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(Poland, Ukraine, Croatia, Slovakia, Sweden, USA)

**ACTUAL PROBLEMS OF RENEWABLE
POWER ENGINEERING, CONSTRUCTION
AND ENVIRONMENTAL ENGINEERING**

Book of abstracts

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EVALUATION OF THE PROSPECTS FOR PRELIMINARY COOLING OF NATURAL GAS ON MAIN PIPELINES BEFORE COMPRESSION THROUGH THE DISCHARGE OF EXHAUST HEAT OF GAS-TURBINE UNITS

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For the transportation of natural gas through pipelines, gas pumping units (GPU) are installed at numerous compressor stations (CS), the energy carrier for which, in most cases, is transported natural gas. 0.5-1.5% of the volume of transported gas is consumed (burned) by the pumping unit drive.

The situation with the replacement of existing equipment with modern equipment is associated with significant investments, on the one hand, and the uncertainty with the transit of Russian natural gas through gas transmission systems of Ukraine in the near future. More promising is the way to increase the efficiency of the GPU cycle through the use of circuits with preliminary cooling of the compressed gas.

The aim of this research is studying the prospects for the application of technology for pre-cooling technological natural gas before compression in a gas pumping unit based on heat-using absorption refrigeration machines.

To analyze the effect of pre-cooling of technological natural gas on the compressor stations of main gas pipelines, gas pumping units – GTK-10I were selected.

The calculation of GPU power consumption and fuel gas consumption at various temperatures of the process gas at the inlet to the supercharger was performed.

The calculation of the operating parameters of the gas pumping unit is performed and the energy and financial prospects of the technology for cooling the process gas before compression in the GPU CS are shown. For the current economic situation (July 2019) in the Ukrainian gas market, the daily decrease in operating costs in standard gas pipelines with a decrease in gas temperature before compression in the gas pumping unit by 20 K ranges from 1800 USD to 3360 USD.

A scheme of a recycling plant based on absorption water-ammonia refrigeration machine (AWRM) is proposed, which in the range of initial data allows to reduce the temperature of technological natural gas before compression by 11-13°C.

The analysis of methods to reduce energy consumption during the transportation of natural gas through pipelines is done.

It is shown that lowering the gas temperature before compression also leads to a decrease in the work spent on gas compression, and cooling tasks can be solved most energetically efficiently using heat-consuming AWRM s with a wide range of cooling temperatures, which use the thermal energy of the exhaust gases for their work.

To assess the prospects of pre-cooling the process gas before compression, the working parameters of a typical gas pumping unit are calculated and, based on the analysis of the calculation results, the energy and financial prospects of such a solution are shown. So, for example, for the current economic situation (July 2019) in the Ukrainian gas market, the daily decrease in operating costs in standard gas pipelines with a decrease in gas temperature before compression in the gas pumping unit by 20 K ranges from 1800 USD to 3360 USD.

To implement the technology for pre-cooling the process gas, an original design of an AWRM-based heat recovery plant has been proposed, which in the range of typical operating characteristics allows to reduce the temperature of the process natural gas before compression by 11-13°C.

The technology for pre-cooling the process gas allows to reduce the temperature level of the compressed gas and to obtain an additional economic effect due to the ACA shutdown, which can be estimated for specific climatic conditions in the region where the compressor station is located.