THE ROLE OF INDEPENDENT LEARNING IN IMPROVING THE QUALITY OF EDUCATION

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ANNOTATION

This article demonstrates the importance of independent education in improving the quality of education on the topic “Electricity generation” in the discipline “Use of electricity in the national economy” on the example of geothermal power plants and radioisotope sources of electricity.

Keywords: Electricity, thermal power plants, hydroelectric power plants, nuclear power plants, quality of education, independent education, creative activity, non-traditional electricity sources, geothermal power plants, radioisotope sources.

Аннотация: *В статье показана важность самостоятельного обучения в повышении качества обучения по теме «Электроэнергетика» по дисциплине «Использование электроэнергии в народном хозяйстве» на примере геотермальных электростанций и радиоизотопных источников электроэнергии.*

Ключевые слова: *Электричество, тепловые электростанции, гидроэлектростанции, атомные электростанции, качество образования, самостоятельное образование, творческая деятельность, нетрадиционные источники электроэнергии, геотермальные электростанции, радиоизотопные источники.*

It is known that the effectiveness of educational work in the higher education system is one of the main factors ensuring the effectiveness of socio-political and economic reforms in our country. Therefore, the laws, decrees, decisions and other documents adopted in the higher education system in the next 2-3 years are aimed at ensuring the quality of education. For example, the Law on Education, developed in 2020, provides for the President of the Republic of Uzbekistan to improve the quality of education in higher education institutions and ensure their active participation in the ongoing comprehensive reforms in the country. Resolution of the President of the Republic of Uzbekistan dated November 6, 2020 “On additional measures for the development of education and science in the new period of development of Uzbekistan” Decree PF-6108 of the President of the Republic of Uzbekistan dated November 6, 2020 “On further improvement of the education system” PQ-4884 and other documents The task of improving the quality of education and ways to solve it are clearly indicated.

The subject "Use of electricity in the national economy" will be taught in the training of future specialists in technology education - teachers.

In this article, we will focus on the importance of independent learning in improving the quality of education in this subject on the topic of “Electricity generation”.

It is known that today the education of students on the basis of credit-module system is a requirement of the time, in which a large place is given to independent learning. The literature has studied and cited the results of many scholarly studies on student independent learning and its importance.

The following types of independent study can be widely used to improve the quality of education and at the same time develop the creative activity of students:

1. Acquisition of new knowledge, independent learning, formation of skills and competencies.
2. Identify and consolidate knowledge.

3. Develop the skills to apply knowledge in practice.

4. Develop skills and competencies of a practical nature.

5. Develop skills and competencies of a creative nature.

Other types and methods of independent learning can also be used to improve the quality of education. As an example, we use the type of acquisition of new knowledge independently of various sources of primary purpose.

It is known that the subject "Use of electricity in the national economy" provides materials on thermal power plants, hydroelectric power plants and nuclear power plants, which generate electricity, however, no other methods of generating electricity have been reported.

The search for and use of non-traditional sources of electricity generation, ie new energy sources, remains one of the world's major challenges today, because alternative energy sources are renewable and are environmentally friendly and noiseless.

In addition, the reserves of natural resources are limited, and in time it has already been proven to be depleted. According to estimates, oil will last for 45-50 years, natural gas for 70-75 years, and coal for 150-160 years. Therefore, it is important to find new sources of electricity. One of the main reasons for this is that the current generation of electricity does not fully meet the needs of all sectors of the economy and the population.

We will look at the importance of independent learning using the literature as an example of new ways to generate electricity, and at the same time show how far independent learning can be.

It is known that there are many non-traditional methods of electricity generation today, the most scientifically based of which are as follows.

-Magnetohydrodynamic method;

-MGD generators with steam power;

-Termoelectric generators

-Method of obtaining electricity from radioisopes

-Termoemmision generators;

-Electrochemical generators;

-Solar power plants;

-Geothermal power plants;

- Wind power plants and others.

