УДК 622

CONTROL MECHANISM TO MANAGE QUALITY OF ENERGY CONVERSIONS

♦♦♦♦♦

CONTROL MECHANISM TO MANAGE QUALITY OF ENERGY CONVERSIONS

Mehdiyeva Almaz Mobil
Azerbaijan State Oil and Industry University
almazmehdiyeva@yahoo.com

Guliyeva Sevinj Vagif
Azerbaijan State Oil and Industry University
almazmehdiyeva@yahoo.com

Аннотация. The development of science and technology in our contemporary world depends on the consumption of electricity. According to experts, the demand for electricity will be twice as high as in 2025. This increase in electricity consumption can result in depletion of natural fuel sources and shortage of electricity in the near future. In addition, the environment is seriously damaged when burning hydrocarbon fuels (coal, gas, oil) used in thermal power plants. Taking into account these effects, it is more appropriate to use alternative energy sources for the production of electricity.

Ключевые слова: control system; alternative energy;energy sources;renewable energy sources; imaging modeling.

Mehdiyeva Almaz Mobil
Azerbaijan State Oil and Industry University
almazmehdiyeva@yahoo.com

Guliyeva Sevinj Vagif
Azerbaijan State Oil and Industry University
almazmehdiyeva@yahoo.com

Annotation. The development of science and technology in our contemporary world depends on the consumption of electricity. According to experts, the demand for electricity will be twice as high as in 2025. This increase in electricity consumption can result in depletion of natural fuel sources and shortage of electricity in the near future. In addition, the environment is seriously damaged when burning hydrocarbon fuels (coal, gas, oil) used in thermal power plants. Taking into account these effects, it is more appropriate to use alternative energy sources for the production of electricity.

Keywords: control system; alternative energy;energy sources;renewable energy sources; imaging modeling.

1. Introduction

The research is dedicated to transforming solar energy into electrical energy, one of today's modern requirements. Also prospects for solar energy production in Azerbaijan were considered. In this study, the characteristics of solar power plants are studied. To do this, the solar cells and their structure, their saturation, solar cells have been analyzed. When solar energy has been converted into electrical energy, special modules have been used to control its energy. The types of controls used are investigated. There is a need to manage the process of charging electrical energy to accumulator batteries during the work. For this purpose the structural scheme of the device was created, the controlalgorithm was developed. The proper selection of the elements required for the installation of the gateway control system has been considered, the device's basic scheme has been developed. The rapid development of technology and industry, the increasing number of people on the ground, and the rapid increase in the number of energy consumers further increase the need for inorganic and organic fuels. Fuel supply depletion, constant price fluctuations, damage to the environment as a result of burning of resources and violation of ecology have revealed the need for alternative sources of energy. Alternative energy sources are sources that can provide people with endless energy.

Renewable Energy Sources – Energy sources that are based on the use of periodic energy flows. These energy sources are as follows: Solar Energy; Wind energy; Geothermal energy; Horsepower, withdrawal and energy of the ocean waves; Biomass energy.

Renewable energy sources are divided into two parts:

1. Traditional energy (geothermal energy and biomass energy);
2. Unconventional energy (solar, wind, winding and discharge, energy of sea waves) [1].

2. Statement of the problem

Solar energy is also widely used in our country as an alternative source of renewable energy. As a result of research, our country has a great potential to benefit from alternative energy sources: the average annual solar energy of 1900–2000 kWt per sq. m. Per square meter of our country. When the amount of sun rays falling into the territory of Azerbaijan is compared to other countries, it appears that Azerbaijan is dominant. It is therefore apparent that large-scale investment in the use of solar energy is beneficial in our country. Annual special electroenergy production of photovoltaic plant in Nakhchivan AR is 246 kWt/sq. m, and Kur-Absheron region is 230 kWt/sq. m. The amount of sunny hours per year is 3200 hours for Nakhchivan Autonomous Republic and 2,500 hours for Kur-Absheron [2–3].

