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Accumulation Of Heat In The Substrate-Soil Cover Around The Heat Accumulator Of Heliogreenhouse-Livestock Building

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Abstract
In the article, in calculating the volumetric heat distribution in a water tank heat accumulator, the location of water tanks along a flat wall and the degree of efficiency of hot air flow heat accumulation along their gaps were determined.

Keywords: water tank, heat transfer, livestock and Poultry facilities, external and internal fences, thermal protection.

Introduction
Uzbekistan has favorable climatic conditions for the use of solar energy, one of the renewable energy sources. In recent years, various projects and technological equipment and devices based on solar energy have been created and improved in our country. One of the main elements of solar devices is the heat accumulator in it. Today, various designs of solar heat accumulators have been developed, in which sharp stones, metal pieces and others are used as heat-collecting materials. However, the thermal and physical properties and mineralogical composition of the proposed cheap and local types of battery materials

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were revealed as a result of the analysis of scientific and patent sources with little or no information [1,2].

The Main Findings And Results

Volumetric air heating under the influence of solar energy is made of a composite material with maximum heat transfer properties around the pipe to the collector-underground heat accumulator, the perimeter of which consists of a substrate filled symmetrically 50 sm above the ground, to study its thermal and physical energy characteristics (figure 1).

It is known [3] that the amount of heat accumulated by the hot air flow due to the amount of heat transferred from the pipes to the substrate soil layer during the day

$$Q_F = C\rho(t_{\max} - t_{\min})\delta \qquad (1)$$

is calculated using the equation. Here, the maximum and minimum values of the temperature variation of the substrate soil layer around the $t_{\max}, t_{\min}$ heat accumulator pipes according to the thickness of the δ and their average value [4]

$$t = \frac{1}{\delta}\int t(\delta)d\delta \qquad (2)$$

is calculated using the equation. If the temperature changes nonstationically, the formula (2) is expressed as a sum and calculated on the basis of a programmed C ++ program.

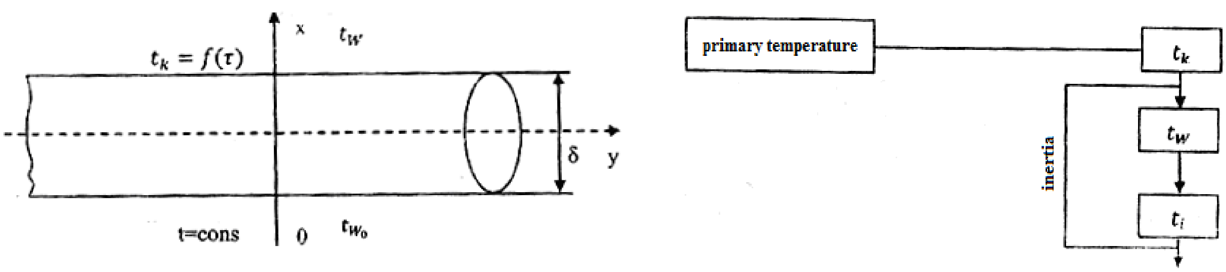

Figure 1. Substrate soil layer heat was determined as the heat transferred through the pipe along the thickness of the accumulator was determined for some building materials [3].

As shown in Figure 1, the effect of the heat flux transferred to the substrate layer heat accumulator layer is uneven, i.e., it is transmitted in a variable mode, as the temperature in the hot air flow composite pipes changes unevenly. Therefore, we consider the differential equation of heat transfer with periodic variable (nostational) temperature at the bottom of the substrate soil layer heat accumulator as the temperature constant at the bottom and the temperature at the top as one value of the initial and boundary conditions;

- differential equation $\frac{\partial t}{\partial \tau} = a\frac{\partial^2 t}{\partial x^2}$ (3)
- boundary conditions when x=0, $t_w = const = t_{w_0}$ (4)

when X=0 , $-\lambda \frac{\delta t}{\partial x}_{x=\partial} = \alpha\left(t_k - t_u\right) + q$ (5)

Initial conditions $(x, \tau_o) = t_0 = const$ (4) and (5) input conditions

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$t(x,\tau+T)=t(x,\tau)$.

