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INTEGRATED CALCULATIONS OF DISTRICT HEATING SYSTEMS

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ANNOTATION

The heat supplied from the heat source is planned taking into account all visible heat consumption. According to the hydraulic calculation of the system, the dimensions of the shrinking equipment (elevators) are determined and it is used to regulate the heat transfer pressure from the heat source.

Keywords: **centralized heat supply, heating network, gidroelevators, temperature graph, water consumption, heating period, heat exchange.**

Centralized heat supply of the city of Tashkent works for a while more than the corresponding heat carrier costs in the system.

The centralized Heat Supply System of the city was established in 30-50 years on the basis of technical ideas from 70-40 years of the last century.

Most buildings in the city of Tashkent are connected to the Heat Supply System, according to The Associated scheme open water intake system.

The heat and hot water supply of the buildings in the city of Tashkent is carried out mainly in a centralized way. Centralized Heat Supply in the city has a ring network, and energy is supplied to them from many sources.

In this case, the water in the heating network is circulated in the heating system, and this water is also supplied to the hot water supply system. In this case, the temperature of the water leaving the heat source is regulated by a temperature graph that depends on the outside air temperature.

The heat supplied from the heat source is planned taking into account the consumption of heat in all its manifestations. According to the power calculation of the system, the dimensions of the narrowing equipment (elevators) are determined, and with its help, the heat-carrying pressure coming from the heat source is regulated.

The calculated values of pressure determine the supply of heat to each consumer, and the sources of heat must supply this pressure.

At the same time, in residential buildings there is no universal accounting equipment and no adjustment devices, most of the heating system pipes in residential buildings are filled with sediments. Since such systems have high resistance, they can only be heated by excessive consumption of the heat carrier. In this case, the gidroelevators can not overcome the resistance of the system, and the houses are heated either on account of water leakage or by increasing the diameter of the elevator.

An increase in the amount of water supplied to a house will automatically reduce the water consumption supplied to neighboring houses, and the heating system in those houses will not work well either.

This situation becomes more pronounced when the outside air temperature is low, due to the limitation of gas supply and the lack of reserve fuel, and the houses are not sufficiently heated.

For the above reasons, there is a tendency for the population to spend more than the norm, and this will harm the enterprise from the economic side.

The characteristics of residential buildings that use centralized heating in the city of Tashkent are given in the table.

№	Number of houses, PCs	Number of houses, pieces	Total area, m^2	Total living area, m^2	Total heated area, m^2	The heat flow from the heating, 1 m^2, Kcal / $m^2 \cdot h$ $t_{Outside}$=-14ºC	Consumption per hour of heating, Q_h, Gcal /hour
Built before 1985							
1-2 storey buildings	1401	14779	731124,45	451264,07	458513,15	136,57	99850
3-4 storey buildings	3587	173557	9221350,47	5766033,61	5853658,93	92,54	853,344
5 storeys or more	1699	116628	6906658,97	4046626,10	4122486,75	65,02	449,071
Construction after 1985							
1-2 storey buildings	38	259	16879,92	10394,62	10941,55	135,54	2,288
3-4 storey buildings	754	24726	1584839,93	950685,58	978975,65	72,93	115,582
5 storeys or more	1552	97927	7163264,47	4028579,62	4090592,78	59,69	427,575
Subtotal:	**9031**	**427876**	**25624118,21**	**15253583,60**	**155151168,79**		**1947,710**

On average, the average weighted heat flow for heating the total area of the city is 76.01 Kcal / hour*1m^2.

Here the values of the heat flow for heating buildings taken according to KMK 2.04.07-99 " Heat networks” for the calculated outdoor air temperature for heating design - - 14C.

The air temperature inside the heated space - +20 ˚C.

Heat consumption for a month is determined from the expression (Regulation on the procedure for determining thermal loads and norms of fuel, electricity, heat, water consumption...)

$$Q_{month} = Q_h^w \times \frac{t_{\text{inside}} - t_{out}^{month}}{t_{\text{inside}} - t_{out}^{\text{calc}}} \times n \times 24, \text{ Gcal}$$

where Q_{month} – monthly heat consumption for building heating, Gcal.

t_{inside} - the temperature of the indoor air, ˚C.

t^{month}_{out} - average outdoor temperature for a month, ˚C.

t_{inside} – calculated outdoor temperature,

n – число суток месяца.