The structural scheme of the alternative energy transducer has been developed during the research. The structure scheme includes several blocks. The device is designed for both large and small energy. To calculate the maximum power from the sun, we need voltage and voltage ratings from the panel, which are obtained by current and voltage transmitters. The data received from these transmitters are transmitted to the controller and the algorithm we are working on calculates the power of the power and controls the pulsing modulation of the width and correctly regulates the accumulator battery charging process through a fixed current converter. To do this, the input and output values of inputs are required. Characteristics of these battery batches have been considered for proper battery charging. They have their own carbohydrates according to the area in which they are used. In accordance with these characteristics, we have the ability to record the results of any of the collecting tools in the controls, that is, the controls we offer. These characteristics are already known, and the characteristics of the panel voltage and current transmitters are compared with the data of the transmitters after the control is recorded in the control memory. According to him, the controller controls the width of the impulse width, creating the width of the impulse modulation on the output. Frequency does not change during modulation. The width of the impulse is controlled by constant current sources. Its battery is properly filled. In accordance with the algorithm we have established, the performance of the battery will be changed through a special program after the results have been matched to the maximum battery charging characteristic.

Reduced topography is used to reduce tension. In photovoltaic applications, the converter is usually used to fill the batteries. It is used to increase tension from topology topology. An incremental converter is used to obtain high output voltage before the transformation phase [4].

3. The solution of the problem

Transforming solar energy directly into thermal energy has taken on a broad scale in the world and is considered as one of the key areas of energy in developed countries. Photovoltaic elements play a major role in transforming solar energy into direct electricity. Solar energy is also widely used in our country as an alternative source of renewable energy. As a result of research, our republic has a great potential to utilize alternative energy sources: the average daily solar energy of 1900–2000 kWt per square meter of our country. When the amount of sun rays falling into the territory of Azerbaijan is compared to other countries, it appears that Azerbaijan is dominant. It is therefore apparent that large-scale investments in the use of solar energy in our country are effective. Annual special electroenergy production in Nakhchivan Autonomous Republic is 246 kWt/sq. m, and 230 kWt/sq. m for Kur-Absheron region, and the amount of sunshine hours is 3,200 hours for Nakhchivan Autonomous Republic and 2,500 hours for Kur-Absheron [3].

Management is one of the most important parts of the modern wind power industry. Because it is more efficient than the power of the wind generator through the control system, and the lifespan of the device is even longer. The most common difficulty to use wind energy is unpredictable character of the wind. Even where wind speeds are constantly high, wind

speeds and direction change occurs over the course of the day, and this affects the cost of electricity transmitted [5, 6]. Therefore, wind generators should have a reliable management system regardless of whether they are large or small. Through the control system, wind direction and wind speed rotation speed are monitored and the desired output parameters are obtained by changing the direction of the windpipe, the wing angle, and the transmission.

Working at constant speed means maximum output power at just one or two speeds. Therefore, during the active management, these generators have limited capabilities. When the wind generator is directly connected to a power grid, the speed of the rotation speed is constant. Therefore, passive control prevents the excessive output of the wind power generator. But in this case it is impossible to make the wind generator output curve ideal. During the research, 2 configurations (fixed speed – variable bending angle) are used. Once the wind has reached the nominal value, the bending angle is activated and the output power remains constant. For using wind energy in wind generators when wind speed is above rated wind speed are available yaw control of rotor, blade pitch angle control and other methods. In this paper, PLC control system, which controls blade pitch angle are used to fix rotation speed of rotor when wind speed is above rated wind speed. During the experiments, it was determined that when the speed of weather remains constant value, if we increase the blade pitch angle, the rotation speed of rotor will decrease. So, for fixing rotation speed of rotor, we can increase the value of blade pitch angle when wind speed is above rated wind speed. In this paper, Siemens ET 200s PLC control system is used to control blade pitch angle of rotor. PLC controller gives directions to step motor, based on calculated blade pitch angle. As a result, rotation speed of wind rotor does not change and output power of wind generator remains stable.

