ANALYSIS OF THERMAL CHARACTERISTICS OF THE SYSTEM OF WATER UNDERFLOOR HEATING DRY INSTALLATION

Nedbailo O.M., Tkachenko M.V., Bozhko I.K.,
Timoshchenko A.V., Vasylenko S.V.
Institute of Technical Thermophysics of the National Academy of Sciences of Ukraine
Str. Bulakhovskogo, 2, of. 101, Kyiv, Ukraine, +380444242527

In the application of heat pump plants in the system of heating supply preference is given to low-temperature systems of water underfloor heating. In addition, floor heating provides the most comfortable sanitary and hygienic conditions for the presence of a person in the room.

The purpose of this work is to determine the effect of the thickness of the insulating layer and the type of finish coating of the underfloor heating system of the dry installation on the properties of the heat transfer from the coolant to the room, depending on a number of different operating parameters and external factors.

The experimental research of the thermal characteristics of the fragment with the area of 6,36 m^2 and the dimensions of 1,2 m x 5,3 m of the floor heating system of the dry installation has been carried out. The system was located in the middle of a laboratory room with an area of 18 m^2 with dimensions of 3 m x 6 m x 3 m. The heating circuit is made of a metal-polymeric pipe PeX with an external diameter of 16 mm and a wall thickness of 2 mm. The thickness of the aluminium heat distributor and the plates of extruded polystyrene foam with grooves (channels) were 0,2 mm and 40 mm (total, varied in various experiments).

Results. Depending on the change in the temperature of the outside air, the values of electrical power (thermal load) on the flow-type electric water heater were discretely determined to compensate for the heat loss of the room at the constant consumption of the coolant in the circuit of the heating system.

A significant increase in the average temperature of the floor surface is due to the use of ceramic tiles as a finishing coating. This is due to the higher value of the coefficient of thermal conductivity of this material. While a different flow of coolant in a certain range almost does not affect the temperature change of the surface of the laminate. This proves the thesis that the quantitative regulation of the heat output of low-temperature heating systems is inappropriate. More efficient, in this case, is the qualitative regulation of the thermal load with the change in the temperature of the coolant in the system. The doubling of the thickness of the thermal insulation reduces, by separate calculations, about 12%, heat losses from the coolant in the contour into the space under the underfloor heating system. Accordingly, this affects the fact that, at a lower temperature of the surface of the finish coating, coverage of the heat loss of the premises is achieved in accordance with the relevant standards.

Conclusions. The conducted experimental researches allow asserting that the system of underfloor heating of dry mounting has a greater thermal manoeuvrability in comparison with the filling screw, and also low heat accumulation ability. A small heat-inertial component is achieved by the absence of a relatively thick layer of monolithic concrete slab in which the circuit of the heating system is usually installed.