5. Енергетика

METHOD OF PROCESS CONTROL AUTOMATION BY ENERGY SUPPLY A FARM FROM AUTONOMOUS ENERGY SOURCES

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The basic task of controlling the process of supplying the farm with autonomous energy sources is to determine which energy source must be used to meet the energy needs of the farm at a certain point in time. Thus, an expert person, a person skilled in the art, who must evaluate and compare the amount of energy required by the consumer, with the amount of energy coming from the power plants at the given time, must be present. After that the expert must make a decision on the use of this or that source of energy, which is capable at this time to meet the energy needs of the farm. Since the energy flows of energy sources and the energy needs of the farm are incidental in nature, it is difficult for the expert person to make a responsible decision in a timely manner, leading to emergency shutdowns of the system and, consequently, the inability to provide the energy needs of the farm and the rational use of energy sources.

World practice has shown that it is expedient to carry out the function of a human expert with the help of automatic control systems (ACS).

Thus, it is important to develop a system of automation of the process of control the power supply of the farm from autonomous sources of energy.

Modern automated power supply systems (APSS) of the farm from autonomous sources of energy (for example, solar and wind energy) have the structure shown in Fig. 1.
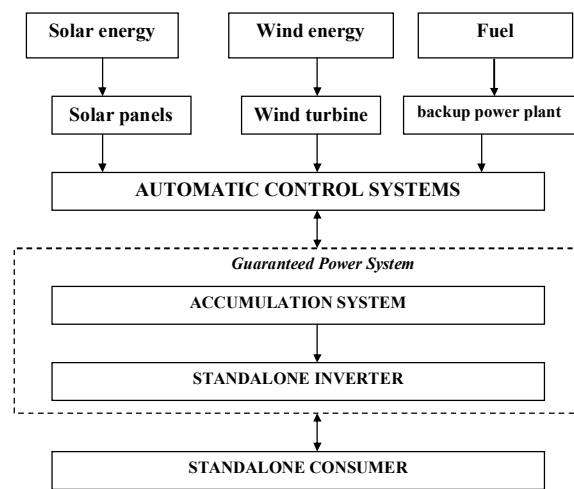

Figure 1 - Structure of the system APSS

Automation of the process of control the power supply of the farm from autonomous sources of energy, in accordance with the proposed structure (see Fig. 1), is recommended for any farms in a certain sequence.

1. Determination of the energy needs of the farm.

2. The choice of autonomous energy sources, which is expedient to use for power supply of the farm.

The search for the optimal combinations of energy flows should be performed separately for each region using the methods of decision theory.

3. It is necessary to determine the energy potential of the energies of the sun and wind.

4. Determination of the area on which solar panels are planned to be located and their number that can be located on the territory.

Assuming that the land area of a farm is used to produce agricultural products, it is not possible to locate solar cells on this area. Then the solar panels can be placed on the roof of the building, and thus the area of the territory on which the solar panels should be located is limited by the area of the roof of the building. In this case, the total number of solar panels will depend on the overall dimensions.

5. Determination of total solar power.

6. Necessary to determine the power of the wind turbine.

7. Choosing a backup power station and determining the required capacity of the storage system.

8. Determination of specific values of power plants, in order to calculate the criterion of the minimum cost of the total cost of power plants, taking into account their performance characteristics in a particular area.

In [1], the formulas for determining the conditions for efficient energy supply from autonomous energy sources are given.

9. To analyze the possibilities of meeting the energy needs of the farm and to establish a interconnection between the power consumption and the power supply of the farm.

10. On the basis of the established interconnection, determine the ranges of the input parameters of the control object, in order to create a ACS APSS farm.

11. Build the architecture of the complex decision-making fuzzy neural ACS.

12. Conduct training for the neural network.

In [2], the architecture of a fuzzy neural network is given, an example of training a neural network. The membership functions are constructed and the information processing algorithm is given.

Conclusions. The proposed method of automation of the process of controlling the power supply of the farm from autonomous sources of energy can greatly simplify the process of selecting power plants and optimal composition of the autonomous energy supply system of the farm.

Automatic control of system elements creates the preconditions for their wider implementation, since the current operation does not involve the involvement of operational personnel, programming and configuration is carried out at the stage of installation of equipment.

Bibliography.

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