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IMPROVEMENT OF DESIGN OF INDIVIDUAL HEAT SUPPLY SYSTEMS FOR RESIDENTIAL HEATING POINTS

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Abstract

Due to the shortage of energy resources in Ukraine, the issue of saving heat and electricity is becoming increasingly important. Saving heat can be achieved through individual control of heat consumption at heating points in combination with centralized control.

Keywords: heat supply, individual heat point, heating, hot water supply.

Introduction

Recently, special attention has been paid to the issues of energy efficiency and rational energy consumption. This has been especially exacerbated by the sharp increase in the cost of energy carriers. Increasingly, managers of utility companies, residents of apartment buildings and owners of other energy-consuming facilities are interested in the following: reducing inefficient energy consumption; accounting and management of energy consumption; automation of processes related to ensuring comfortable climatic conditions in premises at minimal costs [1-2].

Research results

Individual heat point (ITP) is one of the main elements of the centralized heat supply system, which provides the function of effective use of external energy resources to ensure stable circulation and distribution of the coolant in the heat supply system of an individual facility. The transition to a system using ITP is advisable not only when building new facilities, but also in already operated buildings with an old heat supply system. Despite some inconveniences, individual heat point (ITP), which includes the complexity of transportation and installation, the popularity of using ITP is growing every year. In the municipal sector, this problem has become extremely relevant, since it was given much less attention compared to production. It is in the municipal and housing sector that the costs of providing heat have become extremely costly for the budget [3-4]. An individual heat point can significantly reduce energy consumption and increase comfort. Various companies produce modern modular heating units that provide regulation of the supply of thermal energy to heating, hot water supply, ventilation and air conditioning systems. Installation of ITN guarantees savings in terms of ensuring a favorable climate in residential buildings, office buildings or industrial premises. In each building, depending on the needs, one or more ITNs can be installed [5-6].

The heat loads for heating and hot water supply of residential buildings with certain characteristics and number of residents for the climatic conditions of the city of Poltava have been determined. Schematic drawings of individual connections of heat exchangers and hot water supply schemes have been developed and calculated using regulatory documents and catalogs of manufacturers of the relevant products. Calculations for heating and water heating systems for the residential area are given.

Initial data for the calculation:

– dimensions of the house a=24 m, b=42 m;
– number of floors – 5;
– number of houses – 9;
– thickness of the floor between floors δ = 0.350 m;
– floor in all houses – insulated on logs;
– to reduce heat loss in houses, thermal modernization of their external walls was carried out by gluing polystyrene foam (insulation - I) plates, and wooden translucent structures were replaced with energy-saving double-glazed windows;

– the temperature of the internal air in the premises of the houses is t = 20 °C.
The results of the calculations are shown in Tables 1 and 2.

Table 1 - Estimated heat flows by consumers, kW

Load	Marking	Value of a quantity
1. Estimated heat flow for heating buildings	ΣQ_o	1764,36
2. Average daily heat flow for hot water supply to residential consumers	Q_T^h	775,44
Total calculated heat flow for heating and hot water supply to consumers	ΣQ	2539,8

Table 2 - Annual heat consumption by consumers, MJ/year

Load	Marking	Value of a quantity
1. Annual heat consumption for heating houses	Q_{hh}	$0,55 \cdot 10^7$
2. Annual heat consumption for hot water supply of residential consumers	Q_{hws}	$2,34 \cdot 10^7$
Total annual consumer load	$\sum Q$	$2,89 \cdot 10^7$

After interim maintenance calculations, auxiliary equipment such as various pumps and expansion tanks was selected. The main measures and means of organizational and technical support for occupational health and safety were determined.

Conclusions

The work calculates the heat loads: for heating – 1764.36 kW and for hot water supply – 775.44 kW. The total annual load of consumers for a group of houses is $2.89 \cdot 10^7$ MJ/year.

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