During the research, the question of turning solar energy into electric power, one of today's modern requirements, has been considered. Also prospects for solar energy production in Azerbaijan were considered. In this study, the characteristics of solar power plants are studied. To do this, the solar elements and their structure, characteristics, and solar cells have been analyzed.When solar energy has been converted into electrical energy, special modules have been used to control its energy. The types of used controls are investigated.Controllers with control devices are a device that controls the accumulation of accumulators by electric current from the daytime panels in the fields of solar energy conversion. Controllers are used in places that are suitable for a certain fixed tension. Examples include any electrical equipment, accumulator circuits, and other equipment that operates with constant voltage. The controls the electrical flow and tension from the panel. Protects the battery from overloading and discharging. The battery will transmit a part of the energy it receives until the battery is fully charged, and the battery will be disconnected after the battery is full. Thus, the controls make the battery more durable. Controls are selected from the solar panel and the power of all solar panels based on the total cost. In modern times, the need for controllers is so great that the 12V solar panel output is about 16-20V tension and we have to adjust this voltage to fill the battery. The voltage required for many batteries to be fully charged is 14–14,5 V. It is not necessary to use the controller in solar panels with output power of 1–5 W.

Controllers have MPPT (Maximum Power Point Tracking) and PWM (Pulse Width Modulation) types for charging batteries. MPPT – Controls the system by finding the peak point of power as seen on its name. The use of high energy from the systems has been achieved through this. As we know, solar energy is distributed at different prices at different times of the day. And so the energy of the solar panel can be variable. We can not change the variable power to the handler because it can cause the operator to fail or stop working. At this time we use MPPT. Marks the maximum price for power over different time intervals. It performs through complex algorithms.PWM is used to achieve an average result using analogous digital signals. The wavelengths 1–0 are regulated and the power given to the system is regulated.The signal received from the PWM has two parameters: 1) impulse density; 2) frequency.The duty cycle is the ratio of the signal to the constant T time of 1 (active). It can be expressed as a percentage and takes a price of 0 ÷ 1. The average value of a PWM signal is

straightforward with the duty cycle.The speed must be chosen so that the builtin transformer, the frequency of the current motor should not be included in the 20hs–20khs frequency band, where the human ear can hear. Otherwise, sounds that cause people's anxiety.

Finally, let's note that PWM allows us to manage power, used in communication systems, power supplies, power transmissions, signal amplifiers, and so on.

When microcontroller software runs, ARC ports of microcontroller divide analog inputs into 1024 quantities and shows different tensions on the 16 x 2 LCD screen. Thus, the panel and battery voltage measurements are achieved. The foggy resistor is used to find the current value of the photovoltaic module. This resistor joins the ARC consistently. The tension from the suspended resistor corresponds to the current. For example, if the voltage is 5 mV when the current is equal to 1A, the tension will be 10 times more than 10 times the current. This output voltage is coupled to the other ARC port, AN_2 by means of the amplifier, and the input for the operation of this algorithm.The impulse width modulation ports are activated when charging the battery. The battery is charged at a voltage greater than 15 V and a battery of at least 20 V or equivalent. Passes through the panel voltage and current converter. This converter is activated via the bipolar transistor.The voltage from the accumulator battery to the load and the flow of the transmitter through the transistor activated by the transmitter connected to the pulse width modulation of the current occurs. When the system is installed, the full resistance of the battery and the panel should be calculated according to one another. From the panel and accumulator prices, the intensity point of the power dependence graph indicates the maximum power point.

