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CONSTRUCTION PRINCIPLES OF ELECTROTECHNICAL COMPLEXES CONTROL SYSTEMS OF AGRICULTURAL PRODUCTION

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The results of construction principles research of automatic control systems of agricultural production, which are influenced by natural disturbances, in order to increase energy efficiency, resource conservation and productivity are shown.

Key words: electrotechnical complexes, biological objects, natural disturbances, stochastic process, a neural network.

Biotechnological objects primarily include poultry farms and greenhouses. Both areas except technology and process equipment (technical facility) have biological filling (chicken, plants). Each of these biotechnical objects characterized by a significant energy consumption. So for poultry in the cost structure of production, the share of energy up to 20 %, and for greenhouse plants - up to 70 %.

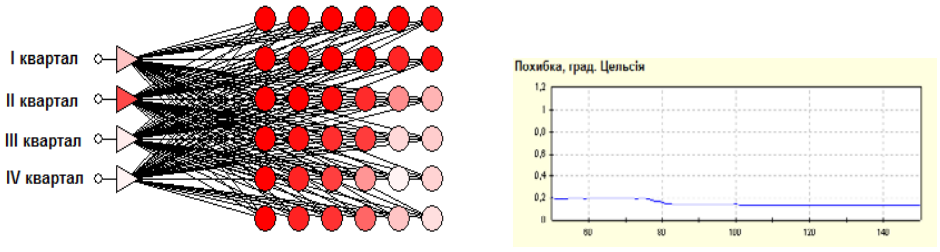
With rampant increasing of energy prices is important to use control algorithms of electrotechnical complexes which accompany appropriate technology, taking into account the biological filling state and maximize production profit primarily by reducing energy costs. The intelligent control systems of electrotechnical objects are able to form such algorithms, which are used the theories of stochastic processes, neural networks, game theory and statistical decisions, etc.

The purpose of research – development of scientific bases of agroindustrial production control with improving the energy efficiency, resource conservation and productivity based on the features of the natural disturbances dynamics and states of biological objects.

Materials and methods of research. These circumstances are explained by the fact that the management policy electrotechnical complexes implement stabilization modes designed to maximize performance as plants and birds. In

conditions such cheap energy management strategy was, to some extent, justified, as it creates the conditions for increased production, which is a characteristic feature extensive economy. It does not take into account the dynamic features of natural disturbances (temperature for poultry, temperature and intensity of solar radiation for greenhouses), filling biotechnological state of biological object, according to experts, significantly affect the performance of living organisms [1].

Taking the observations by the external temperature during 2010, dividing them quarterly, a package of applied mathematics program "Statistica" synthesized and configured with the mean error of 0,13 ° C Kohonen neural network (Fig. 1).



a) b)

Fig. 1. Structural and functional parameters of Kohonen neural network: a - network architecture, b – network training

Sample of energy efficient control systems electro technical complex in greenhouses for production testing is implemented on the basis of forecasting natural disturbances using stochastic processes and neural (Fig. 2).

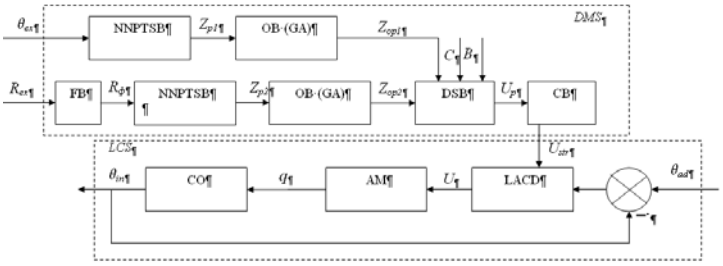


Fig. 2. Block diagram of the process control system in the greenhouse

DMS –decision making subsystem; FB – filtration block for solar radiation intensity; NNPTSB – neural network predictions for time series; OB(GA) –optimization block with genetic algorithm; DSB – decision making block; CO – control block; LCS – local control system; LACD – local automated control device; AM – actuating mechanism; CO – control object.

The results of research. The study results of intelligent control systems of electrical complexes for biotechnological objects are given in this paper. For example, the control system of growing vegetables in greenhouses allows to provide the highest profit from the sale of products and to minimize energy costs by implementing additional unit for neural network prediction of external disturbances and determine the control actions using generalized optimality criterion.