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Heat Pumps and Photovoltaic Systems Optimization

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Annotation: Heat of pumps work principle natural and industry low potential from sources the heat useful to the heat to convert based on Heat of pumps scope very wide _ They are big industry of complexes different technological in the fields of utility in services , for example , consumers heating and Hot water with provide and another in the fields performance can _ Heat of the pump efficiency increase method the first in line photovoltaic from the panels reserve power source as use and the work regimes exergetic evaluation because of exergetic losses to optimization based on.

Keywords: Heat pumps, photovoltaic panels, photoelectric , reserve power, compressor, exergy, energy.

Intoduction.

One of the most important processes in the world of solar energy is the photovoltaic effect . This is the photoelectric effect, in which an electric current is produced that flows from one part of a material to another. These materials move under the influence of sunlight or electromagnetic radiation will come . This effect is important in the production of electricity from photovoltaic elements of solar panels.

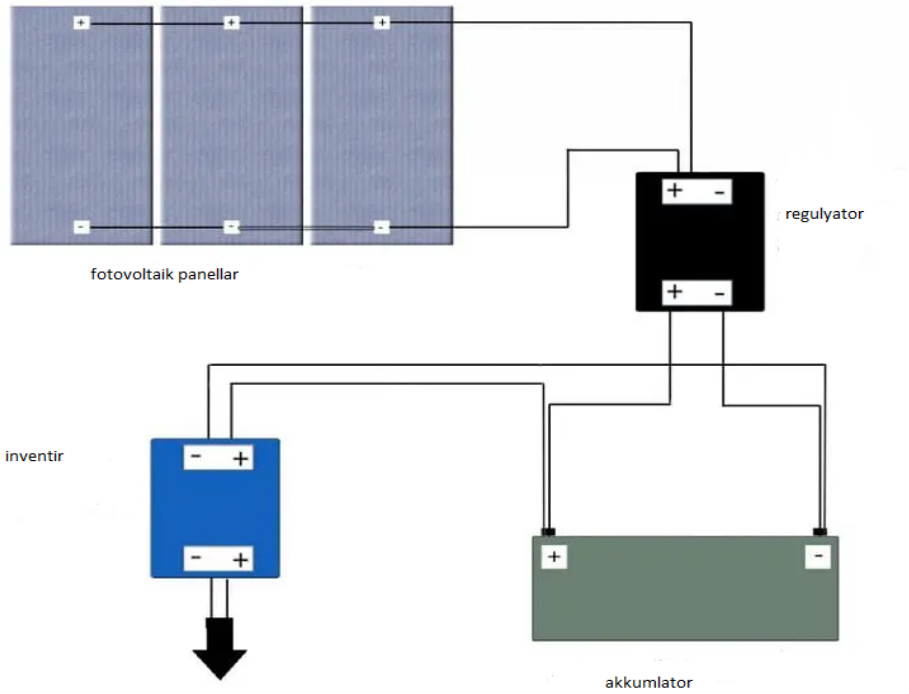

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Figure. 1. Photovoltaic panel operation scheme

When using a solar photovoltaic panel to generate electricity, the particles of the sun's rays convert it into energy that should be converted into useful electricity for our home. Photovoltaic cells are semiconductor devices composed mainly of silicon. These photovoltaic cells have some impurities from other chemical elements. However, silicon tries to be as damned as possible.

If the photon with edible of electron energy silicon atom of the nucleus from gravity if it increases , it is free will be Semiconductor of materials each one type own of atoms electrons release for necessary to the minimum energy that is have _ Short wave to the length have has been and ultraviolet from radiation come coming out photons there is . It is known that this photons in the composition big in quantity energy there is . Other side , we wave length longer those who are we find , therefore for they are less energy they get This photons electromagnetic of the spectrum infrared in the part located _

Electrons release for each one semiconductor materials for necessary the minimum energy that is frequency range depend _ This group them ultraviolet from radiation visible to colors connects _ Of this under they are electrons take out they can't , that's why for electricity until won't be

Heat pumps are used as heat devices for various purposes; they are efficient energy conversion devices. They reduce primary energy consumption using heat from a low-temperature energy source and increase the ambient temperature. Water can be a heated medium. Scientific articles on the heat recovery system are presented in the studies of various authors. Among other thermodynamic quantities and functions, the authors distinguish energy, enthalpy, exergy, and cop. Heat pumps are used as heat devices for various purposes; they are efficient energy conversion devices. They reduce primary energy consumption using heat from a low-temperature energy source and increase the ambient temperature. Water can be a heated environment.