In Figure 1 shows the outcome of the controlsystem imaging model. When connecting the circuit, voltage inputs and inputs from current transmitters are regulated by comparing the output voltage and voltage ratings to the battery charger. As can be seen from Figures 2, when measuring the received energy, a deviation is obtained, and the original signals and their spectra are shown – the offset range and the non-sinusoidal signal. Figure 3 (a) shows the spectrum of the resulting measured signal equal to the product of a non-sinusoidal signal and systematic errors. The control result in relation to the resulting measured signal is shown in Figure 3 (b).The device compares the automatic input output parameters according to the algorithm and provides the proper operation of the fill process by selecting the correct modulation method. It is clear from the Figure that the first step is the completion of the filling process based on the result of the input and output comparison. There is a proper adjustment of fittings for inlet and outlet. The beatings indicate that the width modulation width modulation method compares the data received from the transmitters at the input and output to the PLC. The width of the impulse is adjusted to find the correct operating mode. It also shows itself in dots on the graph. As seen from the graphic, the device regulates within 4ms.The PLC ensures an increase in the width by decreasing the frequency by decreasing the frequency, which in turn creates the transistor. These strikes stabilize the output tension. At the first moment of the connection, the tension reaches peak point. This is explained by the fact that there is a breakthrough in which inductive tension is great. The frequency of the device is 25kHs without changing. As a result of the research it was found out that the proper completion of the filling process begins after 6 msec.

4. Conclusion

In the study, the process of filling of the accumulator fixed current source by solar energy was investigated and imitation model of the controlsystem was proposed. The characteristics of the solar modules were studied for the construction of this controlcomplex, and the volt-amperage characteristics were analyzed. In studying the characteristics of solar photovoltaic, the importance of creating a regulatory complex was substantiated, and an arrangement device was proposed for correct charging of battery batteries. A system imitation model has been created in MATLAB software environment. In the «device» presented the method of finding the maximum point, which is the most ingenious method. Compared with other devices, our «device» is up to 1–1,5 %. This difference was achieved through the proper charging of the accumulator battery through a special algorithm.

