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**ИСПОЛЬЗОВАНИЕ ПЕСЧАНЫХ РЕЗЕРВУАРОВ В ВОЗОБНОВЛЯЕМОЙ
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Аннотация

В современном мире электроэнергетика занимает очень важное место в жизни человечества. Разработки технологий для выработки и сохранения электроэнергии постоянно совершенствуются и не стоят на месте. Именно поэтому авторами работы представлены общие сведения об видах сохранения электроэнергии, проанализированы песчаные резервуары и выявлены их плюсы и минусы.

Ключевые слова: возобновляемая энергетика, песчаные резервуары, хранение энергии.

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ABSTRACT

In the modern world electric power engineering takes a very important place in the life of mankind. The development of technologies for electric power generation and storage is constantly being improved and is not standing still. That is why the authors of this work give some general information about the kinds of electric power saving, analyze sand tanks and bring out their pros and cons.

Keywords: renewable energy, sand tanks, energy storage.

Renewable energy sources are gaining popularity. However, the problems faced by renewable energy sources are - expensive cost of electricity, inconstancy of operation due to weather conditions, impossibility of widespread use.

Now there are already technologies that can reduce the cost of renewable energy production.

The choice of location is a factor that we cannot fully influence. For example, an area where cloudy weather prevails is not suitable for solar power [1].

The biggest problem at the moment is the variability of this energy generation. When weather conditions are bad, we cannot generate enough energy and the backup source is switched on. This practice has been used for a long time, and not only in renewable energy, but also in traditional energy. Whereas when it is in excess, we cannot use it profitably. The question of storing such energy arises. In practice we already know the possibilities of using accumulators, but their environmental friendliness is very questionable because of the difficulties in production and disposal.

There are hydro accumulators with a simple principle of operation, there are two reservoirs with different heights, when energy is in excess water is lifted by pumps to the storage at a higher height. During peak operating hours, water from the upper reservoir flows into the lower reservoir through the hydroelectric generator, thus generating energy. But this technology requires a lot of space, a height difference, and a lot of water [2].

It is also possible to meet technology of compressed air, technology similar to the previous, only instead of water air is pumped. If there is a need to generate energy, the air is released and it starts spinning turbines. But, unfortunately, it is a very expensive working system and in practice it is not expedient to use it.

The sand battery is a new technology in the field of energy. The main idea is that when energy generated from a renewable energy source, such as solar or wind energy, is fed into a tank with sand, where the energy is heated and stored. The sand itself is in a closed loop, in which air heated by the sand also circulates. And to this circuit is simply added a heat exchanger - it may be a separate circuit with water for central heating. Further, such a "Battery" can be used during peak

hours, when additional heat energy is needed. For example, for heating homes during colder periods of the year.

Thus, sand batteries can be considered a very promising project in comparison with counterparts in the market [3].

Analysis of sand tanks:

The tank itself is a steel hopper about 7 meters high and 4 meters in diameter, inside which about 100 tons of sand is placed.

The sand battery works on the principle of resistive heating - a process in which thermal energy is obtained by passing an electric current through a special conductor. In a particular case, air begins to heat, which then enters the sand through the channels of the heat exchanger. The air then heats the sand to a temperature of 400-600 °C. The heated sand can cool for up to several months. Such a system can store and produce up to 8 MWh of thermal energy at a rated capacity of 100 kW [4].

Since wind turbines and solar panels are extremely unstable and directly dependent on weather conditions. For example, in the case of a strong wind, the wind turbine generator can generate a surplus of energy, which should be stored, and the same can happen on a very sunny day with a solar panel. And then that surplus could be conserved in sand tanks until it comes in handy. And since sand batteries are more environmentally friendly than their existing counterparts, since sand is easy to dispose of, sand becomes a more promising way to store the energy generated. For this technology, dirty construction sand can be used, which has a low cost and as a consequence will be a more economical option for the tank (fig.1).

