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USE OF FOUR-STROKE LIFTING CONVERTERS IN TRACKING SYSTEMS OF SOLAR PLANTS

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Annotatsiya: Maqolada kam quvvatli quyosh energiyasi qurilmalarining samaradorligini oshirish masalalari muhokama qilingan bo'lib, bu kam quvvatli to'rt zarbli ko'tarish keng impulsli quyosh elektr stansiyalarida doimiy yuqori quvvatni ta'minlash natijalarini ko'rsatadi. Ish jarayonida kam quvvatli quyosh elektr stansiyalarining turlari va elementlari tahlil qilinib, ushbu ma'lumotlar asosida kompyuter modeli ishlab chiqildi. Quyosh elektr stansiyasining chiqish kuchlanishining quyoshning holatiga qarab o'zgarishi natijalari, 120 Vt quvvatga ega MCW seriyasidagi quyosh modulining tok-kuchlanish xarakteristikasi keltirilgan.

Kalit so'zlar: quyosh energiyasi, quyosh qurilmalari, energiya ta'minoti, mahalliy inshootlar, samaradorlikni oshirish, quyosh elektr stansiyalari, kompyuter modeli, matematik model.

Аннотация: В статье рассматриваются вопросы повышения эффективности солнечных энергетических устройств малой мощности, в которых показаны результаты обеспечения постоянной высокой мощности в солнечных электростанциях малой мощности с четырехтактным подъемом широкими импульсами. В ходе работы были проанализированы типы и элементы солнечных электростанций малой мощности, и на основе этих данных была разработана компьютерная модель. Приведены результаты изменения выходного напряжения солнечной электростанции в зависимости от положения солнца, вольт-амперной характеристики солнечного модуля серии MCW мощностью 120 Вт.

Ключевые слова: солнечная энергия, солнечные устройства, энергоснабжение, локальные объекты, повышение эффективности, солнечные электростанции, компьютерная модель, математическая модель.

Abstract: The article discusses the issues of increasing the efficiency of solar energy devices of low power, which shows the results of providing constant high power in solar power plants of low power four-stroke lifting wide pulses. In the course of the work, the types and elements of low-power solar power plants were analyzed, and a computer model was developed on the basis of these data. The results of the change in the output voltage of the solar power plant depending on the position of the sun, the current-voltage characteristic of the solar module of the MCW series with a power of 120 W.

Keywords: solar energy, solar devices, energy supply, local facilities, efficiency improvement, solar power plants, computer model, mathematical model.

Introduction. Due to the low energy density of solar radiation, it is desirable to use an optical concentrator of solar radiation in almost many types of solar installations.

At present, the problem of using concentrators is to solve the problems of increasing their optical efficiency and ensuring economic profitability in operation.

One of the technical problems when using concentrators is to ensure its turns following the apparent movement of the Sun during the day, continuously or discretely.

Literature review. The complexity of solving the problem is due to the fact that, due to the low energy density of solar radiation, to obtain the required power, significant areas of solar installations are required, including concentrators, the dimensions of which are proportional to the power of the solar installation.

This leads to the need to solve complex technical problems of creating large-sized concentrators, creating rotary bearings for concentrators and control systems that ensure the movement of such objects following the visible movement of the Sun.

In this regard, as well as the tasks of increasing the efficiency of existing concentrators and heliostats, this article presents aspects of increasing tracking systems, in particular, a Matlab computer model of the power supply system of a local object has been developed, containing an active load and lifting wide pulses of a solar power plant [1]. This research work was studied by the following scientists: foreign scientists M.L. Belov, S.V. Berezin, V.A. Gorodnichaev, V.I. Kozintsev[2] and national scientists Gulyamova F.S., Akbarova D.M., Kosimova K.M.[3], Mamasidikov Y.[4] and others.

Reduction of traditional fuel reserves and environmental pollution during their combustion are considered to be the main disadvantages of traditional types of energy carriers. In this regard, in recent decades, energy programs have been developed aimed at the development of alternative energy.

Research methodology. To ensure the general operation of the solar power plant and industrial electrical networks, special converter devices are required. In many cases, actively controlled converters are used in such devices[5]. The output characteristic of such converters in terms of the quality of electrical energy must comply with modern standards. Actively controlled rectifiers are made according to a three-phase bridge circuit on IGBT transistors with free-wheeling diodes[6]. Voltage from solar panels is applied to its input from a constant voltage converter of lifting wide pulses. (Figure 1).

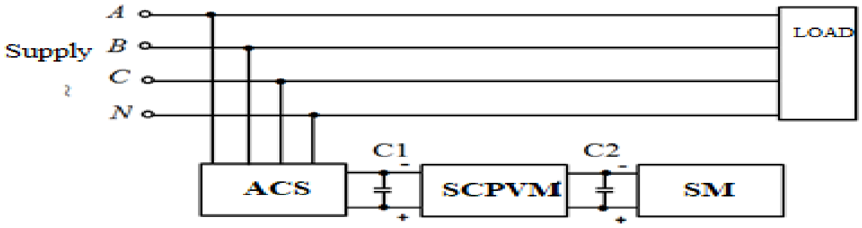

Fig. - 1. Actively controlled rectifier circuit

Block diagram of a solar power plant with a DC voltage converter of lifting wide pulses and an actively controlled rectifier.

