5. Енергетика

INTELLIGENT DECISION SUPPORT SYSTEMS FOR A CONTROL SYSTEM OF POWER SUPPLY WITH RENEWABLE ENERGY SOURCES

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Understand the systems created on the basis of electronic computers, imitating solutions of the difficult semi structured and unstructured tasks demanding accounting of a large number of the interconnected factors as the intellectual systems of decision support.

The existing automated control systems for power supply on the basis of renewable energy sources can not always adequately react to violations and failures in process of management of a system. It is explained by the fact that in a system a number of uncontrollable parameters can be not considered, and it, in turn, significantly changes an operating mode of a system and worsens quality indicators.

The intellectual system of support of decision support has to be based on methods of automatic correction of values of parameters of a system in case of violations and failures in power supply process. Speed of identification of a cause of infringement depends on effective work of algorithms. The complexity of decision support at the same time is caused by the fact that change in work of a system can happen under the influence of various badly formulated factors, and maintenance of indicators of quality of process needs to be carried out change of various interconnected parameters. The solution of this task is modern new scientific problem.

The purpose of this work is the argument of a hypothesis of increase in efficiency of functioning of the automated control system for power supply on the basis of renewable energy sources for providing quality indicators of process of power supply, by improvement of a system due to development and inclusion in its structure of an intellectual system of support of decision support.

The structure of the automated control system for power supply on the basis of renewable energy sources is shown in fig. 1.

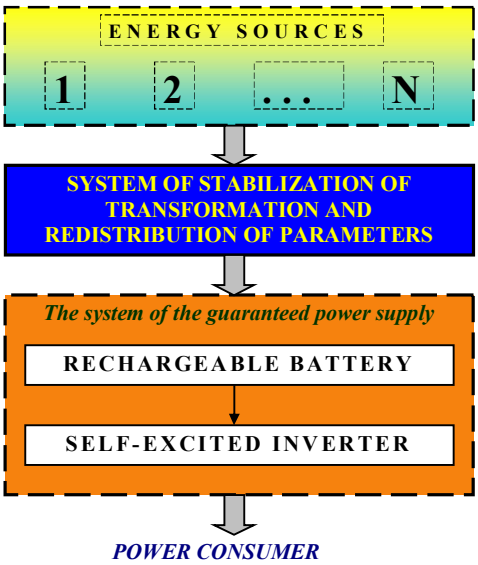

Figure 1 - Structure of the automated control system for power supply on the basis of renewable energy sources

Control object in system given on a fig. 1 is process of autonomous power supply on the basis of renewable energy sources. It consists of the following processes:

- receipts of energy from different sources;

- stabilization of input parameters;

- conversion of parameters;

- redistribution of energy.

Let's assume that the system is characterized by *m* entrance (independent) vectors variables and one day off (dependent) a vector variable. Input variables have stochastic character. The system should be constructed so that necessary processes (stabilization, conversions. Redistributions of parameters) influenced under a certain law each input in suitable time for achievement of desirable result. In a general view our system can be represented in the form presented in fig. 2.

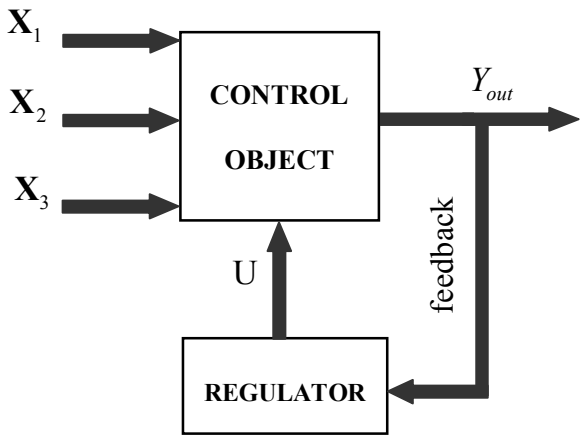

Figure 2 - A system in a general view

X1 - a system loading vector (information, energy);

X2 - a vector of influences of the external environment (set of factors and phenomena which affect processes of a system and do not give in to direct control from the consumer). They can be carried to uncontrollable values - random variables which are characterized by distribution laws, unknown laws, or those acting without any laws (environment);

X3 - a vector which sets laws of the organization and functioning of parameters of a system, the purpose boundary conditions, etc.

Y_{out} - vector of output coordinates (is a product or result of activity of a system). At the exit the system should satisfy to a number of criteria, the most important of which are stability and reliability of work.

U - vector of managing influence.

By means of feedback coupling information from an exit of a system of a control object is transferred to regulator. Then this signal having information on the performed operations is compared to a signal which sets loadings in a system. In case of a mismatch between the actual and planned work status, operations on elimination of this mismatch are performed.

Uncertainty in this system is divided into two versions.

First - the statistical uncertainty caused by randomness. It fitted it is based on use of laws of accidental events.

Secondly - the true uncertainty when it is unknown what of the known or unknown factors (laws) influences in this specific case accidental events. For example fault of one of energy converters, unforeseen natural disasters, sharp growth of loading in a system. Probabilities of emergence of an event, is considered in the conditions of such uncertainty, it is possible to appropriate the corresponding value, but this assessment is purely subjective and is not confirmed by exact calculations.

Other kinds of uncertainty are: impossibility of accounting of all factors influencing decision-making, difficulties of their quantitative assessment.

In the course of carrying out systems analysis it is necessary to consider three main types of uncertainty:

1. Uncertainty in assessment of uncertainty of solutions which is connected with a number of important factors and the moments. Such type of uncertainty always takes place irrespective of the fact which in the way we receive estimates (an analytical or heuristic way)

2. The uncertainty caused by inaccuracy of prediction of events in the future or conditions in which the system will be used. It can be caused by errors in the technical and economic analysis, in planning and management even if the external environment and factors of real life change according to our calculations. For example, the system is implemented can resemble not that which was projected, or characteristics of separate elements can be changed, and together with it the principles of use of a system in general can be changed.

3. Uncertainty of the purpose. It is explained by the fact that in complex systems there are always several purposes, to each of which there corresponds the criterion. In this case it is necessary to solve a complex problem for assessment of the different purposes and to carry out their optimum choice by certain criteria.

Also at design of complex systems of management it is necessary to consider the internal and external conflicts. They arise for three reasons:

1. The complex system consists of many parts which have the tasks. Permission of each of such tasks is defined by resources which are in the corresponding part of a system. But share of a system is limited. The conflict is that it is necessary to distribute a total resource in parts of a system.

2. As the system consists of parts which have independent resources and tasks and interact among themselves so that the result an outcome of an objective depended not only on own actions, but also on actions of other parts, there is a conflict.

3. The conflicts connected with the environment (the external conflicts). When decision-making is influenced by not only a uniform algorithm of distribution of resources, but also existence of the factors which are not considered in a system, but they affect efficiency of actions of a system for achievement of goals.

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