

Mikhail MYSLOVICH¹, Lesia SOBOLEVSKA², Andrii WOLTERS²

Institute of electrodynamics of Ukrainian National Academy of Sciences (1), Kyiv National University of Building and Architecture (2)

Formation of the distribution changes the moment on the rotor shaft power machine and use the characteristics of this distribution for its diagnosis

Abstract. The problems of diagnosis of rotary power machines use as diagnostic features characteristics of the distribution of torque on the shaft of the machine, which is diagnosed.

Keywords: linear stochastic periodic process, diagnostics of rotary power machinery.

Problems of diagnostics of technical state of nodes rotary power machinery associated with the solution of a number of problems, both theoretical and practical plan. Using the information recorded as the rotor, and at fixed sites rotary energy machine (REM) and processed with the help of information-measuring systems (IMS) status is determined by the technical condition of the studied machine. In turn, the reliability of diagnosis using modern IMS can be improved by taking into account the information contained in the parameters of a diagnostic signal that is in functional dependence on the angle diagnosed EM. In this case, the diagnostic features you can use the deviation of the angular velocity of the shaft or the amount of torque on it. It should be noted that these diagnostic features are random.

In constructing models of non-uniformity of the angular velocity and moments on the shaft of REM considered the relations that characterize the rotation angle of the shaft, depending on the time

$$\varphi_t = \varphi_0 + \omega_0 t + \varphi_\varepsilon(t),$$

where φ_0 - the initial phase, which is fixed by a special sensor REM, and therefore, in what may be set equal to zero ω_0 - mean angular velocity, which is defined by

$$\omega_0 = \frac{\pi n}{30}, \quad n - \text{the number of shaft revolutions per minute}$$

$\varphi_\varepsilon(t)$ - unevenness of the rotation angle of the shaft.

Function $\varphi_\varepsilon(t)$ - is nothing else than the fluctuation of the rotation angle of the shaft relative to its rotation angle, uniformly changing. Consequently, it is this quantity to be investigated, since carries information about the unevenness of the rotation shaft REM. The latter may be associated with the appearance of defects in its various sites.

In solving the problem of diagnostics REM in this study used a value of torque at its shaft. Obtained a solution of a differential equation, which allows us to investigate the distribution of this moment on the shaft REM.

Given the randomness of physical processes that accompany the work of the REM, it is better to use statistical methods in diagnostics. Among these methods,

we should first distinguish methods of analysis of uneven distribution of the angular velocity of the shaft REM. The choice for the investigation of irregularities of the angular velocity of the shaft due to the fact that it is the shaft is mechanically connected to the generator rotor through the gearbox (wind power units) or clutch (diesel-electric units) and, therefore, non-uniformity of the angular velocity is the most informative in terms of diagnosis REM.

For analysis and processing of information signals provided in the form of angular observations, statistical methods must have some special features. You must enter the definition of distribution function, characteristic function and moments that are consistent with the periodicity arises when considering the circle. One of the methods of data measuring angles - rose diagram of observations, which consists of sectors with a common vertex, the angles are at the top correspond to the selected class intervals, and the radii are proportional to the frequency of contact with the appropriate class intervals. Convenient representation of the histogram of angles of observation is a linear graph of the histogram, which is deployed on the interval $[0, 2\pi)$ circular histogram. Further development of this method, taking into account the cyclicity of the processes is the representation and subsequent statistical analysis of experimental data measured in the form of φ -series.

Based on studies of uneven distribution of angular velocity and moment on the shaft of REM have been proposed diagnostic features that allow diagnosis of some defect unites REM. These diagnostic features were experimentally tested for power wind generator of type USW 56-100.

Authors: ¹Prof., Dr. Mikhail Myslovich, E-mail: mysl@ied.org.ua; Institute of Electrodynamic of National Academy of Science of Ukraine, 56, Peremogy av., 03680, Kyiv, UKRAINE; ²Assistant Lesia G. Sobolevska, E-mail: sobolesya@gmail.com; ² Assistant Andrii O. Wolters, E-mail: wolters@ukr.net; Kyiv National University of Building and Architecture, 31, Povitroflotsky avenue, Kyiv, UKRAINE;