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Titov M.G., student of group 122-23-2
Olishevskyi I.H., Associate Professor of the department of information security and telecommunications
(*Dnipro University of technology, Dnipro, Ukraine*)

METHOD OF CALCULATING OPTIMAL PARAMETERS FOR THE OPERATION OF MODERN HEATING AND AIR CONDITIONING SYSTEMS OF BUILDINGS

The goal of the work is to analyze existing energy-efficient technologies based on heat pumps. Development of an automated method of calculating parameters for heat pump systems of heating, air conditioning and hot water supply, used in domestic conditions, with non-standard heat transfer flows.

The technology of using the ground heat pump of the water heating system of the building for the air conditioning needs of the building was investigated. At the same time, the heat pump must work to cool the building, transferring heat to the ground (Fig. 1), which will reduce the refrigerant condensation temperature from 46 °C to 30 °C in the scheme with a heat accumulator. This is justified by the ability of the soil to maintain a stable temperature of about 8 °C throughout the year at a depth of 2 m.

Analyzing the dependences obtained, it can be concluded that the temperature of the cooled air varies significantly depending on the temperature of the outside air (from 17 °C to 27 °C). While the comfortable indoor air temperature for the warm period is assumed to be equal to 24 °C, and is performed only at the outdoor air temperature to=36 °C. Such deviations in the temperature of the indoor air are undesirable for the human body.

It was decided to regulate the temperature of the internal air by changing the flow of water in the system in order to maintain a temperature of 24 °C at any temperature of the external air.

On the basis of the functional dependence of the internal air temperature on the external air temperature and the water flow in the system, a control dependence of the mass flow of water in the system on the external air temperature was formed under the condition of constancy of the given comfortable internal air temperature (Fig. 1). This control dependency can be set in the control controller of the air conditioning system of the building.

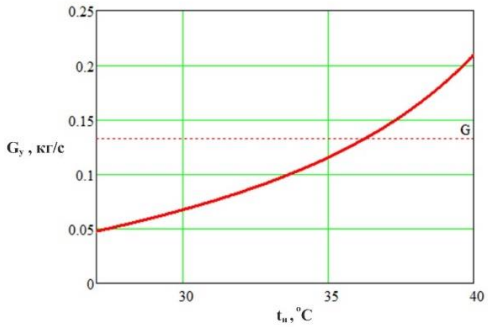

Figure 1. Control dependence of Gy, water consumption in the system, on the outside air temperature

CONCLUSION

Thus, with the help of the control dependence of the water consumption in the system, the constancy of the comfortable temperature of the internal air is ensured at any external air temperature. As a disadvantage, it is possible to note the excess of the value of water consumption in the system relative to the basic value of the heating system, in the area of high outdoor air temperatures (above 36 °C), which is shown in fig. 1. However, this area is much

smaller than the area of applied outdoor air temperatures, which more than compensates for the possible excess of energy consumption in the high temperature zone, compared to the base system.

For hot water supply, it is proposed to use an air-liquid heat pump instead of a heat accumulator, which will use the heat of the outside air and work to increase efficiency in two modes: with a refrigerant evaporation temperature (Freon-11) of 20 °C for outside air temperatures from 27 °C to 37 °C and with an evaporation temperature of 30 °C for outdoor temperatures above 37 °C. This will increase the energy conversion factor of the heat pump by 1.5...2 times (up to 14...22) compared to the air conditioner + heat accumulator scheme.

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