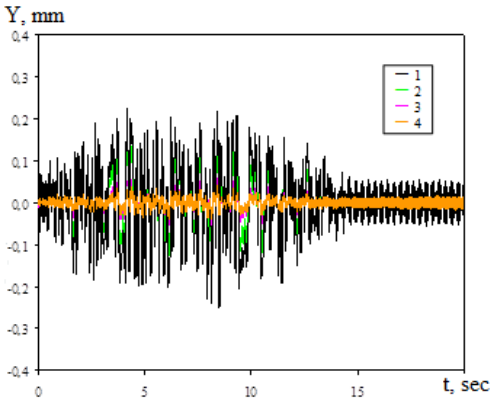

Fig. 1. Displacement of rotaion axis of flexible rotor in one of radial AMB in the scale model during seismic disturbance for different control system parameters.

[1] V. Ovchinnikov, M. Nikolaev, V. Litvinov, “Algorithm for Accounting for Inner Damping in a Computer Model of Dynamics of a Flexible Rotor on Active Magnetic Bearings.” *ACES Journal*, vol. 32, no. 8, pp. 726-730. 2017.

[2] F. Mitenkov, V. Ovchinnikov, M. Nikolaev, et al., “Modeling the dynamics of the electromagnetically suspended vertical-axis wind power plant,” *Problems of Strength and Plasticity*, vol. 74, pp. 184-189, 2012.

[3] F. M. Mitenkov, V. F. Ovchinnikov, M. Y. Nikolaev, et al., “A model of the dynamics of a flexible nonuniform electromagnetically suspended rotor,” *Vestnik of Lobachevsky University of Nizhni Novgorod*, vol. 4-1, pp. 171-176, 2012.