ANALYSIS OF BATTERY PERFORMANCE SOLAR POWER PLANTS

B. Draganov, Ph.D.

Energy systems using solar energy has many advantages: inexhaustible, free of charge use, safety of operation, minimal impact on the environment and a sufficiently high aesthetics.

However, this system has the disadvantage, among which, first of all, the variability in time. This disadvantage can be reduced by using battery power.

Reliable and efficient energy storage systems not only provide a stable power supply to consumers, but also improve the utilization of energy due to the accumulation of peak and low potential energy that can not be obtained without its corresponding transformations. Therefore the problem of the most efficient storage is undoubtedly important. The use of thermal storage can increase by 30 - 50% efficiency of the use of renewable energy sources and, above all, solar energy.

The purpose of research - to develop a method of mathematical modeling of processes taking place in the battery heat and designation means of determining the effectiveness of the charging and discharging of the battery.

Materials and methods of research. The main means of improving the efficiency of thermal batteries include the use of mathematical modeling of the phenomena studied and optimization techniques. In the solar thermal system most commonly used liquid batteries heat. In the formulation of the problem makes assumptions: the battery is not forced fluid flow; dimensional model is used, that is, the temperature is assumed constant within a horizontal layer in the storage tank; coefficients of thermal conductivity of the liquid and the walls of the tank constant. The liquid stored in the tank at the temperature of which is closest to the own fluid temperature. Within the tank caused by the influence of gradient forces is absent; vertical mixing occurs. The system has no internal heat sources.

The results of research. Here is the solution of determining the temperature field in the liquid accumulator.

Battery with liquid heat accumulation material (TAM) is a vertical cylindrical tank with hot water at a ratio of its height to the diameter of 3 ... 5. In the tank there is a coil which is a heat source.

The task is to determine the temperature field is limited cylinder with internal heat source. It can be assumed that the movement of fluid in the tank and therefore a slight basic heat transfer process is thermal conductivity. Consequently, the problem is formulated as follows: given a limited cylinder, which has a first temperature equal to ambient temperature. At the initial time the lateral surface of the cylinder surface and the ends are starting to heat up at a constant speed.

According to the formulation of the problem mathematical model is formed in a two-dimensional heat equation in cylindrical coordinates.

The general solution of the problem formulated based on the method of integral transforms Hankel and Laplace /

Optimization method shown in Example battery provides simultaneous storage and power consumption.

It consists of two heat exchange surfaces arranged in the medium, which accumulate heat. In this case, the heat flux from the heat source is transmitted through the user accumulating medium.

Job heat accumulator is based on two charts:

- Receipt of heat (in our case - solar energy).
- Consumption of heat (heating and hot water).

Additional information is statistical data about the intensity of the solar radiation in this area and the heat consumption curve assuming that the temperature of the coolant at the outlet of the heat accumulator is always constant, i.e. .

The heat source of the installation is the solar energy. To improve the efficiency of the heating system in the scheme included absorption heat pump. If

analyzed the seasonal heat accumulator, there is no flow in the system are equal to zero.

Conclusions

A reliable method for determining the energy performance of the heat accumulator is based on mathematical modeling of the processes under study. Assessment of energy efficiency solutions is determined by optimizing the analyzed variants of structural and parametric solutions.