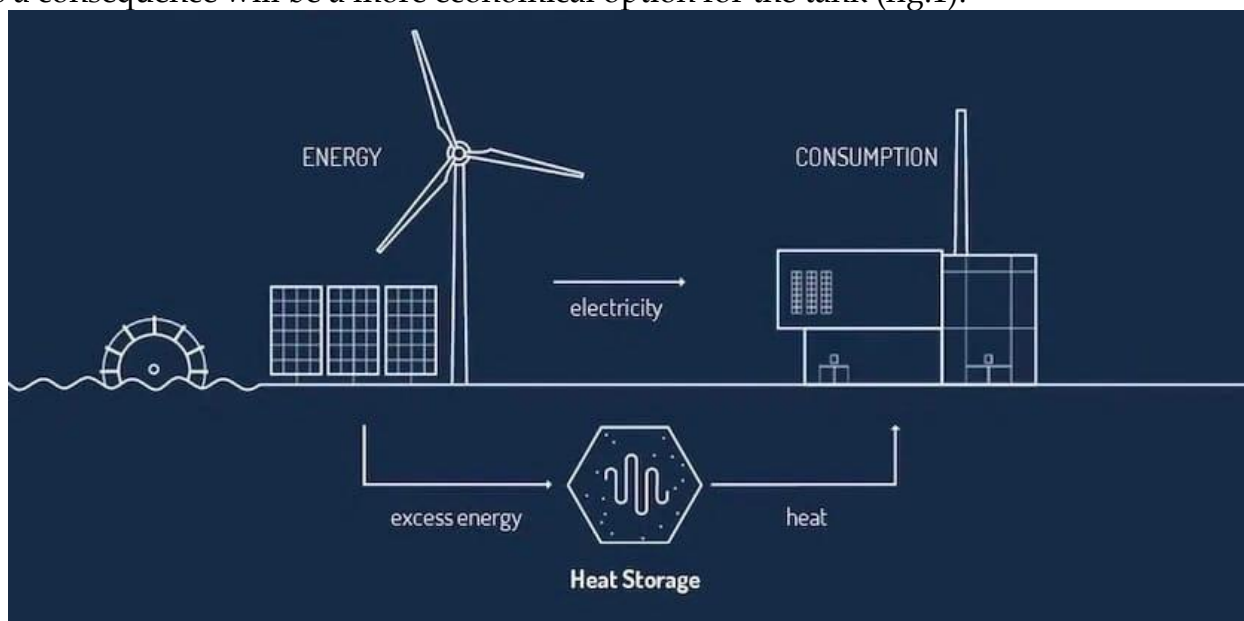


Figure 1. Energy storage scheme

Pros and cons of this technology:

The main advantage of this method of energy generation, unlike renewable energy sources can be considered the absence of seasonality or natural indicators (nature). Sand tanks can run all year round. Also, sand is an environmentally friendly material, which means it is easy to recycle or dispose of after use. Another plus is the availability of sand and its low cost from an economic point of view. That is, it can be used without fear that it will go bad. In addition, sand accumulators solve the problem of storing excess energy, which was released in good weather through solar panels and wind turbines. Previously, such recycling was stored in batteries, which is very expensive. One of the main advantages of the sand tank is that it is cheaper to build than analogues, such as hydroelectric pumped storage power plants or thermal energy storage systems. The main

disadvantage of such a reservoir is that it can not be put anywhere in the world, for example in cold parts of the world will be quite labor-intensive to deliver the sand, making this technology is much more expensive because of the delivery of sand. Also the disadvantage is that the sand in the tank takes a very long time to heat up, which requires a lot of energy, but, also the sand and long retains heat without giving it away, which makes this disadvantage not the most significant [5].

Conclusion:

Summarizing the above, we would like to say that the sand accumulator, this is a very good option for storing generated energy for countries that can not afford huge and expensive plants, but can afford wind turbines, solar panels, stations for generating energy through tidal technology, because it is not expensive and environmentally friendly option.

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