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MODELING A FUZZY LOGIC DECISION-MAKING SYSTEM FOR A COLD ROLLING MILL DIAGNOSIS SYSTEM

The automated system for diagnosing electromechanical processes of rolling mills is a specific system, the efficiency of technological processes and the quality of rolled products depend on the quality of its work. The development of systems for continuous monitoring and diagnostics of the technical condition of electrical equipment of a metallurgical enterprise is the main direction of designing intelligent information systems for industrial enterprises. Quite often, certain mathematical and computer models of equipment are used to check the functionality of the proposed diagnostic and monitoring systems. Prospective areas of development of these systems are the use of databases of monitoring systems and expert knowledge in decision-making systems for service personnel, as well as elements of artificial intelligence for systems of automatic control of the technological process.

The purpose of the work is to develop a computer model of the decision-making system using fuzzy logic for the diagnostic system of the cold rolling mill, which will increase the efficiency of the existing diagnostic system.

Data from current and voltage sensors, which are available on the industrial equipment of the cold rolling mill No. 1 of Zaporizhstal PJSC, are used to obtain measured information on diagnostic parameters. Information about the value of the tensile force of the rolling metal strip can be obtained both by installing additional measuring devices and indirectly, using mathematical models of the current radius of the roll and the linear speed of the metal strip.

To build a computer model of the decision-making system, a package for modeling fuzzy logic systems in Matlab was used. At the input of this system, the voltage of the armature circuit of the motor of the unwinding mechanism, the current of the armature circuit of the motor of the unwinding mechanism was set; the tension of the strip of rolled metal in the area between the unwinding mechanism and the rolling cage [8]. At the output, the general state of the system is obtained, which is completely dependent on the values of the input data. The function of belonging voltage and current of the armature circuit of the unwinding mechanism, the tension of the rolled metal strip in the area between the unwinding mechanism and the rolling cage has been developed. A base of fuzzy rules was developed with the use of given membership functions. To build this base of rules, a model of the "how-what-that" type is used, with the help of which connections are established between the input and output parameters of the system.

Conclusions. A computer model of the fuzzy logic decision system for the cold rolling mill diagnostic system was developed, taking into account various situations with input and output data. Model testing has shown that the system works correctly according to the established requirements and the developed fuzzy rule base, and can be used to diagnose the pre-emergency condition associated with the breakage of the rolled metal strip.