When calculating heat consumption for March and November it is necessary to take into account the increase in heat output on days with outdoor temperatures above 6.2˚C, when the hot water supply conditions require maintaining the temperature in the supply pipeline at least below 70˚C (under heating conditions the water temperature can be lowered).

$$Q_h^{calc.} = 1947{,}710 \text{ Gcal/hour}$$

	Temperature coefficient $K_t = \dfrac{t_{вн} - t_{нар}^{ср.мес}}{t_{вн} - t_{нар}} = \dfrac{20 - t_{нар}^{ср.мес}}{20+14}$	Coefficient that takes into account the maintenance of temperature in the sub-pipelinee 70˚C by $t_{inside} \succ 6{,}2°C$	Monthly heat consumption for heating residential buildings $Q_{мес} = Q_o^p \times K_t \times K_{70°C} \times n \times 24$ n- number of days
January	(20+0,4)/ (20+14)=0,600	1	869457,744
February	(20-2,0)/ (20+14)=0,529	1	692387,532
March	(20-7,9)/ (20+14)=0,356	1,22	568464,562
November	(20-6,7)/ (20+14)=0,391	1,26	690882,342
December	(20-2,0)/ (20+14)=0,529	1	766571,911
Subtotal:			3587764,091
Note:	In March, 28 days were taken, since the duration of the heating season was 148 days		

Specific heat consumption per 1 m² of total area per year:

Heating season - $\dfrac{3587764{,}091}{25624118{,}21} = 0{,}140015124$ Gcal / m² per year

Per month of the heating season - $\dfrac{0{,}140015124}{5} = 0{,}028003025$ Gcal / m² for a month of the heating season

Per 1 month - $\dfrac{0{,}140015124}{12} = 0{,}011667927$ Gcal / m² per month

Specific heat consumption per 1 m² of total heated area per year:

Heating season - $\dfrac{3587764{,}091}{15515168{,}79} = 0{,}23124235$ Gcal / m² per year

Per month of the heating season - $\dfrac{0{,}23124235}{5} = 0{,}04624847$ Gcal / m² per month of the heating season

Per 1 month - $\dfrac{0{,}23124235}{12} = 0{,}019270196$ Gcal / m² per month

In the heating period of 2018 (January, February, November, December), the average outdoor temperature in January is +6.3 ˚C, the temperature of the water supplied from the heat source is 72.2 ˚C, the average temperature on the temperature graph is 79.5 ˚C, in February the outdoor temperature was +8.1 ˚C, temperature s be, and in December, when the outdoor temperature was +5.4 ˚C, the temperature of the water supplied from the heat source was 72.6 ˚C , on the temperature graph, the average approximate temperature should be 86.4 °C.

For this reason, in 2018 (January, February, March and December) the days when the coolant temperature was insufficient were 68 days (January-18 days, February-14 days, March-3 days, November-12 days, December-21 day).

Analysis of the operation of the centralized heat supply system on the coldest days of 2018 (January 29, 30, February 10, 11, November 20, 27, December 19, 25) showed that a gas failure in the heat source caused a significant decrease in the room temperature. The difference between the calculated and applicable heat carrier on these days was 32 ° C (January 29) in January, 34 ° C (February 10) in February, 52 ° C (November 21) in November, 34 ° C (10 December 24) in December . [2]

At a time when the outside temperature drops, the mess in the system accelerates. The amount of water supplied to fill the system increases from the power of the heat source, which leads to a decrease in the quality of water supplied to the heating system, and the water leaving the source cannot provide the required performance. As a result, this will further limit consumers in terms of heat.

The above facts are confirmed by the volume of water provided for the replenishment of the heating network in 2018.

If the average water consumption in the range of the heating period is 10,618 t / h, then the volume of water supplied to complete the system during the heating period was more than 9179 t / h, which amounted to 19797 t / h.

During the period when the day in January was cooled, the volume of water filling the network was 20048 t / h, in December-20780 t / h.

After the heating system was turned off, it again returned to its previous state.

REFERENCES

1. Mamajanov T.M., Nurmanov S.R. "Heat Supply". Training manual. Tashkent 2018 y.- 214 p
2. Nurmanov S.R., Mamajanov T. "Heat losses in thermal networks of centralized heat supply systems". Sofia. Bulgaria. "Byal GRAD-BG ODD" 2020 15-22 April. materials of the XVI international scientific practical conference.
3. Nurmanov S.R. Determination of heat losses in thermal networks // SIS-Journal Slovakiya. Slovak international scientific journal №37, 2020 VOL.1
4. Nurmanov S.R. Heat transfer during the pressure flow of liquid in pipes in heat supply systems // "Journal of Critical Reviews" ISSN: 2394-5125. №8, 2020 VOL.1 www.jcreview.com (Scopus)
5. Nurmanov S.R Loss of thermal energy through the insulation layer in the pipes of thermal networks. // Scientific journal of innovations in architecture/ journal innovasii v architecture/ Journal of innovations in architecture ISSN 218949440 DOI 10.26739/2181-9440/2020/1-6
6. Nurmanov S.R Mathematical model for building a temperature graph in thermal networks. // Scientific-practical conference materials on the theme of the current state and prospects of use of alternative energy sources of the Republic of Namangan city 22-23 April 2020 year.

7. Nurmanov S.R. Innovation in the teaching of heat transfer processes in pressurized pipes in thermal networks // “Collection of materials of the Republican scientific-practical conference on the theme" Innovative Approaches in teaching technical subjects in a foreign language " in Namangan city 14-15 may 2020