New Theory of Rotor Dynamics:
Dynamics of a Rotor Having Hinged Support and Elastic Support

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ABSTRACT

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In modern machines frequently fix a rotor in two supports, one of which is a hinged support and another elastic support. However, for such rotors there is no simple and correct equation of dynamics. The new "inertial" theory of dynamics of a rotor specifies a new way to the decision of problems of dynamics and describes features of rotation of a rotor by means of the simple algebraic equations.

In article given the "inertial" theory is applied for the description of dynamics of a rotor. The forces and rotating moments enclosed to a rotor are considered for a conclusion of the equation of dynamics. Directions of action of forces and the moments also are defined and represented on the drawing. Features of dynamics of a rotor are considered in rotating system of coordinates. The new, basic equation of dynamics of a rotor is received and its analysis also is carried out.

Three ranges define features of rotation of a rotor. These ranges are considered. Formulas for calculation of parameters, forces and the moments are received for each of ranges of rotation of a rotor.

New dependence for definition of critical speed is received. Conditions at which for a disk and cylindrical rotor there is a critical speed are received. Absence of a full self-centering of a rotor is shown.

The special attention is given to definition of corners between plane of action of the main vector of unbalance and direction of displacement of a geometrical axis, and also the centre of a mass of a rotor. Also corners between the main vector of unbalance and vectors of forces are determined.

The special attention is given to rotation of a rotor without an elastic support.