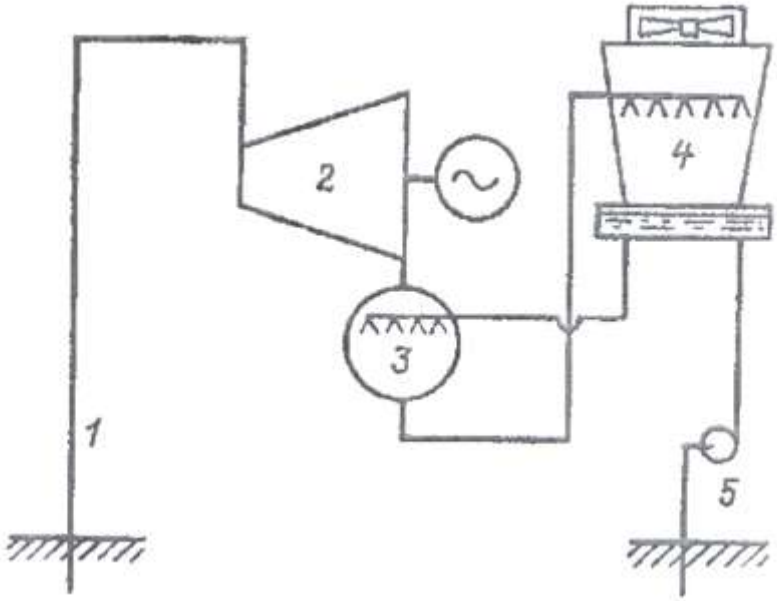
It should be noted that the curriculum for the training of teachers of labor education also includes the use of electricity in the national economy, but almost no information is provided on non-traditional methods of electricity generation.

Therefore, students will have the opportunity to independently develop their creative activities by studying materials from the literature on non-traditional methods.

In the following 3 examples of geothermal power plants, radioisotopes, and thermoemission generators, we will show students what to look for and what information to look for when studying non-traditional methods of power generation. Here are some of the most common new ways to generate electricity.

Geothermal power plants.

Geothermal power plants are steam turbine power plants that use heat from the earth's crust. A schematic of a geothermal power plant is shown in Figure 1.



1 - scheme. GeoTES scheme for dry steam with mixed condenser:

1) steam coming out of the well; 2) turbine; 3) mixing capacitor; 4) gradirnya; 5) Plastic drive.

In areas where volcanoes are present, at a thermal depth, water heats up to temperatures above 100 ° C, from where it rises to the surface through cracks in the earth's crust. In geothermal power plants, a mixture of steam and water is lifted up through drilled wells and sent to a separator, where the steam is separated from the water. The separated steam is sent to the turbine, and the hot water is chemically treated and used for heating purposes. Such power plants were built in Kamchatka with a capacity of 11,000 kW.

Geothermal power plants are built in volcanic areas where there is a mixture of steam and water. The depth of the steam and water mixture is taken from a depth of 0.5-3 km with the help of collectors with natural underground lessons. The dryness of the mixture of steam and water is 0.2 - 0.5, and the enthalpy is 1500 - 2500 Kj/Kg. One well provides electricity with an average capacity of 3-5 MW. There are also geothermal power plants that can use natural steam directly.

The simplest and easiest geothermal electrical device is a steam-turbine device that resists pressure. Natural steam from the well is sent directly to a turbine that can be released into the atmosphere or to a device that traps valuable substances. The method used to evaporate hot liquid from the surface is used to generate electricity from heat sources. This method is based on the fact that when hot (under high pressure) water from an underground hot water basin to the well approaches the surface, its pressure decreases and about 20% of the liquid boils and evaporates.

This steam is separated from the water using a separator and sent to the turbine. Depending on the mineral content of the separator, the water coming out of the separator can be sent directly for further processing or, if economically justified, after the extraction of the minerals in it, it is again ground through the rocks in the mountains. can also be sent back to the bottom.

For much lower temperature sources, a two-loop (binary) cycle process is used. In this process, the water from the pool is used to heat the heat carrier (freon or isobutane) in the second circuit, which has a lower boiling point. This steam used to boil the liquid is used to start the turbine. The used steam condenses and is again passed through a heat exchanger, creating a closed loop. In this case, the use of geothermal water at temperatures above 140-150 ° C in volcanic regions of the planet to generate electricity is economically viable.

As a rule, it is economically feasible to use groundwater with a temperature not exceeding 100 ° C for heating, hot water supply and other purposes.

It should be noted that the production of electricity using geothermal power plants is growing from year to year. For example, in Taiwan, where it is not possible to build solar and wind power plants, a geothermal power plant with a capacity of 60 MWh per day was built in 2021 and will operate continuously around the clock.

According to a study by the Taiwanese Ministry of Science and Technology, a geothermal power plant commissioned in Taiwan's Ilan County has a capacity of 7.4 GW, which can be amplified by a well with a capacity of 9 MW.

Radioisotope sources of electricity.

The natural radioactive decay of nuclei, that is, the fission of particles and radioisotopes γ- occurs by the separation of the kinetic energy of the quanta. This energy of the radioisotope is absorbed by the environment and converted into heat energy that is used to generate electricity by the thermoelectric method. The conversion of natural radioactive decay energy into electrical energy using thermoelectrics is called radioisotope thermogenerators.