Using the exergetic method based on the concept of using exergy and energy flow, the theoretical and methodological basis of studying low-temperature power plants was improved. This increases the accuracy and reliability of the results and is adapted to the capabilities of modern technologies for regulating the thermal characteristics of the energy flow. The software algorithm that allows to calculate the optimal value of exergy losses in individual elements of the installation is based on the technology developed by the authors. .

Energy is it of energy another any one to the shape turning around will not be part _ Only from energy consists of to forms of the environment internal energy , environment with thermodynamic balance in the situation was thermodynamic in systems collected energy , environment temperature heat and environment pressure overcome for the work does _

That's it to emphasize must be partially another energy to the forms conversion possible was energy forms are also available . This is thermodynamic of systems heat and internal their energy _ temperature and pressure the environment temperature and pressure difference does _ of energy this forms for energy quantity of thermodynamics second the law with limited . of thermodynamics second to the law according to , energy and anergy for the following statements action does _ Exergy all do not return in processes complete or partially to energy becomes _ Exergy and energy sum Grossman diagrams [14] are widely used in connection with the development of the exergetic method of thermodynamic analysis based on the second law of thermodynamics. Grossman diagrams are more informative than state diagrams because Grossman diagrams represent exergy flows.

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Development prospects of the exergetic method. Due to the expansion of the number of scientific and engineering workers using the exergetic method, there was a need for specialized literature. The rationale and application of this method should be detailed in such literature. This generalization is the first to be made. Then, practical problems for some types of thermal equipment are described, which were solved using the exergetic method. This literature describes optimization techniques for energy conversion systems and working fluid flows. The concepts of transit exergy, generalized efficiency and secondary energy sources are introduced for the first time.

We briefly describe the theoretical values based on the developed studies. For this, consider section 1 of the freon flow in the heat pump installation cycle, where the freon flow is characterized by pressure p_1, Pa and temperature T_1, K.

of the stream comparison exergy width , kj / kg, (1) by formula is determined

$$e_i = i_1 - i_{env} - T_{env} \cdot (s_1 - s_{env}) \quad (1)$$

this of current in part I_1 -1 on the ground to himself special enthalpy , kj /kg,

s_1 -1 of part to himself special entropy , kj /(kg•K), environment parameters and functions :

i_{env} -of the environment to himself special enthalpy , kj / kg,

T_{env} environment temperature , K, s_{env} while to himself special entropy environment , kj /(kg•K).

Change the formula (1). in the form present reach can :

$$e_i = i_1 - a_i \quad (2)$$

So , of the flow comparison energy a_i, kj / kg ni (3) formula with count can :

$$a_i = i_{env} + T_{env} \cdot (s_1 - s_{env}) \quad (3)$$

Earth heat of flow to himself special exergy the environment in the situation natural zero to the value of have when :$i = i_{env}$, $s = s_{env}$

A_i of flow to himself special energy as well of enthalpy manage to the point looking up to a constant is determined . Energy the difference in determining this constants decreases

of the stream to himself special energy e_i to himself special numerically from energy bigger to be possible ; this without of flow to himself special energy negative to value have will be

Ts in the diagram $i = i_{env}$ enthalpy of the line intersection the point if we choose , flow width special exergy field with is expressed . isobar with p = const

Later on experimental research installation and his technological scheme seeing will be released . Then this installation based on work developed exergetic method using thermodynamic the analysis count example given .

Experiments low potential for energy sources in the field scientific studies for special collected heat the pump installation prototype is used . Experimental in Fig. 1 of adjustment common appearance shown .

