



AUTOMATED SYSTEMS FOR DIAGNOSING AND MONITORING THE CONDITION OF ELECTRIC EQUIPMENT

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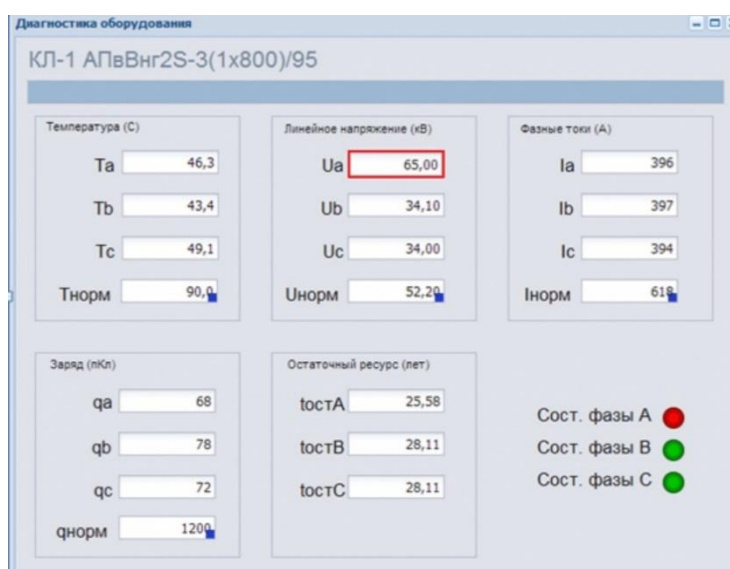
Annotation: *Diagnostic and monitoring systems are developing in two directions - the first is for the development of automation, and the second is for maintenance and repair. The first is focused on measuring and analyzing processes in automatic control systems for machines and electrical equipment. These decisions are made in a split second. Other requirements are set for maintenance and repair: determining the speed of decision-making, diagnosis, diagnosis and prognosis. The article analyzes the modernization of diagnostic and monitoring systems for machinery and mechanisms in long-term navigation conditions. Setting the task Stationary monitoring and diagnostic systems of units are designed to diagnose their components during the operation of electrical equipment. Monitoring tasks are solved for the most critical units, according to current standards.*

Keywords: *analyze, trend in diagnostics, technical condition*

Based on systems of deep diagnostics of mechanisms with rotation nodes, we will consider several technical solutions for optimizing the on-board monitoring and diagnostics system of ship mechanisms with separation of functions of condition monitoring, operational and deep diagnostics. The first is to use local devices for measuring and analyzing vibration and continuous current. Additionally, we organize buffer memory to ensure operation devices for recording primary signals. To measure and analyze vibration signals, we select narrow-band spectral analysis (up to a frequency of 10 kHz), broadband spectral analysis (1/3 frequency), measurement of the level of low-frequency vibration in the standard frequency band (10-1000 Hz) and the magnitude of pulsed high-frequency (up to 20 kHz) vibration components. The minimum rotation speed of the rowing rig on the vessel is 50-100

rpm. For current diagnostics, we use narrow-band spectral analysis, but with a higher frequency resolution. Then we increase the frequency resolution four times and double the update interval of the current analysis results.

To ensure the required level of reliability of the equipment, the technique for determining the technical condition should include a comprehensive assessment of a certain number of parameters characterizing the actual condition of the diagnostic object. Currently, the global trend in diagnostics is aimed at using non-destructive testing methods and the process of determining the technical condition should be in monitoring mode under operating voltage. Taking into account the need to use a more efficient control method, EMA LLC has developed an automatic monitoring system for diagnostic parameters of high-voltage equipment, which allows obtaining a set of diagnostic parameters and, based on the analysis, assessing the technical condition of the facility in monitoring mode under operating voltage. An individual set of diagnostic parameters is selected for each type of equipment. The developed system is a single hierarchical three-level distributed system for measuring, converting, transmitting and processing diagnostic parameters. The system operates in real time at the pace of the technological process.



Example of visualization of monitoring results

The system's hardware and software are based on modern methodology for diagnosing high-voltage equipment, advances in measuring and information technology, and experience in monitoring the technical condition of electric power equipment under operating voltage (in monitoring mode, "on-line").

Currently, there are prerequisites for solving the problem of assessing the technical condition of the equipment of electrical networks of power systems, on the basis of which it will be possible to carry out its repairs and maintenance (maintenance) if necessary. At the same time, taking into account the already developed regulatory documents for determining the quantitative and qualitative assessment of lines, TP, RP of voltage distribution electric networks 0,38 - 6 - 10 kV, overhead power transmission lines with a voltage of 35 - 750 kV [2], appropriate integrated systems have been created, which allow not only to evaluate the technical condition of the equipment managed by the distribution zone and the line service, but also to automate as much as possible the process of planning and performing repairs and maintenance of this equipment. At the same time, an automated system consisting of a number of information and reference (ISS), information technology and expert subsystems was developed to solve the tasks of monitoring and evaluating the technical condition of the rest of the power system equipment and planning its repairs, if necessary (see Figure). The first ISS of this integrated system contains regulatory and reference information on tests. These are the volume and standards of tests, the standards of time for their implementation, etc., as well as information on equipment passports and its elements, which is used in the analysis of tests. The defect log is used not only for analysis, but also for planning test schedules, calculating reliability indicators of electrical equipment, etc. In addition, similar to the repair forms for thermal and electromechanical equipment of thermal power plants and nuclear power plants, repair passports have been developed, which store all information on repairs and maintenance of electrical equipment of substations, including all its tests during repairs and maintenance. Based on this information, it

is possible to assess the technical condition of this equipment to some extent after repair.

Currently, due to a significant increase in television measurements, almost the entire supply network of the power system is “viewed” and, as a result, there is sufficiently detailed operational information for its main switching and oil-filled equipment that can be used to monitor the technical condition of this equipment. Therefore, the block of regime information we have created allows us to accumulate and analyze it. At the same time, for almost the entire 220 kV and higher network and part of the 110 kV network, it is possible to obtain with great accuracy the maximum, minimum, average values of the load, power overflows, voltage levels in the nodes of the electrical network, the number of switches in it, etc., and if appropriate recorders are available, information about short circuits that have occurred. This information will then be used to perform certain types of tests, and taking into account the failure log, defects, and related programs to calculate reliability indicators of electrical equipment.

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