The operation of radioisotopic thermogenerators is reliable, long-lasting, compact, makes good use as an autonomous source of energy for devices used for various purposes in space and on earth. The efficiency of modern radioisotope generators is 3-5%, and the service life is from 3 months to 10 years. Figure 2 below shows the structure of radiozotopic generators.

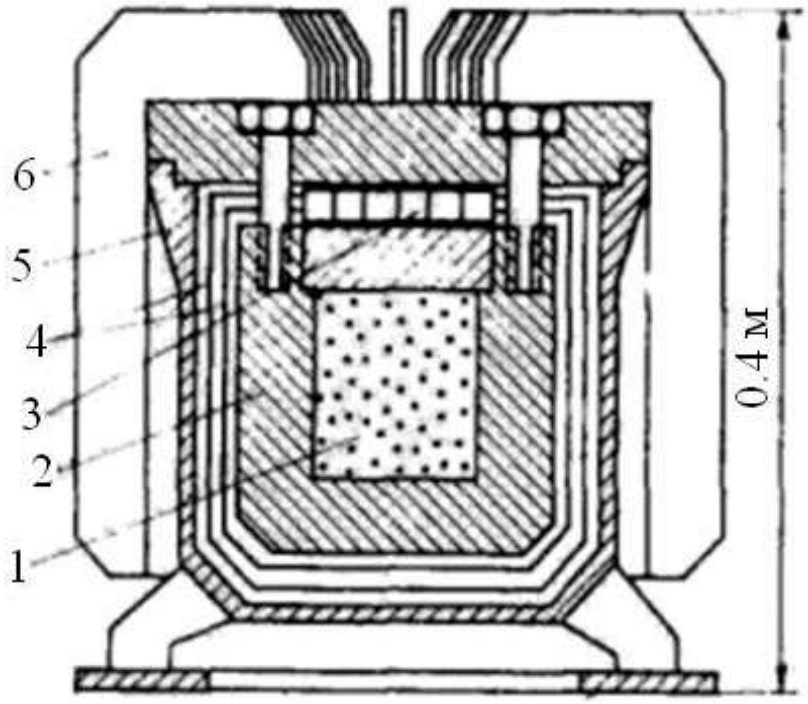


Figure 2. Radioisotope thermogenerator circuit. 1.radioisotope biloki. 2. Heat block, 3. Heating elements, 4. Insulated heat screens, 5. Corp, 6. Radiator

There is interest in radioisotope thermogenerators in various fields of science and technology. They are expected to be used as a source of energy for the human artificial heart, as well as to improve the functioning of various organs of the living organism. Radioisotope thermogenerators are especially useful for space exploration, where energy is needed. Radioisatopic thermogenerators have the ability to operate reliably and for a long time in an unfavorable environment exposed to ionizing radiation, in radiation belts, on the surface of other planets and their satellites.

THERMOEMMISION GENERATORS

The phenomenon of thermoelectronemission was discovered in 1883 by T. Edison. Working on creating an electric lamp, Edison placed two strings inside the tube. When one of them lights up, he turns the light on and turns on the other. During the refraction of the lamp, he observed that a certain amount of electrons passed into the cold wire, that is, the hot wire of the cathode was tied, the cold wire moved towards the anode, and then went to the external electrical circuit. In this case, part of the energy used to heat the cathode is transferred to the anode by electrons, and part of the energy of the electrons is released to the external electrical circuit. The anode heats up at the expense of the energy generated by the electrons. If the motion of the cathode and anode were the same, the energy of "evaporation" of electrons from the cathode would be equal to the energy of "condensation" of the electrons in the anode, and the conversion of heat into electricity would not occur. so much heat energy is converted into electricity.

Figure 3 below shows a schematic of a thermoemission converter.

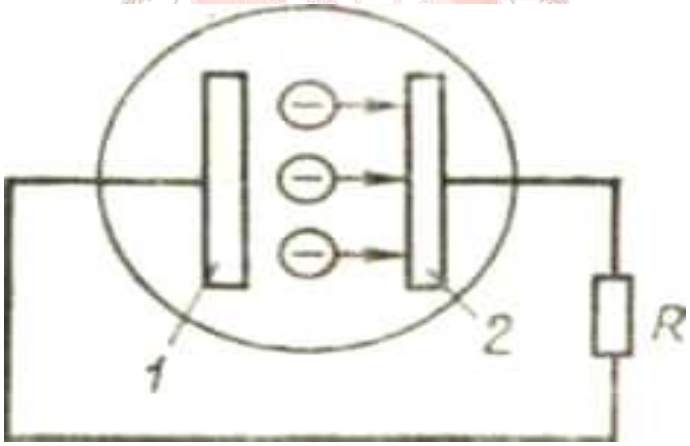


Figure 3. Schematic of an electric thermoemission converter: 1st cathode, 2nd anode.