Here τ -time, c; x-substrate soil layer thickness, m; - coefficient of thermal conductivity, m2 / s; thermal conductivity, $Vt/(m\cdot^0 C)$; specific heat capacity and density of the substrate soil layer; q - specific gravity of hot air flow through heat accumulator tubes, Vt/m^2; $\alpha-$ heat transfer coefficient, $Vt/(m^2\cdot^0 C)$; $t_w, t_{w_0}-$ changes in the lower and upper temperatures of the substrate soil layer, 0C; t_k- the average temperature of the air flowing through the pipes, 0C;

The value of $\delta-$ (1) and (6) is determined by solving the last difference method (2) of the system of equations. We divide the soil layer of the substrate, which is considered a heat accumulator, into thought pieces. We call i pieces of substrate soil layer Δx_i and the number of layers k. This is 1.2… k. The time at which the experiments are performed is Δt, and the time of the full experiment is $\tau=n\Delta t$ (number of n units of time). In this case, the temperature change in the soil layers of the Δx_i-substrate at moments $t^n{}_{\Delta x_2}$, $t_{\Delta x_{1+1}}{}^{n+1}$ s n and n + 1; the numbers of the n-time unit period are the number of k-substrate soil layers, represented by $\delta=k\Delta x$.

By solving systems (1) and (6)

$$t_i^{n+1}=\frac{t_{i-1}^n+t_{i+1}^n}{2}, i=1,2,\kappa \qquad (6)$$

has been identified.

Also, the change in the temperature of the substrate soil layer was calculated and determined using the $t_i^{n+1}=\dfrac{\alpha\Delta x t_{i-1}^n+\lambda t_k^n+q\Delta x}{q\Delta x+\lambda+\alpha\Delta x}$ formula [5]. (7)

Here t_{i-1}^n-n is the change in temperature in the layer at the moment of time (k-1) (Fig. 2). Figure 3 shows a heat accumulation system based on the thickness of the substrate layer around the underground composite pipe.

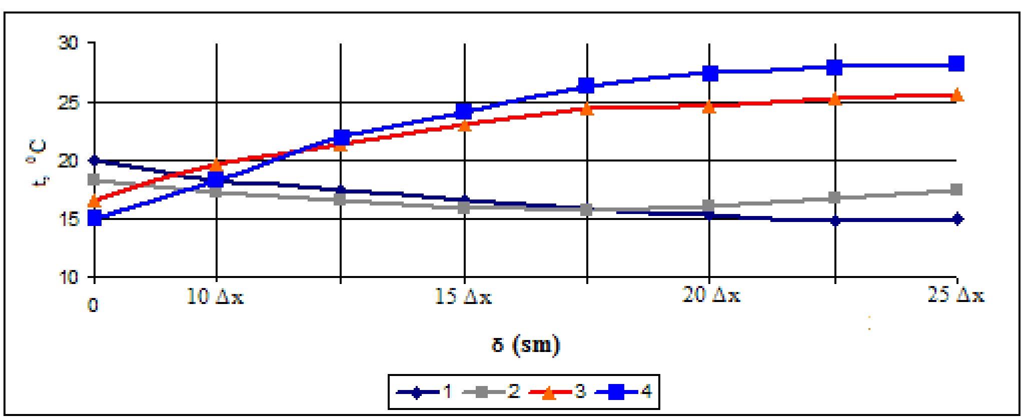

Figure 2. Temperature change on the depth δ (sm) in the n-time unit in the soil layer when the underground composite tubular heat accumulator is not used (1, 2) and used (3, 4)

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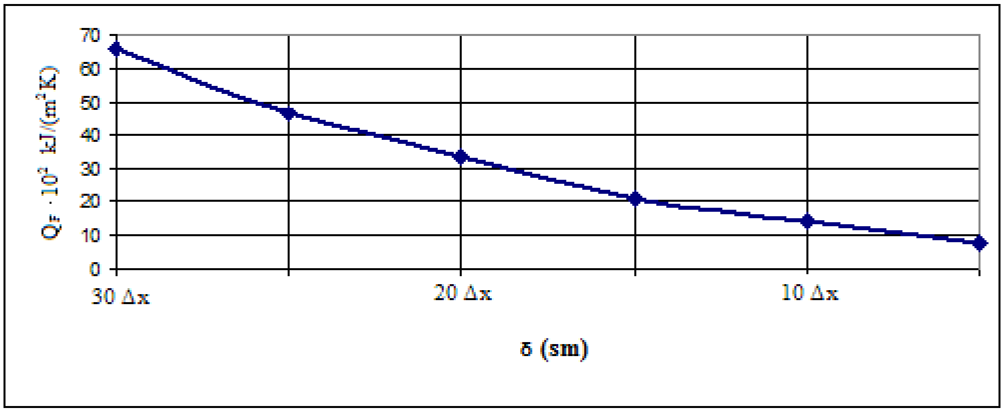

Figure 3. Change in the amount of δ (sm) accumulated heat in the substrate-soil mixture layer around the heat accumulator pipe

By formula (7), the temperature at the top of the soil layer of the heat-accumulating substrate was determined, on the basis of which the degree of accuracy of the t_i^{n+1} was evaluated [6,7,8].