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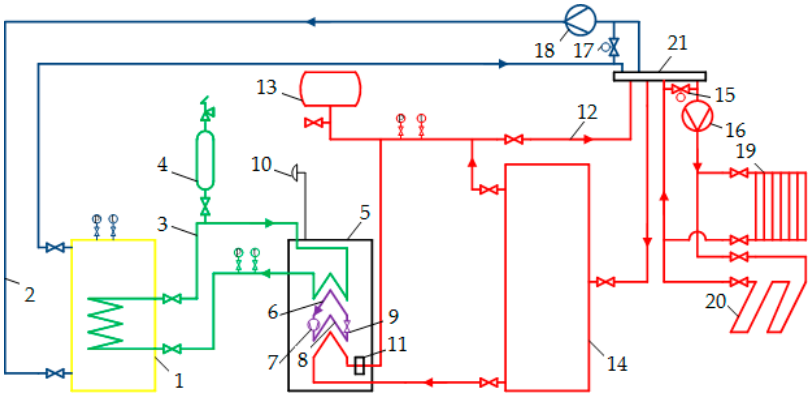

Figure 2. Scheme of the research heat pump device

1—cold water tank, 2—cold water ring, 3—propylene glycol ring, 4—expansion tank, 5—heat pump, 6—evaporator, 7—compressor, 8—condenser, 9—throttle valve, 10—temperature sensor, 11-electric heater, 12-warm floor, 13-membrane tank, 14-hot water tank, 15, 17-mixing valves, 16, 18-pumps, 19-heating radiator, 20-floor heat exchanger, 21-water collector.

The connection diagram of photovoltaic panels is shown in Fig. 2

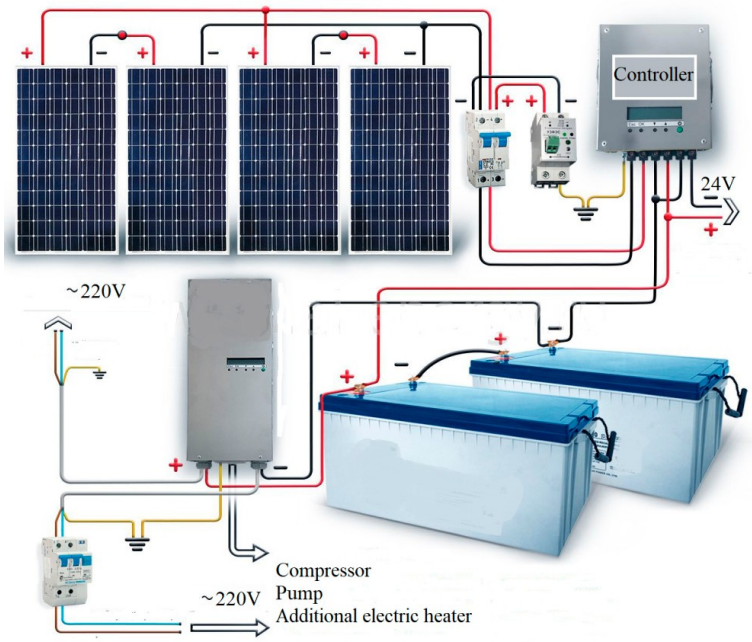

Figure 3. Connection diagram of photovoltaic panels for heating pumping devices

According to Figure 2, an inverter is used to convert direct current from batteries or solar panels into alternating current, similar to the current in a centralized power grid. The purpose of connecting the photovoltaic panels is to provide backup power to the compressor, pumps and additional electric heater of the heat pump unit.

of energy all forms of thermodynamics second to the law according to energy and from energy consists of That is , the most common without , energy exergy and energy write as sum can _ It is known that exergy is the environment parameters under another each how energy to the shape conversion possible was of energy one part _ That's it to emphasize should not _ how without residue conversion possible was energy forms there is . of energy such to the forms useful work ,

kinetic and potential energy and electricity energy enters _ of energy this forms only from exergy consists of Energy is it of energy another any one to the shape turning around will not be part _ Only from energy consists of to forms of the environment internal energy , environment with thermodynamic balance in the situation was thermodynamic in systems collected energy , environment temperature heat and environment pressure overcome for the work enters

Summary and methodological basis of studying low-temperature power plants was improved. This increases the accuracy and reliability of the results and is adapted to the capabilities of modern technologies for regulating the thermal characteristics of the energy flow. The software algorithm that allows to calculate the optimal value of exergy losses in individual elements of the installation is based on the technology developed by the authors. As shown by the performed experimental works, as well as analytical calculations of exergy losses when using photovoltaic cells as a backup power source, this allows to increase the efficiency of the thermodynamic cycle.

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