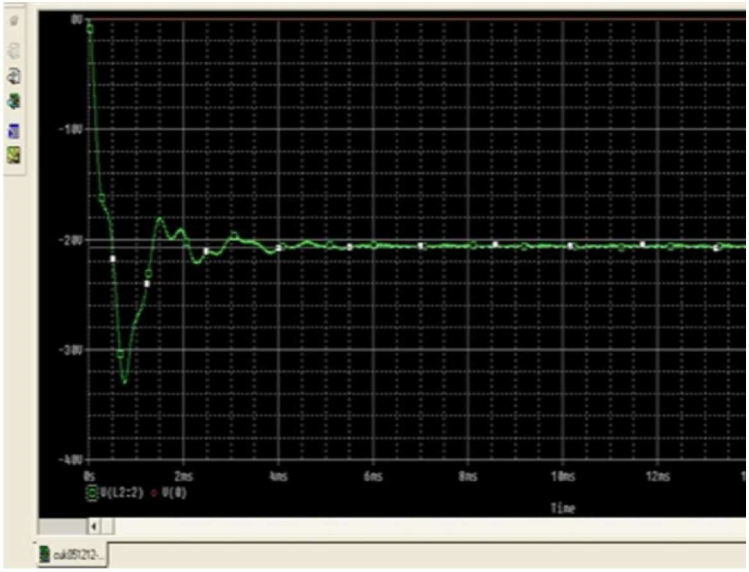

Figure 1 – Consequences of imaging modeling of the control system

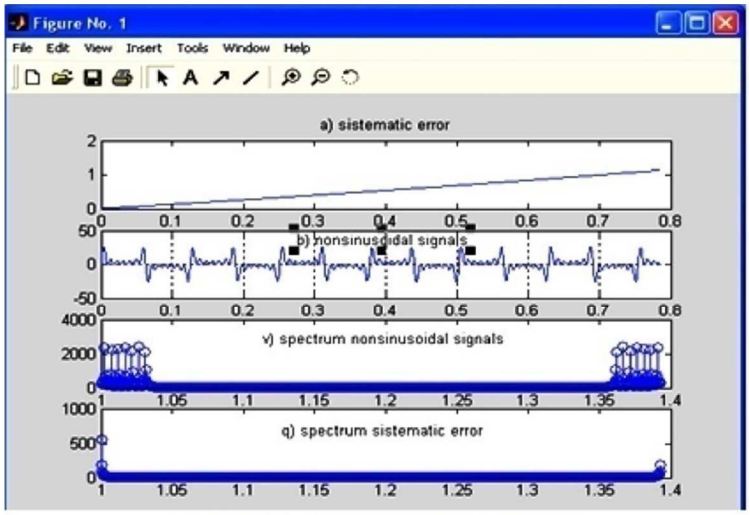

Figure 2. Initial spectrum of signals.
a) Systematic error; b) a non-sinusoidal signal;
v) Non-sinusoidal signal spectrum; q) range of systematic errors.

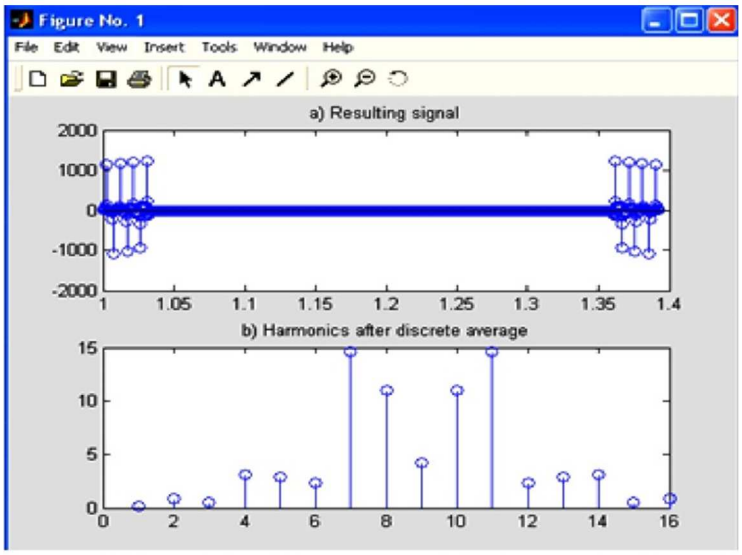

Figure 3. a) Spectrum of the input signal;
b) Spectrum after corrective filtration.

Литература

1. An Advancedb LBIC Measurement Technique for Solar Cell Local Characterization / J. Carstensen [et al.] // Solar Energy Materials and Solar Cell. – 2003. – 76. – 4. – P. 599–611.
2. Huseynov E.E., Hashimova A.I. Regenerative Energy Devices. Textbook. – Baku, 2015. – 120 p.
3. Jalilov M.F. Alternative-Regenerative Energy Systems. Textbook. – Baku, 2014. – 409 p.
4. Khalighand A., Onar O.C. Energy Harvesting-Solar, Wind, and Ocean Energy Conversion Systems / CRC Press, 2010.
5. Ned Mohan. Power Electronics-Converters // Application and design. – 2011.
6. Roger A. Messenger and Jerry Ventre «Photovoltaic System Engineering». – 2014.

References

1. An Advancedb LBIC Measurement Technique for Solar Cell Local Characterization / J. Carstensen [et al.] // Solar Energy Materials and Solar Cell. – 2003. – 76. – 4. – P. 599–611.
2. Huseynov E.E., Hashimova A.I. Regenerative Energy Devices. Textbook. – Baku, 2015. – 120 p.
3. Jalilov M.F. Alternative-Regenerative Energy Systems. Textbook. – Baku, 2014. – 409 p.
4. Khalighand A., Onar O.C. Energy Harvesting-Solar, Wind, and Ocean Energy Conversion Systems / CRC Press, 2010.
5. Ned Mohan. Power Electronics-Converters // Application and design. – 2011.
6. Roger A. Messenger and Jerry Ventre «Photovoltaic System Engineering». – 2014.