In the process of thermoelectron emission, free electrons are observed on the surface of metals.

Metals contain more than 6-1021 free electrons per 1 cm2.

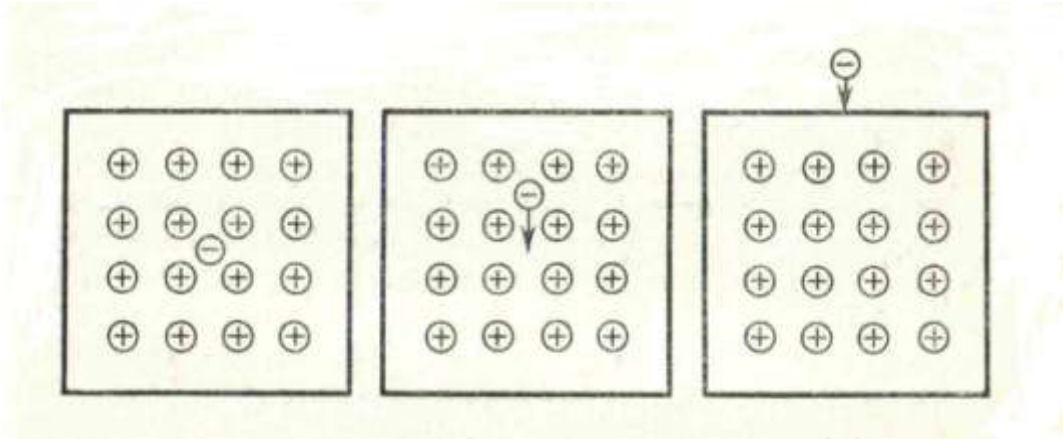


Figure 4. The resulting force acting on an electron near a metal and its surface.

The gravitational force of electrons inside the metal is balanced by positively charged nuclei (Figure 4). The electrons on the surface of the metal are directly affected by the resulting gravitational force, and in order for the electrons to overcome this force and the electron to come out of the metal surface, the electron must have sufficient kinetic energy. The conversion of electron kinetic energy into electrical energy takes place.

In energy thermoemission generators, heat from nuclear reactions can be used to heat the cathode. The schematic of the core thermoemission converters is shown in Figure 5. The efficiency of the first such converters was about 15%, and it is estimated that it can reach 40%.

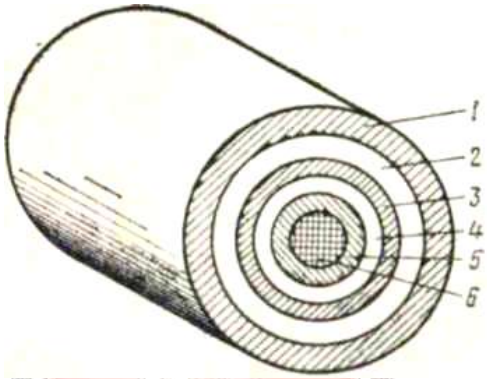


Figure 5. Nuclear thermoemission converter: 1st protection, 2nd cooler, 3rd anode, 4th vacuum, 5th cathode, 6th nuclear fuel.

In thermoemission generators, the electrons are released by heating the cathode. In radioactive decay, electrons (--rays) are released as a result of the natural properties of the elements. Using these properties of the elements directly, nuclear energy can be converted directly into electrical energy. (Figure 6)

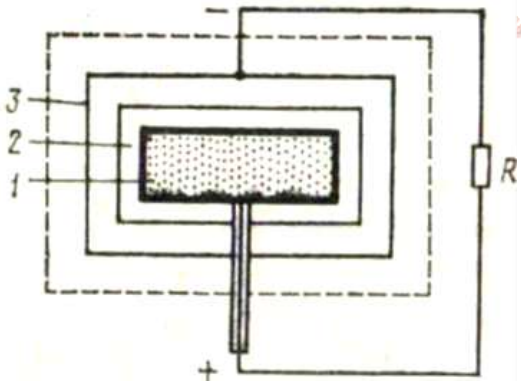


Figure 6. Schematic diagram of a device that converts nuclear energy directly into electricity:

1-β- radioactive irradiator, 2-metal ampoule, 3-metal container.

In conclusion, as a result of studying the process of electricity generation, which we discussed above, students develop their creative activity in the implementation of their independent work, just as in the study of other non-traditional methods of generating electricity, students will have to do some scientific research, which will undoubtedly increase the creative activity of students and in turn lead to an increase in the quality of education.

Enhancing and developing students' creative activity through independent study is important for training qualified professionals.

This means that the better the quality of independent study, the more creative their students will be, and the better the quality of science and subject education will be.

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