

METHODOLOGY FOR SUBSTANTIATING THE ECONOMIC EFFECT FROM THE INTRODUCTION OF HEAT PUMPS

Dudnikov S.M., Ph.D., associate professor, Polyak M.I., master's student,
(SBTU, Kharkiv, Ukraine)

State Biotechnological University

Надано методологія визначення обсягів корисно використаної енергії від теплових насосів.

With significant access to the use of geothermal potential in the Ukrainian agro-industrial complex, the use of heat pumps (HP) is increasing. The main incentive for the use of HP is energy independence, durability and environmental friendliness. The use of autonomous HP at agro-industrial enterprises causes contradictory opinions in society, the main of which is the economic inexpediency of the relevant projects, which is associated with the high cost of energy produced. [1, 2]

Unlike the price of electricity from a centralized system (CS), the cost price (C) of electricity from HP is constantly changing downward, which is explained by the dependence:

$$C = \frac{E}{W} \quad (1)$$

where E – total capital and depreciation costs for HP, UAH;

W – volume of usefully used electricity produced by HP, kWh.

Volume of usefully used energy from HP is determined by the formula:

$$W_{HP} = \eta K_{ITH} F \int_0^t \sum g_{jt} dt, \quad (2)$$

where: η - total efficiency of the heat pump, c.o.; F - area of the external circuit of the HT heat exchanger, m^2 ; t - time of use of the HT load, h.; n - day of the calculation period of the j th season, c.o.; g_{jt} - intensity of operation of the external heat exchange circuit of the HT at time t of the n th day of the j th season, kW/m^2 ; K_{ITH} - coefficient of mismatch of the consumer load schedule with the availability of geothermal energy, acting: $0 \leq K_H \leq 1$ c.o.:

Studying the functional dependencies of the volumes of generated HT energy will allow, during the design process, to make a decision on long-term forecasting of the efficiency of HT use.

List of references.

1. Dudnikov S, Miroshnyk O, Kovalyshyn S, Ptashnyk V, Mudryk K Methodological aspects of evaluating the effectiveness of using local energy systems with renewable sources, 2020 E3S Web of Conferences 154, 07013

2. Mohamed Q, Lazurenko A, Miroshnyk O, Dudnikov S, Savchenko A, ... Trunova, I. Analysis of the energy balance of the local energy supply system based on the bioenergy complex, 2020 IEEE 7th International Conference on Energy Smart Systems (ESS), 134-138