In this case, equations (1) and (2) are expressed as follows:

$$\bar{t} = \frac{\sum_{i=1}^{K} t_i}{K} \quad (8) \qquad Q_F = C\rho\left(t_{max} - \overline{t_{min}}\right)K\Delta \quad (9)$$

Hence, at n time units, t_i^{n+1} temperature values were determined at n and (n+1) unit time moments in the upper layer of the substrate soil layer heat accumulator [9,10].

Conclusion

In this case, the lower layers of the substrate soil layer were considered to be temperature constant, ie determined according to the formula $t_w = t_{\Delta x} = t = const, \quad t_w = t_{K\Delta x}$ (8). Also, first t_w, then t_is (n + 1) and (n + 2) and so on were calculated in units of time (Fig. 2 a, b). Experiments (eg, constantan thermocouples) were conducted, computer-programmed studies were performed. As long as the results of the $\Delta x = 10 - 30 \quad см$ interval i.e. $\Delta x = \delta \bar{t}$ calculation (Figure 3) are QF maximum in the graph. Substrate soil layer heat accumulator during the day QF=54,5·102кJ/(m2 a day) heat volume volumetric air heating collector young animals in the building heat accumulator accumulates in the surrounding substrate soil layer this amount of heat externally air temperature $t_T = -7 \div 10 \ ^0C$ Storage at $t_i = 10 \div 12 \ ^0C$ was investigated based on experiments.

References

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[1] Risbaev A.S. Xayriddinov B.E. Rabbimov E. Davronov X.T. Ergashev Sh.X. Accumulation of the amount of heat in the soil layer of the substrate around the heat accumulator in the livestock room with volumetric air heating collector. Republican scientific and technical conference "Science, education and modernized energy and resource-saving technologies, technical means: problems, solutions, prospects for the development of sectors of the economy" Jizzakh Polytechnic Institute. April 17-18, 2015. Pages 279-281.

[2] Khayriddinov B.E., Rajabova O.B., Abdullaev A.I. Determination of the thermal conductivity of local heat-insulating building materials. Proceedings of the scientific-practical conference "Science and Innovation". Karshi State University. 2019. pp. 11-15.

[3] Xayriddinov B.E., Ergashev Sh.X. Solving the problem of heat balance of a flat-wall water and underground heat accumulator in a greenhouse using solar bioenergy. Fergana Polytechnic Institute "Science and Technology" magazine. 2020 №2. Pp. 102-108.

[4] Bogoslovsky V.N. Construction Thermal Physics M .: "High School" 1982 400 p.

[5] Murusidze D.N., Zaitsev A.M., Stepanova N.A.

[6] Fokin K.F. Construction heat engineering of enclosing parts of buildings M .: Stroyizdan 1973 268 p.

[4] Bogoslovskiy V.N. Stroitelnaya teplophysika M .: «Vysshaya shkola» 1982 400 p.

[5] Murusidze D.N., Zaytsev A.M., Stepanova N.A. Establishments for the creation of microclimates in animal farms -M .: Koloe 1979, - 327 p.

[6] Fokin K.F. Stroitelnaya teplotexnika ograjdayushchix chastey zdaniy M .: Stroyizdan 1973 268 s.

[7] Khayriddinov B.E., Kholmirzaev N.S., Xalimov G.G., Ergashev Sh.X. "Use of Alternative Energy Sources" T .: "SPARKS OF LITERATURE" 2018. 417 p.

[8] Khayriddinov B.E., Namazov F.A., Ergashev Sh.H. About mathematical of heliobioenergetic citcuit for heating system of stock and poultry buildings. "Development of energy systems of the agro-industrial complex: promising technologies" materials of the international scientific-practical conference of the Institute of Agrarian Engineering, Chelyabinsk, 2018. p.p 101-107.

[9] SNiP 2. 10. 03-84. Livestock, poultry fur farming buildings and premises. 8 p.

[10] Bogoslovsky V.N. Aspects of creating a building with efficient use of energy // AVOK Journal, 2000. №5.