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INDEXES OF ENERGY, ECONOMIC AND ENVIRONMENT EFFICIENCY OF COGENERATION HEAT PUMP INSTALLATION IN THE THERMAL SCHEME OF HEATING BOILER HOUSE

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The aim of our study was estimated a number of indexes of energy, economic and environment efficiency of cogeneration heat pump installation (CHPI) in the thermal scheme of heating boiler house, with using the research results from our study [1].

The study [1] was aimed at determining the effectiveness of CHPI in the thermal scheme of heating boiler house in Vinnytsia. This heating boiler house works to meet the consumers' needs of heating and hot water supply. As was mentioned in [1], the working fuel of heating boiler house is natural gas.

In the study [1], we have proposed the installation of a cogeneration heat pump installation that will use the low-temperature heat of secondary energy resources of the boiler house and a heat of natural source (surface water). The use in the thermal scheme of the boiler house the cogeneration heat pump installation on the basis of steam compression heat pump installation (HPI) and gas-piston engine-generator will save fuel and increase energy efficiency and economic efficiency of the boiler house, which is determined based on research results [2 – 14].

In our study [1] it was noted that cogeneration heat pump installation will operate in heating mode and hot water supply mode. Installation of HPI in the thermal scheme of the boiler house will provide heat generation with high energy conversion rates. The source of low-temperature heat for HPI will be heat from the contact recycler and surface water. In [1] the savings of natural gas in heating boiler house due to the modernization of the thermal scheme with CHPI are determined. In order to modernize the thermal scheme of the heating boiler house, the installation of two heat pump units with estimated capacity of 300 kW of each was chosen. The drive of the heat pumps compressors will be provided by the gas-piston engine-generator with a nominal power of the electric generator of 400 kW.

In our investigation, is estimated a number of indexes of energy, economic and environment efficiency of CHPI in the thermal scheme of heating boiler house, with using the research results from our study [1] and developed by the author methodological fundamentals for assessing energy, economic and environment efficiency of energy supply systems with cogeneration HPIs, covered in publications [2 – 14].

The energy, economic and environmental effects from the introduction of CHPI in the thermal scheme of heating boiler house is confirmed by the efficiency of compared to the

basic version of the heat supply source– the existing boiler house. Estimation of indexes of energy, economic and environment efficiency for basic and alternative (with CHPI) variants of heat supply sources is executed based on researches [1 – 14], results are summarized in Figs. 1 - 2.

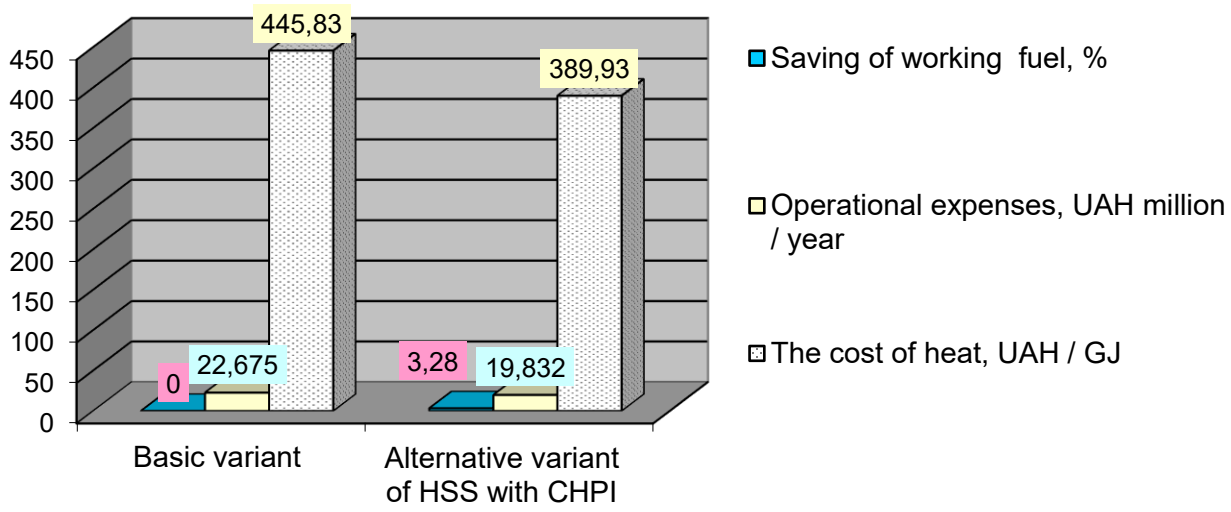

Fig.1 – Indexes of energy, economic and environment efficiency of the variants

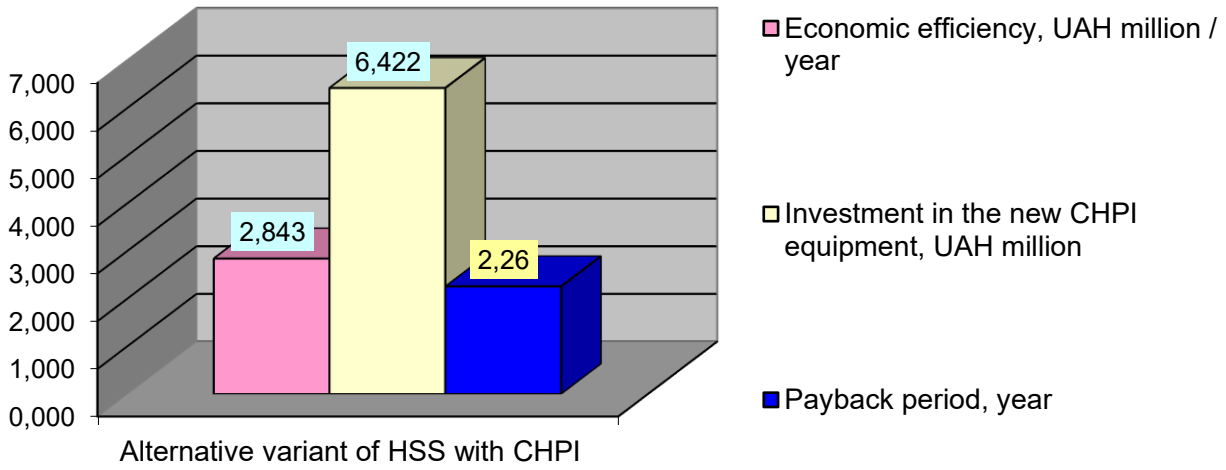

Fig.2 – Indexes of economic efficiency of the variants

Conclusions

In investigation estimated a number of indexes of energy, economic and environment efficiency of cogeneration heat pump installation (CHPI) in the thermal scheme of heating boiler house.

According to the results of the analysis of the indexes of efficiency of CHPI in the thermal scheme of heating boiler house, it is determined that:

– saving of working fuel will be provided by the boiler house in the amount of 22,68%;

– will reduce the operating costs (economic efficiency) of the boiler house in the amount of UAH 2,843 million / year;

– investment in new CHPI equipment will amount to UAH 6,422 million;

– payback period of new CHPI equipment in the thermal scheme of heating boiler house will be 2,26 years.

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