Small capacitors C1 are connected to the output of the solar battery. The connected capacitor C2 is selected to the input of the actively controlled rectifier with a high voltage of the peak value of the supply line voltage.

$U_c > kU_{at}$, (1)

Where k=1,25 ÷ 1,5.

For stable operation of the converter, it is necessary that C2>>C1.

In a solar power plant with a power of 100 kW, the use of a converter of lifting wide pulses of direct voltage makes it possible to reduce the number of solar cells connected in series[7] and, as a result, increase the overall efficiency of the solar power plant. The connection diagram of the converter of lifting wide DC voltage pulses to the output of the solar battery is shown in Figure 2.

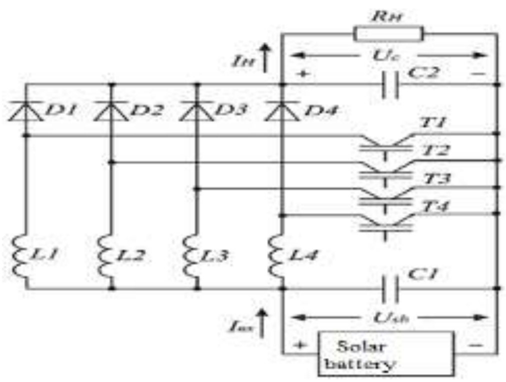

Fig. 2. - Scheme of SCPVM connection to the solar battery output [8]

The SCPVM model shown in Figure 3 is built as follows Figure 3:

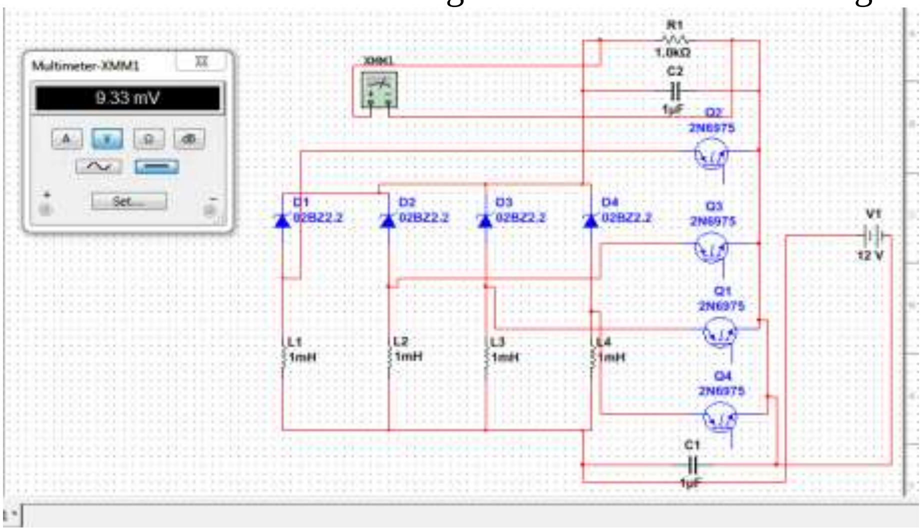

Fig. - 3. The SCPVM model

Here, at sunrise, the multimeter shows 9.33 mV. In accordance with this, with a change in the position of the sun, the angle of the elevator will change[9]. In the model below, you can see an increase in voltage due to a change in the SCPVM angle. It follows from this that with a change in the angular value of the SCPVM, depending on the position of the sun, the voltage value will also change accordingly[10].

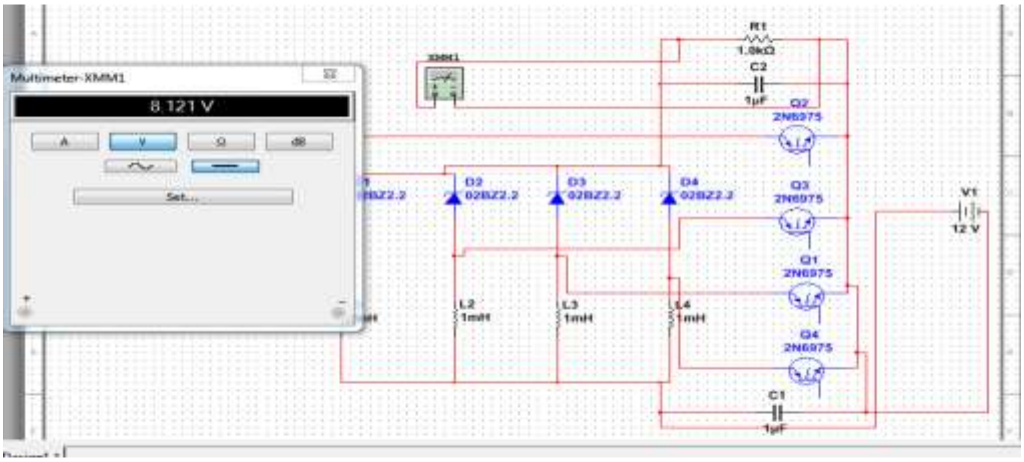

Fig. - 4. Change in the output voltage of the SCPVM depending on the position of the sun

Conclusion. In this regard, the task set in this article to study and ensure constant high powers when using solar cells using four-stroke lifting wide pulses in solar cells is relevant and is of scientific and practical interest.

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