ABSTRACT

on the thesis work of a PhD student of the specialty
6D070200 – Automation and Control
Zhaparova T. Aizhanon the theme: “Smart technologies of control and monitoring the power supply systems of an autonomous object”

Relevance of the work. The perspectives for sustainable economic development of Kazakhstan, as well as of other developing countries, according to the President Nazarbayev N.A., are associated with the introduction of a new model of “inclusive” economy, based on the concept of Smart - the basis of scientific-technical and innovative reforms. The most important factors, determining the higher priority development of Smart-technologies are:

- the tendencies of total automation of technological processes and production;
- huge scales and prospects for the development of computer technologies;
- the appearance of new technologies, materials, instruments, providing a high level of a comfort life (“Smart Home”, “intelligent” network, etc.);
- the necessity to comply with environmental regulations, to reduce the impact on the environment, including the field of energy recovery (RES, SPP, WPP, etc.).

2016 (according to the agency "an ENERGY media») was a turning point for the development of clean energy: the price of solar power has fallen below $ 25 per MW / h, in the UK wind plant already provides nearly a quarter of the country's electricity needs, and total global investment in low-carbon energy in the coming years could exceed $ 1 trillion. dollars, one third of which is to build China alone.

Within the framework of the Paris Agreement, adopted in December 2015 during the United Nations Climate Change Conference, more than 60 countries around the world have agreed to develop a national program to reduce greenhouse gas emissions and switch to low-carbon energy sources. First of all, it is necessary to keep the temperature increase on the planet to within 2 ° C from the beginning of the industrial age and avoid a global climate catastrophe that scientists predict.

However, the rapid development of clean energy in 2016 was influenced not only environmental, but also economic considerations. According to a recent study by of Lazard, solar and wind energy in the US now costs less than nuclear, coal or gas, even without government subsidies. This means that leading energy companies are no longer profitable to invest in the traditional energy sector.

For Kazakhstan, one of the priorities is the development of AIC, in 2016 in conditions of crisis this sector was additionally invested 97 billion tenge, that indicates the severity of the problems facing the industry. One of the objectives of a currently being developed “Strategy for the Development of AIC of Kazakhstan”

is to create an optimal social infrastructure of the village, providing the villagers (farmers) with completely different levels of comfort and safety. This can be achieved through the introduction of automated systems of control that regulate and monitor the operation of the systems of power supply, heating, lighting, air conditioning, warning about the problems in the work of a system. These "intelligent" objects can be of various caliber and purpose - domestic, residential, industrial, agricultural, processing facilities of AIC, stationary or displaceable (of a yurt type), at the same time, depending on its designation, it is formed the load on the system (an object needs) and operating devices (sources of heat generation, automation, control, etc.) for ensuring the efficient operation of such a smart object, its comfort and safety.

The use of solar energy for power supply of autonomous objects is one of the most urgent problems both in Kazakhstan and around the world.

Currently, there is a large-scale introduction of the complexes of solar panels and collectors in many countries in Europe and Asia. So, in Germany the ratio of solar energy is approximately 20% of all the energy, generated at the expense of renewable energy sources.

The relevance is also emphasized by the development in the thesis a safe low-voltage lighting system, integratable with solar panels (batteries).

The leading idea of the work is the creation of an automated power supply system of monitoring an autonomous object.

The goal of the work is to develop a Smart technology of control and monitoring the power supply systems of an autonomous object.

The object of the work is a power supply system of an autonomous object

The object of the work is the automation of monitoring a power supply system of an autonomous object using RES and computer technologies.

The methods of study. The following methods have been used to achieve the objectives: the basic provisions and the methods of the theory of automatic control, the theory of experiment, the methods of mathematical statistics.

The objectives of the work:

1. to study the current condition of Smart technologies and the perspectives of their application in an autonomous object;
2. to examine a low-voltage lighting system of an autonomous object using solar panels;
3. to model the automation of a power supply system of an autonomous object;
4. to work out a model of optimal control of normative temperature in an autonomous object;

5. to develop a Smart center of monitoring the automated power supply systems of an autonomous object.

Scientific novelty (provisions for defense):

1. the automated system of a low-voltage LED lighting was developed;

2. the model of an automatic temperature control device in an autonomous object was designed;

3. the simulation model for estimating the capacity of a power supply system of an autonomous object was implemented;

4. the Smart center of monitoring in order to optimize processes (technologies) in an autonomous object for domestic and industrial needs was created.

Justification and reliability of scientific provisions, conclusions and recommendations are based on the correct use of the theory of automatic control, the theory of experiment. Reliability is based on the comparison of theoretical and experimental results, as well as the positive assessment, received at the international conferences.

Practical significance lies in improving the quality and the efficiency of technological processes, the technological level of power supply, lighting and the creation of Smart center of an autonomous object through the automation of control with the use of computer and information technologies. It is confirmed by the acts of introduction of “KEGOC” JSC, “East IEN” and “OBLGRADPROEKT” LLC; the patent №68645 “Illuminating equipment”, dated 30.06.2010; and licenses on intellectual property “Program “KAPP-1” Constructional design and qualitative analysis electric networks” №1605 dated 22.10.10 and “Program “PDA-1” of an automated dispatch control of “Smart home” power supply” №2396 dated November 17, 2016.

Carrying out field experiments with low-voltage lighting system, confirmed by an act of EKSTU. D.Serikbaev.

Approbation of the work. Key provisions of the thesis, its separate solutions and results were presented at the meeting of the chairs “Instrumentation and automation of technological processes” and “Power engineering and technical physics” of D. Serikbayev EKSTU; on the international and scientific-technical conferences and schools workshops “Innovative technologies and research, aimed at the development of green energy and deep processing of products.” - Ust-Kamenogorsk, 2013; Symposium on Applied Informatics and Related Areas “New Faculty, New Ability!” (AIS-2014)”, Szekesfehervar, Hungary, 2014; “Technical sciences: Modern Issues and development prospects” ... Sheffield, the United Kingdom, 2014; “Green economy - the future of mankind” - Ust-Kamenogorsk, Kazakhstan, 2014; “Procedia Engineering” (ICIE-2015), Netherlands, 2015;

“Engineering for space exploration” - Tomsk, 2016; at the international symposium “11th International Symposium on Applied Informatics and Related Areas”, Szekesfehervar, Hungary, 2016.

Publications. On the theme of the thesis there were published 14 publications, including 2 articles published in foreign journals, included in the Scopus database, 6 articles were published in the Proceedings of international scientific conferences, 6 articles are published in the journals, recommended by the Committee for Control in the sphere of Education and Science of the MES.

Structure and content of the work. The thesis consists of an introduction, four chapters, conclusion, appendices 11 and the list of references 147. The total volume of the thesis is 134 pages and contains 98 figures and 9 tables.